



# Experts' opinion reports

DG AGRI

Analysis on future developments in the milk  
sector

**2013**

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# ***Theme 1: Market balance and competitiveness***



**AGRI-2012-C4-04 - Analysis on future developments in the milk sector**

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Opinion Report

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**Theme 1: Market balance and competitiveness**

## 1. How will the balance between supply and demand be affected by market forces, organisational systems of the supply chain (in particular POs and IBOs) and policy measures, including market support mechanisms, in a non-quota regulatory framework?

### 1.1 Interpretation and comprehension of the key terms of the evaluation question<sup>1</sup>

*Key terms in EQ1: Balance, supply, demand, market forces, supply chain, Producer Organisations (POs), Inter-Branch Organisations (IBOs), policy measure and market support mechanisms.*

*Supply:* We refer to *primary supply*, i.e., milk production, which is channelled toward the final markets (either domestic or export markets) through either deliveries to dairies and further processing or direct sales (a small, and residual, proportion of the whole production will be self-consumption within the farm). Total (aggregate) supply within the EU is just the sum of each farm's production.

*Demand:* We refer to *primary demand*, i.e., demand at the final (consumer) level for dairy products. We need to distinguish between two main sources of demand, i.e., domestic demand (within the EU) and export demand (from third countries). Primary demand is then translated through the supply chain into the so-called 'derived demand', i.e., the farm level demand for milk (raw material).

*Balance:* We mainly refer to the notion of market balance: in a post-quota environment, and with no intervention on prices, we expect prices and quantities to adjust to changing market forces. As a general idea, we will discuss how market forces may impact on the following identity:

**Domestic supply + imports = domestic demand + exports (+ net change in stocks)**

arguing that any possible imbalance due to the existence of net changes in stocks as a consequence of policy intervention should play a minor and incidental role, thus avoiding any possible structural imbalance typical of the milk quota environment.

*Market forces:* A standard definition of market forces relates to the interaction of demand and supply leading to market adjustments toward equilibrium. However, we extend this very general definition by referring to all the forces that impact market balance, i.e., all the forces that may produce changes in final demand (both domestically and in third countries), in primary supply (milk production) and also in the transmission of prices and information along the supply chain, apart from policy support intervention.

*(Food) Supply chain:* We refer to the systems of activities (management, logistics, trading, institutional and policy) and agents (farmers, consumers, wholesalers, processing firms, retailers, institutions and organisations)

<sup>1</sup> The interpretation of the key terms of the three evaluation questions are somehow built on the definitions proposed in the recent evaluation study carried out by LEI (European Commission, 2011), in which this expert was involved as a member of the evaluation team.

involved in the whole process of producing dairy products (but also information and value added) moving between the agricultural sector and the final (consumer) markets.

*POs (Producer Organisations in the dairy sector):* We generally refer to the association of producers' (farmers) with the main purpose of concentrating supply and counterbalancing the purchasing power of dairies. With specific reference to the dairy sector, with the term POs, we refer to the definition made in Regulation (EU) No 261/2012 of the European Parliament and of the Council of 14 March 2012 (the so-called 'Milk package') amending Council Regulation (EC) No 1234/2007, where POs are formed on the initiatives of producers aiming mainly at concentrating supply and marketing the products of the members and adapting production jointly to the requirements of the production and processing (under the provisions that some minimum constraints will be fulfilled).

*IBOs (Inter-Branch Organisations in the dairy sector):* We generally refer to organisations made up by representatives of different interests in the supply chain, mainly devoted to collective bargaining and contracting for the raw material, thus acting as a form of vertical coordination of the supply chain. Again, with specific reference to the dairy sector, with the term IBOs, we refer to the provision of EU regulation 261/2012 (see above), where IBO's are organisations of representatives (farmers, processors, retailers and traders) aiming at concentrating and coordinating supply and marketing the produce, adapting production and processing jointly to market requirements, promoting rationalisation and improvement of production and processing, and intervening in writing contracts.

*Market support mechanisms and policy measures:* We refer to the whole set of policy instruments for the dairy sector. Policy intervention in the agricultural sector comes mainly from the Common Agricultural Policy (CAP), which is divided into two pillars, pillar I (direct aids and market intervention) and pillar II (rural development measures). Owing to the long-lasting CAP reform process (the MacSharry reform, the Agenda 2000 package, the Fischler reform, the Health Check and the recent proposal for the future of the CAP beyond 2013), the current instruments in pillar I are largely decoupled from production, since farm income support is implemented through the Single Farm Payment (SFP), while the whole set of market intervention mechanisms (public storage based on intervention prices, private storage aids, export subsidies) are implemented following a "safety net" logic, which means that they become effective only in case of very low market prices, with strict quantitative and time limits.

## 1.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

In order to answer the question, we have to consider all the elements affecting the supply-demand balance. An exhaustive answer must take into account both quantitative and qualitative information. Information will be needed on:

### 1. Evolution of domestic and international demand

Both qualitative and quantitative information needs to be collected, at least as a benchmark for the analysis.

We may refer to official documents and projections:

- a) In the EU, a source of information is the document *Prospects for Agricultural Markets and Income in the EU 2012-2022* (European Commission, 2012a), in which section four is devoted to milk products. In this document, projections are carried out using economic (partial equilibrium) models available at DG-AGRI and JRC-IPTS, although projections are conditional on the hypothesised scenario (market demand will be projected on the basis of some assumptions on the macroeconomic environment characterizing the economy in the near future)
- b) The *OECD-FAO Agricultural Outlook 2012-2021* (OECD-FAO, 2012), based on a modelling framework that combines the OECD's Aglink and FAO's Cosimo models (Chapter 9 is dedicated to dairy products): it provides projections for world's areas and countries
- c) The *FAPRI-ISU World Outlook on dairy products* (FAPRI, 2011), based on the FAPRI/CARD International Dairy Model, a partial equilibrium, multi-market model with country or regional modules, modelling specifically trade among such country/regions



- d) Any other information on the evolution of dairy demand, mainly for emerging countries (China and India) that can be collected, since for the balance of the dairy market in the EU, a relevant role will be played by competition on the international markets.

Quantitative information from the above models must be analysed critically: projections from the different models will be compared, trying to assess a reasonable evolution for dairy products' markets (supply and demand balance) in the near future: we believe that demand conditions will probably be the main determinants of market balance.

2. *Evolution of domestic and international supply*

Again, we may refer to the previous official documents.

For the EU market, a crucial issue is that, after 2014, milk supply will not be limited by the quota system; a few studies have attempted to estimate the likely response of milk supply in a non-quota regulatory framework. We will refer to the available studies, mainly the Report on the *Economic Impact of the Abolition of the Milk Quota Regime - Regional Analysis of Milk Production in the EU*, prepared by JRC-IPTS for the European Commission (Witzke et al., 2009).

3. *Evolution of domestic and international agricultural and trade policies*

Trade policies (and WTO agreements) and agricultural policy reforms may in fact impact the market outcome; qualitative information on the on-going reform process will provide valuable insights in tuning the response to EQ1.

4. *Evolution (trends) in domestic and international dairy supply chain*

Given that market balance involves final demand for processed dairy products on one side and milk supply by farmers on the other, knowing the characteristics of the supply chain will significantly help in answering EQ1 (see for this point, EQ2).

Quantitative information from the above models must be analysed critically; model characteristics and assumptions, as well as the different macroeconomic scenarios, may be crucial in determining model outcomes. Projections from the different models will be compared, trying to assess a reasonable evolution for the dairy products' markets (supply and demand balance) in the near future. Benchmark scenario will be critically analysed and qualitatively revised, stressing the main likely changes.

### 1.3 Description of the method(s) used and an indication of its (their) limitations

To answer EQ1, we will proceed to critically analyse the 'official' data collected. The above discussion on the quality of collected data provides the main limitations related to this approach. In fact, official estimates and forecasts do not take into account all the different scenarios that can reasonably happen in the near future; furthermore, the modelling exercise has to simplify and approximate real situations. However, comparative analyses of the data coming from different sources may help in finding consistencies and reliability in the data.

### 1.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

In order to answer the question, we have to consider all the elements affecting the supply-demand balance. As explained above, market balance can be reached in a perfectly competitive environment through price and quantity adjustments. Milk quota removal will eliminate an important factor limiting adjustment in the milk market and in the dairy supply chain, although other elements should be accounted for when evaluating market balance in the sector.

Links across markets are relevant for the agricultural sector, and especially for the dairy sector, which is highly dependent on the feed market. Therefore, we cannot isolate the dairy market from information about other markets (e.g., given the growing importance of biofuels, and their competition with feedstuffs, we would need at least to account for this aspect in our analysis). Then a 'benchmark' for the analysis can be represented by

the available projections for the post-quota environment produced by the main large models employed in analysing the agricultural sector.

Quantitative information from the above models must be analysed critically, since modelling the post-quota environment using information coming from the 30-year quota implementation period is rather complicated and implies some approximations. Thus, projections from models considering explicitly quota removal will be critically analysed and compared among each other, trying to assess a reasonable evolution for dairy products' markets (supply and demand balance) in the near future. In general, we believe that demand conditions will probably be the main determinants of market balance. If the available quantitative results do not consider quota removal, such projections will be integrated/corrected through qualitative reasoning.

## 1.5 Evidences on the various aspects of EQ1

### 1.5.1 Forecasting the balance between supply and demand: description of analytical tools

Table 1 summarises the main projections concerning the likely developments of the EU dairy markets as a result of quota removal<sup>2</sup> that will be used as a benchmark for our analysis. Two types of information are given. First, the table reports a set of simulation results made in 2008-09 (right after the Health Check reform and the decision to phase out milk quotas in 2015), in which the authors, using the different models, have compared the scenario of quota removal with a baseline of maintaining the milk quota system. Moreover, the table reports also the most recent projections on the same variables for the period 2012-20, provided by the European Commission services in their yearly report on "Prospects for Agricultural Markets and Income in the EU 2012-2022" (European Commission, 2012a), integrated with the price projections obtained by the OECD-FAO AGLINK modelling system (OECD-FAO, 2012).

**Table 1: Market trends for milk and dairy products after quota removal with respect to a baseline of maintaining the quota system\***

Study and model used	Dairy herds	Cow yields	Raw Milk			
			Price	Production		
Witzke et al. (2009) – CAPRI	4.2%	0.2%	-9.8%	4.4%		
Binfield (2009) – FAPRI	0.4%	-0.4%	-2.0%	-0.1%		
Chantreuil et al. (2008) – AGMEMOD	n.a.	n.a.	-7.2%	4.8%		
Witzke and Tonini (2008) – CAPSIM	n.a.	n.a.	-7.5%	2.8%		
Bouamra et al. (2008) – EDIM	n.a.	n.a.	-8.6%	3.2%		
<i>Prospects for ag. markets in the EU (2012)- AGLINK (% change 2020/12)**</i>	-2.2%	5.4%	0.1%	3.3%		
	Butter			SMP		
	Price	Production	Consumption	Price	Production	Consumption
Witzke et al. (2009) – CAPRI	-6.5%	5.5%		-6.5%	5.5%	
Binfield (2009) – FAPRI	-15.4%	-2.4%		-3.8%	7.6%	
Chantreuil et al. (2008) – AGMEMOD	-9.9%	7.4%	2.5%	-5.7%	13.8%	7.8%
Witzke and Tonini (2008) – CAPSIM	-0.5%	6.0%	0.1%	-4.6%	7.9%	2.3%
Bouamra et al. (2008) – EDIM	-13.6%	3.9%	4.0%	-4.9%	5.3%	2.6%
<i>Prospects for ag. markets in the EU (2012)- AGLINK (% change 2020/12)**</i>	7.8%	4.0%	3.5%	19.5%	10.5%	1.3%

<sup>2</sup> The same data are discussed in Section 1.2.3 of the Theoretical analysis.

	WMP			Cheese		
	Price	Production	Consumption	Price	Production	Consumption
Witzke et al. (2009) – CAPRI	-6.5%	5.5%		-4.5%	1.0%	
Binfield (2009) – FAPRI	-0.8%	2.1%		-0.9%	0.3%	
Chantreuil et al. (2008) – AGMEMOD	-6.7%	6.4%	0.4%	-9.1%	5.0%	1.7%
Witzke and Tonini (2008) – CAPSIM	-4.0%	3.4%	2.2%	-2.5%	2.1%	1.1%
Bouamra et al. (2008) – EDIM	-5.3%	21.7%	1.7%	-5.6%	5.2%	0.8%
<i>Prospects for ag. markets in the EU (2012)- AGLINK (% change 2020/12)**</i>	15.6%	2.5%	2.8%	5.6%	5.3%	3.2%

**\*The projections provided in the table are not fully comparable, since they refer to different years in comparing the outcome of quota removal vs. the baseline of maintaining the quota system: 2015 for Bouamra et al. (2008), 2017 for Binfield (2009), 2020 for the other three studies.**

**\*\*General trends with no scenario analysis, incorporating quota removal. Prices are from OECD-FAO.**

Regarding the first type of information, the simulations on the impact of quota removal should be related to the structural characteristics of the employed model, in order to identify the critical elements of each model and how market forces can impact. We have a few studies on the impact of quota removal that use different models (basically, the CAPRI model and the CAPSIM model, the FAPRI model, the AGMEMOD model and the EDIM model). Three of these models are 'regional', concentrating on the EU countries, with a somewhat 'simplified' modelling of the rest of the world, while the fourth model (the FAPRI model) aims to provide a more detailed picture of the world situation. Here, we provide a brief description of the main characteristics of the models under consideration:

- EDIM:** It is a partial equilibrium model that takes into account the whole dairy chain in the EU (from farm milk production to the final consumer demand); milk supply is modelled under the presence of quota (in terms of fat content), and the downstream part considers 14 different products (balancing the fat and protein content of milk); final demand comes from two sources, within the EU and from the rest of the world (four net importing areas). Another linkage with the rest of the world is through the modelling of the net supply of dairy products from Oceania and Australia. The EU coverage is EU-27, although countries are individually detailed only in the EU-15.
- CAPRI:** It is a very detailed model (about 270 different regions) of agricultural supply in the EU-27 (based on nonlinear mathematical programming), consisting of a system of market (supply-demand) equations within a spatial world trade model for agricultural commodities. As such, the CAPRI model allows for a reallocation of resources to different agricultural products.
- CAPSIM:** It is a partial equilibrium model, with market clearing conditions accounting for trade; it distinguishes agricultural production, processing stage and final consumers, modelled using behavioural equations. Also, for the downstream situation, it distinguishes among butter, skimmed and whole milk powder, cheese, fresh milk products, cream, concentrated milk, whey powder and casein.

It is worth noting that all the above models base their simulation of the quota removal scenario on the use of econometrically estimated quota rents obtained from the Farm Accounting Data Network (FADN) data for the major countries<sup>3</sup>.

- FAPRI:** The dairy model in FAPRI is a partial equilibrium multi-market model, with dairy products detailed up to five commodities (milk, butter, cheese, non-fat dry milk and whole milk powder), with price linkages to other commodity models in FAPRI. The demand side is explicitly modelled accounting for (per-capita) final demand and (sometimes) stock demand. World equilibrium prices are obtained and transferred into domestic markets through a

<sup>3</sup> See Table 9 of the Theoretical Analysis in this report.

price transmission equation (although for the EU, trade is modelled by behavioural equations and the domestic price is a market clearing mechanism for the EU).

**AGMEMOD:** It is an econometric, dynamic multi-product partial equilibrium model of the EU, covering a large spectrum of products (among them, milk, cheese, butter, whole milk powder and skimmed milk powder, and other dairy products) with milk allocation driven by the fat and protein content. Equilibrium is obtained using market clearing conditions, upon recognizing the important role of the rest of the world.

Finally, the EC projections are built in the context of an integrated Modelling Platform for Agro-economic Commodity and Policy Analysis (iMAP), which includes the AGLINK-COSIMO model (a recursive dynamic partial equilibrium model merging the OECD's AGLINK model and the FAO's COSIMO model), the European Simulation Model (ESIM model) and the CAPRI model.

### *1.5.2 Forecasting the balance between supply and demand: a critical analysis*

In order to interpret these results, one should consider the major limitations of the above modelling efforts. First, consider that simulations do not usually account for any adjustment period, i.e., they measure the effect after full adjustment. Further, in order to evaluate the impact of quota removal, all the models should consider a representation of milk supply without quota, whose specification may be rather different across models. Also, we have to keep in mind that not all the studies refer to the same time horizon (see the note to Table 1), and of course this may partially explain the observed differences. In three studies (Witzke et al., 2009 and Kempen et al., 2011; Boumra et al., 2008; Witzke and Tonini, 2008), the specification of the milk supply without quota is based on the estimation of quota rents and (long-run) marginal costs obtained using an econometric approach on FADN data (simulations obtained by CAPSIM model use the same quota rents estimated for the EDIM model, although milk supply does not come from marginal cost estimation). In one study (Chantreuil et al., 2008), quota rents are 'estimated' through model calibration. In the last study (Binfield, 2009), quota rents from Lips and Rieder (2005) are used.

Results are not fully comparable: the reduction in milk prices ranges between -2.0 percent and -9.8 percent. Explaining these differences is not an easy task, since the models, as we have seen, have very different structures.

One key assumption is that on quota rents: in two studies (Bouamra et al., 2008; Witzke and Tonini, 2008), the same quota rents estimated within the EDIM project were used, although in different models, and they in fact provide some comparable figures (-7.5 percent in CAPSIM and -8.6 percent in EDIM), although the EDIM study refers to 2015 and the CAPSIM study to 2020. The main explanation provided by Witzke and Tonini (2008) was that the sensitive part of the model should be that relating to the specification of international trade (use of different behavioural equations vs. spatial models, homogeneity vs. heterogeneity). Similar although updated estimates of quota rents/marginal costs were used in Witzke et al. (2009) and Kempen et al. (2011) within the CAPRI model, with a different and more detailed modelling of the supply side. This led to projecting a stronger reduction in prices (-9.8 percent) for 2020, thus indicating larger adjustment at the sector level. Also, the study by Chantreuil et al. (2008) using the AGMEMOD model provides a comparable reduction in prices (-7.2 percent). The lower impact on EU raw milk prices is obtained using the FAPRI-GOLD model (Binfield, 2009), simulating a -2.0 percent reduction in prices for the quota removal scenario.

Of course, the FAPRI-GOLD model provides a more detailed specification of the world dairy market, while all the other models concentrate mostly on the European sector. Thus, accounting for a possible reaction/adjustment of the rest of the world seems to reduce the amplitude of the effect (this explanation follows also from the previous considerations). This may be the main lesson that we learn from this comparison: the world situation, in terms of demand evolution, supply responses, as well as strategies from other players on the global arena are going to be the key elements that will affect the performance of the dairy sector in the EU.

Obviously, a different price impact determines different changes in production, ranging between -0.1 percent (FAPRI) and 4.8 percent (CAPRI); however, these figures are quite encouraging, since in all cases we remain within the 5 percent increase in quota provided by the soft landing strategies (1 percent increase of quota year

by year), thus indicating that the strategy may be sufficient to allow a smooth path toward quota abolition in 2015.

To support this idea, just consider that according to the most recent statistical information for 2011/12 (European Commission, 2012b), deliveries in the EU are well below the overall quota (reaching about 95 percent of the guaranteed quantity), with only a few Member States producing above their quota (among them Germany and the Netherlands, as well as Ireland and Austria, whose production exceeded the quota level by about 4 percent). Considering that from 2009, quotas have increased by 1 percent per year, we do not register an effective increase in production, and therefore we may consider that, at the aggregate EU level, the soft landing approach has been effectively driving the milk sector toward quota removal, with a quota system that is not binding any more. This suggests that most of the adjustment has already taken place.

It may also be interesting to consider, where available, some of the simulations at the Member States' level. In Chantreuil et al. (2008), we have five regional aggregates (Nordic, Western, Mid-Eastern, Alpine-Balkan and Southern countries); in Kempen et al. (2011), we have all the EU-27 countries, and most of the countries are also present in Bouamra et al. (2008); on the other hand, only a few selected countries are considered in Witzke and Tonini (2008) and Binfield (2009).

According to the reported simulations, in EDIM the increase in production due to the quota removal should be concentrated in the EU-15 (mainly in Germany, France, the Netherlands and Italy, accounting for more than 80 percent of the total increase in milk production), while the United Kingdom (UK) and Sweden are expected to reduce their milk production. In CAPSIM, we expect a similar result. In fact, the overall increase in production is likely to concentrate in the EU-15. Using the CAPRI model, we expect a 4.7 percent increase in the EU-15, and only 3.3 percent increase in the new Member States; furthermore, Austria, the Netherlands, Belgium, Germany, Ireland and Spain are expected to have an above average increase in percentage terms, while the UK and Sweden are again expected to reduce their production. In the FAPRI-GOLD simulation, all countries are expected to reduce production, with the exception of Ireland and Poland (the analysed countries are the UK, Ireland, France, Germany, Italy, Poland, Hungary and an aggregate of the other new Member States). In the AGMEMOD model, again the increase in production will favour the EU-15 (5.4 percent vs. 3.9 percent), and mainly Western countries (including the Netherlands, Ireland, France and the UK), Mid-eastern countries (including Germany and Poland) and Southern countries (including Italy and Spain), while a reduction is expected in the Alpine-Balkan countries (Austria, Bulgaria and Romania).

Apart from the different figures, we find quite consistent results in terms of direction and intensity. If we then compare these projections with the actual statistical information for 2011/12, we see that actual trends are overall consistent with the projected ones: we see that, for example, Sweden (almost 20 percent lower) and the UK (around 10 percent lower) are in fact well below their current quota level (and also clearly below the 4 percent increase due to the soft landing). On the other hand, most of the countries that are above the quota level or below by less than 4 percent are those expected to increase production as a result of quota removal.

The official data for the 2012/13 campaign are not available yet, but some preliminary figures seem to suggest that this situation will continue (a few countries producing above their national quotas and total EU production staying below the global quota). Although the available market projections for the two remaining campaigns (2013/14 and 2014/15) seem to predict an increase in the number of Member States producing above their quotas, with milk production being stimulated by the recent surge in prices, total EU production should remain below the global quota till the end of the regime. This means that, since quotas are no longer binding, at least at the aggregate level, the trend in milk prices should not be affected by quota removal and should follow the trend predicted by the European Commission studies, as long as we believe in the assumptions concerning future macroeconomic scenarios.

Thus, most of the results for the supply side (milk price and production) provided by simulation models seem rather reliable, and thus they can be seen as a sufficiently robust benchmark for a critical evaluation of the future of the dairy sector in the EU. Forecasts for the medium term can be retrieved mainly from the European Commission (2012a) and from the FAPRI model (FAPRI, 2011), but also from OECD-FAO (2012); indications are mixed. Over the medium term (the 2020 horizon), we expect a 2.1 percent increase in production within the EU, but a 6.1 percent reduction in milk price, according to the FAPRI model; the European Commission forecasts a higher increase in production with no change in price; finally, the OECD-FAO outlook forecasts a 5.7

percent increase in production. All the models provide an overall clear picture about the increase in domestic production, but it is less evident what is going to be the effect on farm-level milk prices.

Further implications of quota removal will be the impact on herd size and yields. In most of the models, we do not have projections for these two variables, with the exception of the simulations in CAPRI and FAPRI-GOLD. In the CAPRI model, we register a small change (+0.2 percent) in the average yield between the baseline and the quota removal (year 2020), leading to an increase in herd size. However, actual figures for the 2011/12 campaign show that the current trend is different. We have been experiencing a reduction in the EU herd size, since the number of dairy cows has decreased from 23.6 million heads in 2009 to 23.1 million heads in 2011, the soft-landing period, due basically to the constant increase in yields (1.7 percent on average just for the last year). It is likely that we would experience a slowdown of the rate of yield's increase, although the most recent EU projections (see Table 1) call for a 5 percent cumulative growth in yields from 2011 to 2022, thus confirming the figures in Table 1. The combined effect of production increase and yield increase will however determine a further reduction of the herd size (-3 percent in 2011-2022) to 22.2 million animals in 2022. Very similar figures can be obtained from the FAPRI projections (22.2 million animals in 2020 with a cumulative growth in yield of 8.1 percent in 2012-2020).

In Table 1, we also have simulations for the main processed dairy products: butter, skimmed milk powder, whole milk powder and cheese, although with the exclusion of fresh products, like fresh milk and yogurt. As it can be easily seen, for processed products, differences among models are larger, and they are likely to depend on the different modelling of the downward part of the supply chain (the level of disaggregation among products, the specification of the final demand and of international trade, products' substitutability in consumption and production, the behaviour of dairies). Looking at the figures, it is not easy to find a common pattern, apart from the fact that all models simulate a reduction in prices. In percentage terms, butter appears to be the most penalised product (with the exception of the CAPSIM simulation in Witzke and Tonini (2008), the reduction of the price of butter is the strongest among the four products, and it is 9.2 percent on average), while cheese shows the lowest average reduction (-4.5 percent). If we take a rough weighted average of the four prices and production changes (using actual production for 2008 and milk equivalent coefficients to compute weights), we get the figures reported in Table 2.

**Table 2: Average changes in dairy production and prices (weighted averages among projections)**

	Dairy price	Dairy production
Witzke et al. (2009) – CAPRI	-5.0%	2.2%
Binfield (2009) – FAPRI	-3.1%	0.6%
Chantreuil et al. (2008) - AGMEMOD	-8.8%	6.1%
Witzke and Tonini (2008) – CAPSIM	-2.5%	3.1%
Bouamra et al. (2008) – EDIM	-6.6%	5.7%

The quota removal thus produces a reduction in the price of processed products, ranging on average between 2.5 percent and 8.8 percent, a reduction that is comparable with the reduction in raw milk price. This result may call for an elasticity of transmission between prices at the two levels close to 1 and likely relates to the perfect competition assumption for the supply chain relationships, common to all the simulation models.

The decrease in prices is due to the increase in production of all the four processed products (the only exception is the FAPRI-GOLD model indicating a 2.4 percent reduction for the production of butter), which is linked to the increased availability of raw material due to quota removal.

If we compare actual production with the simulated figures (production from 2008 to 2011), some interesting considerations arise. First of all, considering the first three years of the soft landing, actual figures do not fully coincide with the simulations results: butter production (-6.3 percent) and whole milk powder (-10.6 percent) have been decreasing since 2008, while we register a strong increase in SMP production (+28.6 percent) and in cheese production (+1.2 percent). The simulation models are thus unable, at least in this transition phase, to correctly forecast the gross markets trends, although in terms of raw milk utilisation (i.e., weighting for the milk equivalent coefficients) we obtain an overall increase in production of the four products that is around 3.5

percent, roughly consistent with the simulated changes in milk production after quota removal. In other words, simulated models seem to fail in consistently modelling the allocation of milk to different products along the supply chain. Again, this indicates that the transmission along the supply chain is not fully accounted for in all these models, and that it is a crucial element in evaluating the future of the milk sector.

Finally, we should consider that all the models used to develop the above scenarios do not consider the impact of price volatility. As it is well known, commodity price volatility has become one of the key issues for the agricultural sector at the world level, and, as it is detailed below, this issue is likely to strongly influence the development of the EU dairy sector after quota removal. Thus, all the above projections should be taken with some caution, since the presence of price volatility is likely to generate a lower milk production response by farmers, as a result of their risk-averse behaviour. In addition, one should also conclude that any future modelling effort in this area should try to explicitly consider the issue of price volatility, in order to obtain more reliable projections.

### 1.5.3 *The impact of market forces, organisational systems and policy measures*

In terms of general market trends for 2012/2020, we expect a favourable situation for the dairy sector, with sustained (world) dairy prices, as a result of increasing world demand, especially in the emerging economies, facilitated by economic growth, increasing population, changing diets and a general shifting of preferences toward animal products. Based on the European Commission projections, this favourable market trends imply an increase in milk production of 3.3 percent, and, given the above considerations, this increase should keep milk production within the level of the 2013 quota; milk prices should be substantially stable during the period. For dairy (processed) products, we expect an increase in nominal prices, while the same prices should remain stable in real terms. This price increase should be accompanied by an increase in EU production and exports of all dairy products; projections also favour SMP and cheese.

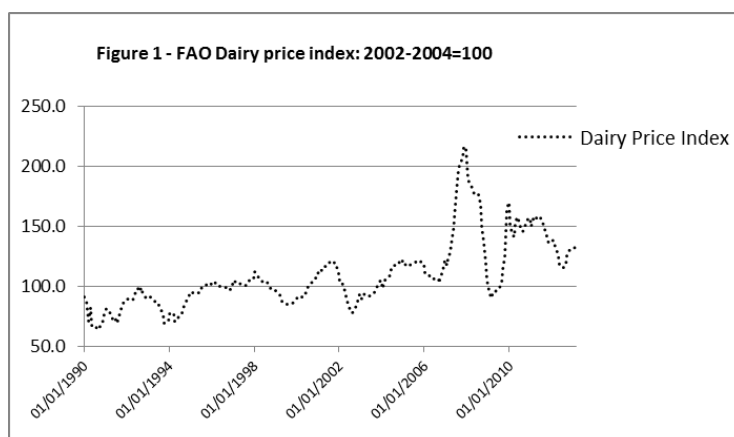
One first important issue is whether the level of EU milk and dairy prices would have been different (higher) in the hypothesis of maintaining the quota system. Our previous considerations suggest that the existence of the quota at the 2013 level should not be binding for the system, and thus we would not expect significant differences with respect to the quota removal scenario under 'normal' circumstances.

The crucial issue for the future of the EU dairy sector does not seem to be related to quota removal but mostly to the global situation of the sector i.e., to the evolution of global supply and demand, as a result of the likely increase in trade liberalisation. The market forces (demand, supply and supply chain shifters) are likely to play the most relevant role for the future. Here we discuss the critical forces that may affect the EU dairy sector over the medium term and provide some insights on their impact for market balance:

- *The (global) evolution of the demand for dairy products:* Current trends indicate an increase in the demand of dairy products, mainly driven by increasing population and economic growth in the emerging countries (in particular China, India and Brazil, whose current share in world dairy consumption is about 16 percent), while per-capita consumption in developed countries is projected to remain stable (EU, US and New Zealand still account for 61 percent of the total consumption). Projections assume some rate of growth of the EU/world GDP, but many of these exogenous figures are changing over time, since the situation of the world economy is currently uncertain. The recovery of the economy has been postponed, a trend reversion toward growth is expected, starting from the current year, but probably the rate of growth of the economies of the emerging countries will remain below historical values. A lower growth rate of the world demand will put a downward pressure on prices, and thus on milk producers' returns. The impact of such a slowdown of economic growth may be relevant and may imply a revision of our previous conclusions, resulting in an excess in global production of milk.
- *The evolution of supply:* In this regard, the crucial issues are the evolution of yields (and consequently of production costs) and the allocation of resources in agriculture, mainly driven by the trend in prices for agricultural products. The evolution of biofuels' production is going to consistently affect the allocation of resources and, at the end, the production costs for milk. Thus, given the structure of EU milk production, EU producers may be penalised by this increase in feed costs. Looking globally, expectations are for an increase in milk supply in the medium term (for 2020, the FAPRI-GOLD model estimates an 11.3 percent increase in the US, a 17.3 percent increase in New Zealand, a 30.7 percent

increase in India and a 47.4 percent increase in China), that, combined with a lower growth in demand, may produce a negative impact on prices.

- *The behaviour of agricultural commodity prices:* In the last three to four years, we have been experiencing an increase in price volatility for all major agricultural commodities (milk, meat, cereals and oilseeds), with price booms and large fluctuations. The causes of this phenomenon are not completely clear: different reasons have been put forward, like, weather conditions and climate change; trends in food demand, mainly in rapidly-growing emerging countries; reductions in stocks; trade interventions; the explosion of biofuels' production and the dynamics of energy prices; the US dollar exchange rate; the *financialisation* of commodity markets with speculative behaviour on the futures markets for agricultural commodities. Increased price volatility has also affected dairy prices, within and outside the EU. In Figure 1, we report the FAO dairy price index and the picture clearly shows that, from 2007, dairy prices have been characterised by a larger volatility. This is true also within the EU, where in fact, according to Section 2.3 of the descriptive chapter, raw milk price volatility has increased from 8.9 percent (from 2000 to July 2007) to 10.2 percent (after July 2007). The expectations for the coming years are that price volatility will remain a key issue, especially for dairy markets, since world trade in dairy product is rather limited as compared to other commodities (only 7 percent of global dairy production is traded), such that small changes in supply and/or demand may lead to rather strong price fluctuations. The increased price volatility poses important policy questions; in fact, price volatility determines income volatility, and (risk-averse) producers value negatively income fluctuations (higher fluctuations mean a riskier business and producers tend to allocate lower resources and to reduce/diversify production). Further, high volatility implies a larger differential between maximum (peak) and minimum (slump) prices, and thus one may want to intervene to stabilise income, especially when prices are excessively low. However, another (expected) effect of the increasing globalisation of agricultural commodity markets, and of the dairy market in particular, is that we experience a convergence of national milk prices toward a similar absolute level.



Source: FAO

- The price volatility and upward trends in commodity prices also affect costs (feed prices); for the competitiveness of EU milk production, milk costs are a key aspect, in terms of competition toward non-EU producers, but also in terms of competition among EU countries. This aspect is discussed in EQ2.
- The price volatility, as discussed above, determines income volatility. Farmer incomes are expected to follow their historical trend within the EU, with a projected 2.1 percent increase from 2012 to 2020 in nominal terms, which means that income is expected to remain stable in the EU-15 and to increase only in the new Member States. This increase implies a 14.4 percent reduction in real terms, but, since labour use in agriculture is likely to be reduced even further, we expect a 17.2 percent increase in real income per labour unit. In this situation, income volatility may become a key issue and policy measures addressing risk management are going to be very important. Decoupled payments to farmers, as the Single Farm Payment (SFP) in the EU, may play a relevant role in mitigating the adverse effect of uncertainty on farmers' income and choices, especially for their 'insurance' role against prices (and thus income) fluctuations. Some empirical evidence on the role of decoupled payments in milk production should unveil the role of the SFP by quantifying its impact on farmers' choices and income.



However, the increasing turbulence on international markets may require more tailored policies to protect milk producers (and consumers) from the negative effects of volatility.

- *The agricultural trade policy environment:* All the models discussed above assume that the *current* WTO regulations will remain unchanged for the entire decade. Although the recent CAP reforms have shifted a large part of support from coupled to decoupled payments, thus requiring minimal adjustments for the EU, a new agreement will likely put some constraints especially for market access (tariffs) and, to a less extent, for the use of export subsidies (in the EU export refunds have decreased dramatically in the last decade and the abolition of export subsidies is seen as one of the few agreed points in trade negotiations).
- *The competitive position of the EU in the international arena:* The EU has been experiencing an increase in dairy exports for the last decade, mainly for cheese and whey (see Table 18 in the descriptive chapter). Projections over the medium term are mixed; the EU forecasts an increase in exports for cheese (+23.5 percent from 2012 to 2020) and butter (+47.6 percent), while SMP (+5.0 percent) and WMP (+2.2 percent) exports should remain substantially stable. On the other hand, the FAPRI-GOLD model forecasts an overall reduction in EU net exports (-25.7 percent for butter, -1.4 percent for cheese, -55.9 percent for WMP and -33.6 percent for SMP) in a context in which global trade of dairy products is expanding, with New Zealand, the major competitor of the EU on international markets, significantly expanding its export quantities. The net export position of the EU could become even worse in case of a trade liberalisation scenario, with a reduction in tariff protection, which is still very high for EU dairy products. Therefore, attention should concentrate on EU competitiveness on international markets in terms of portfolio of products and promotion (see the detailed discussion in EQ2).
- *The perfect competition assumption of simulation models:* A relevant characteristic of the above models is that they assume perfect competition for the processing stage along the supply chain: this assumption is crucial in assessing the reliability of models' projections. Some empirical work (see Soregaroli et al., 2011 for an example on the dairy sector) has shown that the presence of imperfect competition (market power) along the supply chain may largely impact on price transmission effects due to market forces affecting the supply/demand balance. Under market power (i.e., oligopoly power at the final/retailing stage, but also oligopsony power at the processing/farm level), price effects can be distorted. As a general trend, a demand expansion should result in a lower increase in raw milk price and a higher increase in retail dairy prices as compared to the perfect competition case. Therefore, we should interpret some of the above figures with some caution, since, for example, any reduction in demand will have a lower effect on prices under imperfect competition. At the same time, any expansion in domestic supply will have a stronger (negative) impact on raw milk prices under imperfect competition than under perfect competition.
- *The price transmission mechanism* is crucial since it determines the behaviour of raw milk prices and retail dairy prices; an increasingly crucial policy issue relates to trend and volatility transmission between commodity prices and retail prices that may generate food inflation. In the EU, attention to this issue has been increasing for the last years (European Commission, 2008), but further attention should be given in order to monitor the effect of market power and processors/retailers strategies along the supply chain.
- For an efficient functioning of the dairy supply chain in the EU, we then require a well-organised coordination along the chain; market forces and competition alone are not able to provide the most efficient coordination due to the fact that many relevant obstacles (mainly related to information issues and market power) may impede such efficient functioning. In this respect, the recent *Milk Package*<sup>4</sup> has stressed the role of POs and IBOs in the dairy sector<sup>5</sup>, as vertical integration tools that should help information transmission along the supply chain, increase transparency (see e.g., the role of IBOs in setting appropriate standards for milk contracts) and reduce market power (increasing producers' bargaining power by concentrating milk supply).

<sup>4</sup> Regulation (EU) No 261/2012 of the European Parliament and of the Council of 14 March 2012 amending Council Regulation (EC) No 1234/2007 as regards contractual relations in the milk and milk products sector.

<sup>5</sup> A more detailed analysis of the role of POs and IBOs is made within EQ2.

## 1.6 Conclusions and policy recommendation drawn directly from the analysis

The analysis carried out in the previous sections may lead to some policy implications and recommendations; we concentrate on those most closely related to the milk sector, discarding other relevant general issues (e.g., the implications of climate change and the production of energy by renewable resources) that may produce relevant side effects also on the milk sector. Of course, this is a partial view of the problem, since we agree with the idea that agricultural policy must be considered as a set of coherent instruments that cannot be isolated. Furthermore, agricultural policy should integrate also with other sectorial policies (mainly those related to energy and environment).

As stressed above, dynamics in prices appears to be the most relevant issue for the near future, posing the key policy question: how to deal with income volatility resulting from market price volatility (imbalances)? Price volatility is *bad* because of its unpredictability that generates uncertainty and risks, thus affecting producers' choices. As we know from the theory, the relevant issue is not price volatility/unpredictability *per se* but the resulting income volatility/unpredictability.

Policies may intervene either on income or on prices. Usually, price policies (in this case price stabilisation policies) are easier to implement, but imply high costs and produce more relevant side effects, such as world market instability (due to domestic policies that amplify external fluctuations) and biased market signals for producers. For example, a buy-out scheme may work as a tool for stabilising prices, at least reducing the probability of prices dropping below a minimum level (see EQ3 for a detailed discussion of this scheme); it can be used to address temporary dramatic market imbalances, but of course the instrument should be carefully designed, to avoid going back to the old days of a "guaranteed price" environment.

In the CAP, the issue of income stabilisation has been already addressed by the recent proposals for the CAP after 2013. An income stabilisation tool has been proposed as part of the second pillar (see EQ2 for details); such tool would allow for a compensation (income stabilisation payment) when income drops consistently (by more than 30 percent). In general, we feel that more attention should be concentrated on income stabilisation/insurance policies rather than on price stabilisation/supporting policies.

In any case, a crucial issue is the financing of such schemes, since we expect some form of participation by farmers in financing such income insurance scheme, as it happens with similar tools implemented in other countries (see EQ2 for details).

Other income stabilisation options may involve income taxes. For example, if income taxes are paid on a multi-annual farm income average, as it happens in some Member States, farmers may be less affected by the progressivity of income taxes. Of course, the drawbacks of both price and income stabilisation policies is that of slowing down structural adjustment, e.g. maintaining inefficient marginal producers in the sector.

Obviously, also the SFP acts as an implicit stabilisation tool, by ensuring that a portion of the income is risk-free, and therefore we expect that any process of redistributing/reducing/abolishing the SFP should take this aspect into consideration; we suggest further investigation on measuring the insurance effect of the SFP, in order to better target its reform.

Policy intervention should also consider that price and income effects will vary largely from region to region and from country to country, as a reaction to changes in general conditions. Therefore, we suggest that attention should be put on regional differences, by considering how regional prices react to market and policy changes and by considering the existence of relevant (leading) markets. There is evidence that some regions/markets exert a price leadership within the EU. For example, this seems to be true for Italy with respect to neighbouring countries (leaders), such as Austria, Germany and France for raw milk not processed to PDO/PGI: (see EQ2 for a detailed discussion of these issues).

The functioning of the supply chain can be improved by an efficient functioning of the IBOs/POs system; we believe that such organisational policies may be a key factor for the overall performance of the supply chain; thus we expect IBOs and POs to be implemented across countries and to be continuously monitored, mainly in those countries where historically producers' organisations, also in different sectors, have performed poorly,

and this will likely require some adjustments to the setting put forward by the milk package (see EQ2 for a more detailed discussion, since IBOs and POs may play a major role in efficiently reacting to changes in milk supply and final demand).

Finally, the position of the EU on the international market is at least uncertain in the near future. The major competitor on the international market is New Zealand, where milk is almost entirely collected by Fonterra, a cooperatively-owned company that exports 95 percent of its production, thus acting as a very large player in the international arena. For this reason, we may expect that New Zealand will erode the competitive position of the EU at least for the less differentiated products (butter, WMP and SMP). For cheese, the portfolio of products is much more differentiated in the EU, mainly with regard to high quality production, and such strong differentiation may limit the competitive pressure on the international market. In this context, policy intervention may be important, mainly in enforcing the capability of EU producers to access the export markets, and again in this respect the role of IBOs (but also of other organisational bodies, such as the promotion bodies linked to PDO/PGI products) may be stressed (see EQ2 for details).

We summarise our **policy recommendations** as follows<sup>6</sup>:

- Pay special attention to price/income volatility (market imbalances): reinforce the current instruments, refine the proposed instruments (as the income stabilisation tool proposed for the reform of pillar II) or add new instruments (e.g., a carefully designed buy-out scheme for temporary severe market imbalances, other income insurance instruments, fiscal policies).
- Consider co-financing by milk producers of such stabilisation tools.
- Pay attention to the role of the SFP in the milk sector as an insurance tool and carefully evaluate any proposal for a reduction/harmonisation of the payment, in terms of their redistribution of risk across farmers and countries.
- Pay attention to regional differences.
- Support the role of POs/IBOs, so that they may become an effective tool to allow coordination along the supply chain and to respond to market changes.
- Support the competitiveness of firms on the international market through a coherent strategy, stressing the strengths of European production (PDO/PGI products, high quality products).

## 2. How will those elements affect the sector's competitiveness in terms of added value and portfolio of products, ability to react to changes in demand, competitive position of the EU in the world market and need of investments in the production and processing industry?

### 2.1 Interpretation and comprehension of the key terms of the evaluation question

Key terms in EQ2: *Competitiveness; added value and portfolio of products, ability to react to changes in demand; competitive position of the EU in the world market; need of investments in the production and processing industry.*<sup>7</sup>

*Competitiveness*: Competitiveness is a complex concept that implies several dimensions. Some of them (added value and portfolio of products, ability to react to changes in demand, competitive position of the EU in the world market, need of investments in the production and processing industry) are at the core of EQ2 and will be defined explicitly. In general, competitiveness of a firm or sector cannot be separated from the performance of up- and downstream industries (and the transmission of earnings over the supply chain). Thus, the

<sup>6</sup> Some of these policy recommendations are more carefully discussed in EQ2 and EQ3.

<sup>7</sup> In EQ2, the elements impacting competitiveness to be analysed are the same of EQ1 (market forces, organizational systems of the supply chain, in particular POs and IBOs, and policy measures, including market support mechanisms). Their definition and interpretation has been discussed in EQ1.

competitiveness of the dairy industry as a whole depends on the performance of every segment of the supply chain. In EQ2, the focus is on the competitiveness of both primary milk production and processing.

From a milk producer's perspective, competitiveness could be described as the ability to supply milk in the location, form and place sought by buyers, at prices that are as good as or better than those of other potential suppliers, while covering at least the opportunity costs of the resources employed. As such, competitiveness depends strongly on production costs relative to those of other market suppliers. This aspect of competitiveness holds in particular for standardised products, such as raw milk, where individual producers of an undifferentiated product face competitive suppliers of the same product. Furthermore, at the farm level, competitiveness can also refer to the ability of one commodity sector to compete for resources with other agricultural commodity sectors. The most important factor here is the profitability of milk production relative to other commodity outputs.

If one considers processing of highly differentiated dairy products, this perspective changes. In this case, the main aspect of competitiveness becomes the ability to satisfy demand by final consumers, using raw milk to produce those products for which demand is expanding and for which consumers are willing to pay higher prices. Among these products, a key role is potentially played by high quality products, like those carrying the Protected Denomination of Origin (PDO) or the Protected Geographical Indication (PGI), as well as organic dairy products.

Alternatively, national sector level competitiveness refers to the ability of a country to produce dairy products that meet the test of world market competition, in the sense of being able to compete on cost and quality with similar sectors in other countries. Again, also at the country level, we have to distinguish between competitiveness of bulk commodity dairy products, such as butter or milk powders, and competitiveness of highly differentiated dairy products, such as high quality cheese. In the first case (bulk commodities), the key element of competitiveness is the unit cost of milk produced in the EU relative to that of competitors elsewhere in the world. In the second case (highly differentiated products), competitiveness is related to the ability of meeting consumer demand and adopting adequate marketing and export strategies.

All dimensions of competitiveness mentioned in EQ2 are part of the above interpretation (see the definitions below).

The *added value and portfolio of products* is mainly linked to the ability of the processing sector to produce those products for which demand is expanding and for which consumers are willing to pay higher prices. This means exploiting the opportunity of differentiating their products from those of the competitors, and in this context, production of high quality PDO/PGI/organic products may represent a valuable opportunity, even though most of these products represent a niche market (with the exception of some French and Italian cheeses). Another component of added value refers to the transmission of earnings along the supply chain. In this context, the payment system implemented for rewarding milk quality (i.e., fat and protein content of milk) at the farm level is a crucial element, as well as the price premium granted to farmers producing milk used for high quality PDO/PGI/organic products.

The *ability to react to changes in demand* is the so-called "market orientation" of dairy production, i.e., the ability of the whole supply chain (milk producers and processors) to respond to market price signals regarding the quality and quantity of raw milk demanded by processors and the quality and quantity of dairy products demanded by final consumers, and their ability to respond to these signals in a rational and unconstrained way. The transmission of market signals starts with the general trend in domestic and international dairy markets that can be transmitted at the local level (single processor and single farm level) as long as the supply chain mechanisms work properly. In this respect, a key role is played by dairy policies that may partially or totally insulate the domestic market from world market price fluctuations, as well as by the vertical relationship along the chain. For example, signals concerning milk quality are typically transmitted at the farm level through the payment system discussed above (premiums for fat/protein content and premiums for milk used for high quality dairy products).

The *competitive position of the EU in the world market* is linked to two key aspects:

- a) The unit cost of milk produced in the EU relative to that of competitors elsewhere in the world, for what concerns production of bulk dairy commodities.

- b) The ability to respond to a changing world demand, adopting adequate marketing and export strategies, for what concerns high quality dairy products.

The *need of investments in the production and processing industry* is mainly related to the competitiveness on costs; especially in a non-quota environment, the competitiveness of milk producers will depend on their production costs as compared to those of other market suppliers. As long as milk production is characterised by relevant economies of scale (and many studies confirm this statement), increasing competitiveness implies increasing the size of farm operations (i.e., the number of dairy cows) in order to reduce the long run average cost of producing milk, which in turn implies relevant investment efforts at the farm level. A similar reasoning applies also to the processing sectors, especially in those countries in which milk processing takes place in a large number of very small processing firms (either private or cooperatives) that are likely to benefit from an increase in size, exploiting economies of scale.

## 2.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

### 2.2.1 Added value and portfolio of products

The impact of market forces on *added value and portfolio of products* will be analysed mainly through the likely trend of international and domestic dairy prices, which should be the main driver of processors' choices in terms of which dairy products to produce. Together with the general trend in dairy prices, we need information on the likely trend in demand, due to changes in demand determinants different from prices (i.e., consumer tastes, income trends). Thus, we plan to analyse the available studies concerning the likely trend in demand of the main categories of dairy product after quota removal (butter, cheese, milk powders, fresh dairy products, liquid milk) and, as far as possible, of high quality PDO/PGI/organic dairy products.

The organisation of the supply chain and several policy measures are also likely to affect the distribution of the *added value* along the chain. The recent "milk package" (see also EQ1) is supposed to be a response to this problem, since it reinforces the role of POs and IBOs in the dairy chain. In fact, POs can contract the price of raw milk with processors and each PO can control up to 33 percent of production of each Member State. This means that, in perspective, POs may gain a central role in milk supply management and in reinforcing the bargaining power of farmers. Under the same package, IBOs should be designed to carry out a number of activities including promotion, research, innovation and quality improvement, and should create the conditions for a more transparent functioning of the supply chain. This clearly means that, as long as these institutions can work properly, they may play a crucial role in guaranteeing a proper distribution of the *added value* along the supply chain.

The potential effectiveness of the milk package will be assessed mainly through theoretical considerations and qualitative analysis, since, to our knowledge, no specific study is available, given the short time elapsed since the approval of the package (March 2012).

### 2.2.2 Ability to react to changes in demand

The first factor affecting *the ability of processors and farmers to react to changes in demand* is the evolution of dairy policies. The recent trends in the CAP, especially the decoupling of the milk premium and of all other direct payments, are the milestone of a more market-oriented milk production. The new policy environment, which is in place from several years (the CAP reform obliged Member States to decouple the milk aid before 2008), has certainly helped milk producers to respond to market signals more properly and in an unconstrained way. Quota removal in 2015 will remove the last obstacle to manage milk production in line with market signals.

In this more liberalised policy environment, the role of IBOs, and, in general, of all vertical integration tools affecting the functioning of the supply chain, is also crucial for the ability to react to changes in demand. In fact, one of the key roles of IBOs is to improve the flow of information (typically market signals) that should help processors and farmers to properly react to changes in demand, changing for example, the composition of their portfolio of products. Another key element on which IBOs can play a key role is setting appropriate payment

systems to be used in contracts (premiums for fat/protein content and premiums for milk used for high quality dairy products), that should adjust to changing market signals.

The potential impact of decoupling and quota removal, as well as the effectiveness of IBOs, will be assessed using the literature (i.e., all available studies analysing the potential impact of decoupling/quota removal/IBOs on milk production and on the mix of final dairy products) and some additional qualitative/anecdotal considerations.

### *2.2.3 Competitive position of the EU in the world market*

The main driving factor of the *competitive position of the EU in the world market* is the difference in milk production costs between the EU and its competitors. In order to carry out this comparison, we will use the FADN evidences on milk production costs in the EU to be compared with the available evidences on milk production costs in other countries. Such comparison will be made using the most recent available evidences, thus assuming that the cost structure of EU farms will remain the same even after quota removal. The competitive position of the EU in the market of high quality differentiated dairy products will be assessed using the information described in point 3.2.1 (i.e., the likely demand trends).

### *2.2.4 Need of investments in the production and processing industry*

The *need of investments in the production and processing industry* will be evaluated using the same cost information used for the previous point, together with the information on the likely evolution of prices in a non-quota environment (see point 3.2.1). In fact, we expect that the main incentive to restructure farms and processing units will be linked to the evolution of their profitability (i.e., the difference between revenues and costs). Milk prices are the main revenue component of the farming business (and the main cost component for processors), while dairy prices are the revenue component of the processing business. The size of the economies of scale to be exploited will be evaluated using the available studies on milk production cost functions in the EU (Witzke et al., 2009; Kempen et al., 2011; Wieck and Heckeley, 2007).

The restructuring process at the farm/processing level is likely to be affected also by several policy measures. In terms of market support measures, after the 2003 and 2008 CAP reform, the EU can still use public intervention and private storage aids to support dairy prices (butter and skimmed milk powder), maintaining them above a safety net level, even though such tools are subject to strict quantitative and time limits; these tools may be used in combination with export refunds. This system clearly has an impact on the ratio between revenues and costs at the farm level, together with all tools that may affect the bargaining power of milk farmers. As discussed above, POs are supply management tools and should allow farmers to enjoy a better bargaining position and obtain a better remuneration (higher prices) for milk. If this mechanism works, the need for expanding farms and exploiting economies of scale should be reduced.

## **2.3 Description of the method(s) used and an indication of its (their) limitations**

The impact of market forces, organisational systems of the supply chain and policy measures on the various dimensions of competitiveness (added value and portfolio of products, ability to react to changes in demand, competitive position of the EU in the world market, need of investments in the production and processing industry) will be analysed in perspective, trying to simulate their impact in a non-quota environment. In terms of methodology, this implies using quantitative information coming from specific studies that simulates the impact of quota removal (i.e., Witzke et al., 2009) or data describing phenomenon that are likely to be unaffected by quota removal. For example, the trends in international and domestic prices should be taken from studies that have explicitly incorporated the quota removal scenarios (European Commission, 2012a; OECD-FAO, 2012; FAPRI, 2011), while information on milk production costs will be taken from the FADN database, thus assuming that the (average) cost structure of dairy farms will not be affected by quota removal.

The main limitation of this approach is that very few reliable data are available, since modelling the post-quota environment using information coming from the 30-year quota implementation period is rather complicated and implies some approximations. Our effort will be to combine all the available quantitative evidences, analyse them critically, considering the assumptions that are behind each modelling approach, and then

integrate them with qualitative/anecdotal reasoning, based on economic theory and on the experience of some Member States.

## 2.4 Detailed description of the reasoning followed in the analysis, indicating in particular, the underlying hypotheses and validity limits

The complexity of the concept of competitiveness requires the use of an integrated approach for answering EQ2. The basic reasoning/hypotheses we are going to follow in order to analyse the different dimensions of competitiveness mentioned in EQ2 can be summarised as follows:

- 1) Quota removal is likely to affect milk supply at the EU level, with rather strong differences across the Member States (see Witzke et al., 2009). Thus, we expect that the combination of such changes in milk supply and the evolution of the final demand of dairy products, both domestically and internationally, will affect dairy prices. This trend, together with the exogenous trend in demand (i.e., changes in consumer tastes) is going to be the main driver of processor's choices in terms of which dairy products to produce, thus affecting the *value added and portfolio of dairy products*.
- 2) The distribution of the *valued added* along the chain is going to be affected by the functioning of the organisational tools, such as POs and IBOs. POs should strengthen the bargaining power of milk producers, while IBOs should help in developing more effective contractual relationships along the chain.
- 3) The recent decoupling of direct payments and the future quota removal will increase the ability of the EU dairy supply chain *to react to market signals, especially to changes in demand*. But in order to improve such ability, the organisation of the supply chain is also crucial. Here, the key role is going to be played by IBOs, since they should improve the flow of information along the chain, helping producers and processors to properly react to market signals.
- 4) The competitive position of the EU in the world market of bulk commodities (i.e., butter, milk powders) depends on the difference in milk production costs between the EU and its competitors.
- 5) The competitive position of the EU in the world market for highly differentiated dairy products (i.e., PDO/PGI/organic cheese) depends on the general demand trends (both domestically and internationally) and on the ability of producers/processors to develop adequate marketing/export strategies.
- 6) The need of restructuring/investing in dairy production and processing depends on the evolution of milk profitability after quota removal. This will depend on the likely evolution of dairy prices and on the average costs of production of dairy farms. The potential economies of scale to be exploited through restructuring/investing will depend on the shape of the long run average cost function of dairy farms.

## 2.5 Evidences on the various aspects of EQ2

### 2.5.1 Added value and portfolio of products

As discussed in the methodological section, the impact of market forces on *added value and portfolio of products* is analysed through the likely trend of international and domestic dairy prices, as well as through the likely trend in demand, which should be the main driver of processors' choices in terms of which dairy products to produce.

The data reported in Table 1 have already been discussed in EQ1. The key point for discussing the issue of added value and portfolio of products is whether we can expect a strong impact on prices and production of dairy products after quota removal. As discussed in EQ1, the entire counterfactual scenario analyses carried out in 2008-09 projected a reduction of dairy prices due to quota removal (the order of magnitude was around 10-15 percent for butter and 5-9 percent for cheese, SMP and WMP). However, all these studies were carried out using estimates of quota rents based on data for 2005 or earlier<sup>8</sup>. In the following years, the big price crisis of 2009 led to a remarkable reduction of milk production in several countries. This fact, combined with the

<sup>8</sup> See Table 9 in the Theoretical analysis for details.

gradual phasing out of quotas established with the Health Check reform of the CAP, has led to a situation in which most EU Member States are producing below their quotas. In 2011/12, only six Member States (Austria, Ireland, The Netherlands, Germany, Cyprus and Luxembourg) exceeded their milk quotas, but, despite this overrun, the total EU deliveries remained well below the global quota volume (-4.7 percent).

As discussed in EQ1, the preliminary figures for the 2012/13 quota year, as well as the available market projections for the two remaining campaigns (2013/14 and 2014/15), seem to confirm that the total EU milk production should remain below the global quota till the end of the regime. This means that, since quotas are no longer binding, at least at the aggregate level, the general trend in milk and dairy prices should not be affected by quota removal and should follow the trend predicted by the European Commission study<sup>9</sup>.

As long as we believe that general market trends will be substantially unaffected by the event of quota removal, the main point for judging the impact of market forces on *added value and portfolio of products* are the figures concerning demand trends, both on the EU market and at the international level. Table 3 reports the most recent projections on the evolution of dairy markets, taken both from the European Commission study mentioned above and from the OECD-FAO 2012 baseline projections. These trends show a moderate increase in domestic consumption of all dairy products in the 2012-2020 period, while, at the same time, export would increase at a much higher rate, driven by the demand increase expected at the world level, especially in emerging countries, such as Asia and South America. This export increase is the main driver of the corresponding increase in prices and is particularly strong for cheese and butter. However, in interpreting these data, one should be aware that butter (and also WMP) has experienced a strong drop in exports in 2009-12, such that the increase projected for 2012-20 is, at least in part, a recovery of levels reached in the past. This is not true for cheese, whose export has increased also in the years of the big crisis and is projected to increase further in the next years.

**Table 3: Dairy market projections for the EU**

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Raw milk</b>									
Production (million t)	153.1	154.3	154.8	155.8	156.9	157.2	157.5	157.8	158.2
Price (index 2012=100)	100.0	103.0	98.7	95.5	96.1	98.9	101.0	100.3	100.1
<b>Fresh dairy products</b>									
Production ('000t)	47 008	47 134	47 322	48 045	48 556	48 629	48 847	49 028	49 226
Consumption ('000t)	47 008	47 134	47 322	48 045	48 556	48 629	48 847	49 028	49 226
<b>Cheese</b>									
Production ('000t)	9 061	9 155	9 212	9 314	9 394	9 416	9 453	9 497	9 539
Consumption ('000t)	8 385	8 434	8 480	8 531	8 531	8 541	8 590	8 622	8 656
Exports ('000t)	756	794	805	857	888	910	914	926	934
Price (index 2012=100)	100.0	100.1	97.7	97.6	98.3	100.5	102.6	104.3	105.6
<b>Butter</b>									
Production ('000t)	2 248	2 241	2 229	2 259	2 310	2 308	2 323	2 330	2 338
Consumption ('000t)	2 120	2 125	2 126	2 144	2 201	2 194	2 194	2 195	2 195
Exports ('000t)	124	128	141	158	167	173	178	184	183
Price (index 2012=100)	100.0	98.4	97.7	98.4	99.1	102.3	105.1	106.6	107.8
<b>SMP</b>									
Production ('000t)	1 164	1 212	1 222	1 234	1 250	1 258	1 261	1 272	1 286
Consumption ('000t)	630	628	624	624	629	634	629	633	638
Exports ('000t)	618	580	600	611	622	625	633	640	649
Price (index 2012=100)	100.0	104.3	104.9	108.9	110.5	113.5	115.3	117.5	119.5

<sup>9</sup> Stronger changes are of course possible in countries where quotas are still binding. This may be especially relevant in large milk producing countries, such as Germany and The Netherlands. The projections in Witzke et al. (2009), once they are adjusted for the gradual increase in milk quotas introduced with the Health Check CAP reform, may imply an increase of milk production of +14% in The Netherlands and +2% in Germany right after quota removal. But even these increases should not alter the market trends predicted by the European Commission.



	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>WMP</b>									
<b>Production ('000t)</b>	678	695	708	715	714	704	698	697	695
<b>Consumption ('000t)</b>	320	324	327	324	325	326	327	328	329
<b>Exports ('000t)</b>	360	373	383	393	391	380	373	371	368
<b>Price (index 2012=100)</b>	100.0	100.9	102.0	104.4	105.9	108.9	111.2	113.4	115.6
<b>Source: EU Commission (2012) and OECD-FAO (2012)</b>									

Based on the above figures, the cheese market seems to be the most promising driver for the EU dairy sector. Cheese is the most important processed dairy product, both in the domestic and in the international market. Moreover, cheese exports are by far the most important component of dairy exports, since in 2011 they totalled €3.2b, around 40 percent of the total dairy exports in value terms. Nonetheless, based on the projections in Table 3, EU dairy production does not seem to evolve following such market signals. In fact, converting the data in Table 3 in their corresponding milk equivalent data<sup>10</sup>, the share of the four main product categories in terms of milk utilisation remains approximately the same in the 2012-20 period (50 percent for cheese, 31 percent for fresh dairy products, 10 percent for butter, 6 percent for SMP and 3 percent for WMP). If these projections are correct, the dairy industry does not seem sufficiently reactive to the demand changes that, as general trend, show a strong increase in world demand for cheese and a weaker increase in the demand for butter and milk powders.

However, one should consider that this judgment is based on the available projections that refer to very aggregate data. In fact, a product category like cheese is extremely heterogeneous, and includes both bulk commodity products like cheddar and high quality PDO/PGI/organic cheeses. Although data are scarce, many dairy operators claim that the demand of high quality cheese is likely to increase at a faster rate as compared to other types of cheese, especially in non-EU markets. This means that policies should try to favour a faster reorientation of dairy production, such that the portfolio of EU dairy products becomes more in line with the evolution of domestic and world demand: i.e., reducing production of bulk products, such as butter and milk powders (that in the past were explicitly targeted to market intervention) and increasing production of cheese. In the countries where high quality PDO/PGI/organic cheeses play a relevant role, these differentiation opportunities should be fully exploited.

The second crucial issue concerning value added is its distribution along the supply chain. The question is, again, whether, under quota removal, the organisation of the supply chain and some specific policy measures may affect the distribution of the value added along the chain. As it is well known, it is extremely difficult to estimate how the value added is distributed among the actors of the dairy chain<sup>11</sup>. If one takes as example a product like refrigerated milk, it is extremely difficult to obtain precise information on the price paid by processors to farmers, and it is even more difficult to obtain information on the contractual relationships between processors and retailers. For example, in the farm-processor relationship, there are differences in the payment system between cooperatives and private dairies. The price paid by the latter depends very much on the relative bargaining strengths of the two 'sides' of the market: this may vary from country to country, and among dairies in the same country<sup>12</sup>. By contrast, milk producers delivering to a cooperative enjoy a different price, depending on the economic success of the cooperative, since, in theory, all the cooperative's net value added is paid out to members. In the processor-retail relationship, the contractual conditions depend on the bargaining power of retailers, but other factors may play a crucial role (i.e., volume of sales, logistics, competition among brands, role of private labels). Nonetheless, the general claim is that the imbalance of market power among the actors of the chain creates an unequal distribution of the value added in which farmers get the lowest share of the pie.

In the medium term, and in a more competitive environment, such as the one that is going to be created by quota removal, there is no structural reason that may lead to a "rebalance" of market power and to a different,

<sup>10</sup> The conversion factors used here are the same used in section 2.2.1 of the descriptive chapter.

<sup>11</sup> The IFCN figures reported in Table 26 of the descriptive chapter are based on a very small sample of farms, with no guarantee on representativeness. Thus, those numbers should be taken with extreme caution.

<sup>12</sup> In fact, unequal bargaining power may be a much localized phenomenon, where one dairy is effectively the only downstream outlet for a geographically determined group of producers.

less unequal, distribution of the value added along the chain. Thus, the question is whether policies, especially those introduced with the 2012 “milk package”, may create the conditions for such rebalancing. One of the key elements of the “milk package” is the reinforcement of the role of POs and IBOs in the dairy chain, whose target is exactly that of increasing the bargaining power of farmers (POs) and of promoting a more transparent and efficient functioning of the supply chain (IBOs). Based on the first evidences available on the use of POs and IBOs in the EU Member States, the general impression is that these tools need time to become important actors of the dairy supply chain.

As documented in the theoretical chapter, right now only some EU Members States have reported recognition of POs and Associations of Producer Organisations (APOs), as well as activities in terms of negotiations of the milk price. By the way, in some of these countries, the recognition of POs and APOs comes from a previous legislation that was already in place. Most countries have adopted or are adopting appropriate legislations to implement the milk package<sup>13</sup>, but they need some time to become effective. However, based on the available information, some general considerations can already be drawn. For example, it is clear that, in many EU Member States, the minimum size limits for recognising POs are extremely small: by definition, an association of five farmers managing a few thousand tonnes of milk cannot improve the bargaining power of its members. As long as the experience of POs proceeds, these size limits must be increased, in order to allow them to play a role in the negotiations with processors.

In countries like Italy, POs were already active before the milk package, although in a different legislative framework, and such experience can lead to several important considerations. For example, the Italian experience shows that only true commercial POs can be really successful. By commercial POs, we mean POs that manage the milk of their members, in the sense that they make the contracts for selling the whole amount of milk they manage to processors, on behalf of their members. Thus, POs can guarantee the appropriate flow of milk to their customers, based also on the different destinations (i.e., milk for PDO cheese, milk for fresh dairy products, milk for refrigerated milk) and on the seasonality of production/processing. Thanks to this service they can guarantee to processors, they may obtain a (slightly) higher price. But price is not the only potential advantage for farmers joining the POs. For example, in periods of economic crisis, if a processing company closes, the milk of members delivering to that dairy can be easily reallocated to other customers of the PO, thus saving their possibility of delivering milk. The situation is totally different for non-commercial POs that negotiate only a framework contract with processors, establishing the price and the other contractual conditions. In fact, in this case, POs cannot guarantee that members will actually follow the indications in the framework contracts, since they have no tools to force their members to stick to such contracts. In this context, POs cannot play a credible supply management role. The new Italian legislation, approved in December 2012 as application of the milk package, seems rather clear in providing recognition only to those POs that can actually manage the milk of their members, through a written mandate, but it leaves room for some exceptions. The problem is that the European legislation still leaves room for the creation and recognition of non-commercial POs, while experience says that such organisations are not effective.

Other situations may arise in other Member States, where milk production and processing conditions are rather peculiar. For example, in a small milk producing country like Ireland, the role of POs may be played directly by farmers’ unions. In fact, the small size of both the production and the processing sector, as well as the difficulties in finding alternative source of liquid milk for processing, increases the potential bargaining power of farmers, whose unions are quite successful in carrying out their collective action in the milk price bargaining process.

In general, we believe that an appropriate legislative framework, addressing the issue of commercial POs and of their minimum size, should create the right environment for farmers joining such POs. However, in the medium term, the success of POs is linked to their ability to provide effective services to farmers, since the main incentive for farmers joining POs is a “good reputation” of the existing POs. As discussed above, such reputation is certainly linked to their ability to obtain better prices in the negotiations with processors. But also to the provision of other services to their members (i.e., market information, logistic services, linkage with other processors in case of problems,....).

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<sup>13</sup> See Table 48 in the theoretical/descriptive chapter.

The experience of IBOs is even more limited than that of POs. In many Member States, the “milk package” national legislation concerning the recognition of IBOs has not been released yet, with some exceptions (see Section 2.8.2 of the descriptive chapter). Again, also for IBOs, the first important issue is the size limit. In order to carry out their institutional activities, IBOs must have an adequate size, in the sense that participating farmers, processors and retailers (or their associations) must represent a relevant share of the dairy business at the regional/national level. Thus, appropriate size limits should be included in the national regulations.

France is one of the few EU countries in which IBOs have a long history in the milk sector. Centre National Interprofessionnel de l'Economie Laitière (CNIEL) has been founded in 1973 by the most representative organisations of milk farmers, private dairies and dairy cooperatives. Its objectives coincide with those established by the milk package (improve knowledge and transparency; coordinate research and market studies; draw up standard contracts; adjust production to market requirements; improve quality) and French operators seem to have a positive judgement of its activities, at least in terms of disseminating market information and developing standard contracts to be used by all actors of the chain. However, the experience says that IBOs require time to become a reference for the supply chain operators, since the culture of collaboration along the chain is often difficult to implement. Thus, one should expect good results from this policy only in the medium term, as long as participating actors are convinced of the role of IBOs.

Based on the above discussion, POs and IBOs can certainly play a role in improving the functioning of the dairy supply chain, but their role should not be over-emphasised. In order to be successful, such organisations require an adequate “culture” of the dairy operators and, especially in countries where there is no previous experience in this area, one should expect some concrete results only in the medium term.

#### *2.5.2 Ability to react to changes in demand*

One of the most important factors affecting *the ability of processors and farmers to react to changes in demand* is the evolution of dairy policies. The recent changes in the CAP, especially the decoupling of the milk premium and of all other direct payments, are all targeted to create the conditions for a more market-oriented milk production, since milk producers should respond to market signals more properly and in an unconstrained way. Quota removal in 2015 will remove the last obstacle to manage milk production in line with market signals.

Thus, the question is whether decoupling and, in perspective, quota removal are likely to improve the ability of dairy farmers to react to changes in demand. This question has been partially answered in the previous section, since the available projections on the evolution of dairy markets seem to suggest that the portfolio of EU dairy products is not likely to change very much by the end of the decade. As long as these projections are reliable (but, as discussed in EQ1, they coincide with those of the major international organisations modelling agricultural commodity markets), the EU dairy industry seems quite “inflexible” with respect to the demand trends, that, as mentioned above, show a strong increase in world demand for cheese and a weaker increase in the demand for butter and milk powders. Again, one should also speculate on the composition of the cheese aggregate: especially in the Mediterranean EU countries, high quality cheese may play a key role in increasing value added of dairy production and providing higher margins to farmers and processors.

In this respect, some provision of the recent milk package may play an important role. As mentioned in the previous sections, well functioning IBOs may help farmers and processors to be more reactive to demand changes, through a proper diffusion and interpretation of market information, as well as with some active policies helping processors to develop their export skills. This is especially relevant in Southern and Eastern EU countries, where the structure of dairy processing is still very fragmented<sup>14</sup>. In fact, while the most relevant opportunities for the EU dairy products are likely to be in the international market, many EU processors do not have adequate managerial skills to face the export market. Sometimes, this is related to their small size, such that, at least in Southern and Eastern countries, a further process of consolidation is likely to favour the development of a more competitive dairy industry.

Another important role of IBOs is that of drawing up standard contracts for the contractual relationships along the chain, especially those between farmers and processors. This is especially relevant if IBOs are able to set appropriate payment systems to be used in contracts (i.e., premiums for fat/protein/cells content and other

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<sup>14</sup> See tables 44-47 in the descriptive chapter

premiums for milk used for high quality dairy products). In fact, as long as the demand trends imply a different use of milk at the processing level, the “ideal” technical features of the raw material change and this should be transmitted at the farm level through an appropriate system of premiums/penalties. For example, the increasing demand for cheese should make the protein content especially relevant in establishing the raw milk price, while the increasing demand for fresh dairy products should lead to increase the premiums for milk with low cell content, since this allows to reduce the pasteurisation temperature and preserve the nutritional content of milk. The French experience of CNIEL shows that IBOs can play an important role in this respect.

Finally, the second element of the milk package that may enhance the ability of processors and farmers to react to changes in demand is the possibility of using production plans for PDO/PGI cheeses. This supply management tool could be very useful for some Italian and French hard cheese (i.e., Grana Padano, Parmigiano Reggiano, Comté), characterised by a long ripening period. For these cheeses, production decisions are taken many months before the product is ready for being sold to final consumers. This implies that prices of these products tend to fluctuate rather strongly over time, as a result of mismatch between demand and supply and speculative behaviour in storage activities. Thus, production plans introduced by the milk package may help in stabilising cheese supply and reducing cheese price volatility. This instrument is new, thus we do not have previous experiences to refer. However, dairy operators seem quite interested in applying these plans, as long as they are established with appropriate criteria, that consider not just the market interested by supply management (i.e., the specific PDO/PGI cheese subject to the plan), but also its relationships with other markets. For example, a production plan should consider the potential impact on the markets of alternative uses of milk, as well as on competing cheese on the consumer side, that may suffer negative consequences of supply management (i.e., excess production and low prices).

### 2.5.3 Competitive position of the EU in the world market

The main driving factor of the *competitive position of the EU in the world market* is the difference in milk production costs between the EU and its competitors. Table 4 reports the total production costs of milk in the EU Member States, as computed through the FADN database. Since it is extremely difficult to predict the path of structural change after quota removal and its impact on average production costs, we develop our considerations assuming that the cost structure of EU farms will remain the same even after quota removal.

The total costs include all types of costs considered in the FADN: specific variable costs (i.e., feed, veterinary expenses), non-specific variable costs (i.e., energy, machinery and building maintenance), other variable costs (i.e., wages, rent, interest) and imputed family inputs (family labour, own capital imputed costs). The total costs in EU-15 showed a slightly declining trend in 2000-06, and a strong increase in 2007-08, due mainly to the peak of energy and cereal prices that affected feed costs. In 2009, the year of the big milk crisis, costs went down, mainly because of the reduction in cereal and feed prices, but they remained well above the levels of the previous years, since the EU-15 average for 2009 was around 380 €/t.

**Table 4: Total costs of milk production for specialist dairy farms, €/t**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Austria</b>	454	463	458	447	430	442	440	446	498	503
<b>Belgium</b>	314	300	301	297	317	308	307	324	353	324
<b>Denmark</b>	379	413	391	380	394	386	370	381	506	369
<b>Finland</b>	562	590	563	578	608	582	619	643	714	697
<b>France</b>	355	365	343	353	352	347	363	374	404	402
<b>Germany</b>	382	406	369	362	343	347	348	392	375	360
<b>Greece</b>	286	296	285				397			242
<b>Ireland</b>	301	317	306	285	305	319	326	355	387	374
<b>Italy</b>	413	411	399	371	381	392	345	361	452	390
<b>Luxembourg</b>	357	368	378	354	359	362	370	404	417	427
<b>The Netherlands</b>	353	379	378	364	385	341	351	374	429	405
<b>Portugal</b>	279	282	278	274	279	270	266	298	400	318
<b>Spain</b>	255	254	259	258	258	235	247	283	312	309
<b>Sweden</b>	481	449	441	448	469	496	452	450	468	413

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
United Kingdom	345	320	301	300	296	298	300	325	317	290
<b>EU-15</b>	<b>367</b>	<b>371</b>	<b>357</b>	<b>350</b>	<b>352</b>	<b>346</b>	<b>349</b>	<b>373</b>	<b>393</b>	<b>381</b>
Czech Republic					285	319	333	374	427	400
Estonia					235	263	279	289	333	312
Hungary					299	300	295	324	361	328
Latvia					224	258	301	355	386	372
Lithuania					173	210	228	237	276	279
Malta										
Poland					192	231	250	270	324	268
Slovakia					292	334	521	495	501	551
Slovenia					380	362	384	384	398	481
<b>EU-10</b>					<b>226</b>	<b>253</b>	<b>271</b>	<b>294</b>	<b>340</b>	<b>301</b>
Bulgaria								235	317	301
Romania								397		348
<b>EU-02</b>								<b>361</b>		<b>341</b>

Source: FADN

This trend of average costs was also observed at the Member State level, but the most striking data of Table 4 are the large differences among the Member States, that persist over the entire period despite changes in the FADN sample composition. The highest-cost producer is Finland, with average cost at 50-80 percent above the EU-15 average, followed by Sweden and Austria, while the lowest-cost producers are Spain and Portugal, with the average cost at 25-35 percent below the EU average, joined by the UK at the end of period.

By contrast, average production costs in EU-10 followed a marked upward trend between 2004 and 2007, which became even stronger in 2008, in line with what happened in the rest of the EU. Average production cost in EU-10 increased by 33 percent in five years, but it remained well below the EU-15 level in the whole period (301 €/t in 2009).

The implications for competitiveness of this cost trends are not straightforward. The declining trend observed in the EU-15 till 2007, that was accompanied by an average increase in farm size, may imply that dairy farms were exploiting economies of scale, thus increasing their competitiveness *ceteris paribus*. But the strong upward trend observed in 2008-09 shows how sensitive milk production costs are to the fluctuations of commodity prices, since feed expenditure is a key component of costs. The increase in costs in EU-10 is likely to be related to the long-term adjustment process due to EU enlargement that has been exacerbated by the commodity price volatility in 2007-08. Thus, policies addressing price volatility should be at the top of the agenda for the post-quota environment, where such volatility is expected to continue.

**Table 5: Fraction of specialised dairy farms earning a positive net economic margin (excluding coupled payments)**

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria	0.05	0.05	0.00	0.00	0.00	0.00	0.06	0.09	0.00
Belgium	0.57	0.48	0.49	0.36	0.34	0.32	0.55	0.35	0.11
Denmark	0.04	0.06	0.06	0.00	0.03	0.03	0.07	0.04	0.00
Finland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
France	0.21	0.30	0.19	0.16	0.13	0.04	0.14	0.15	0.02
Germany	0.15	0.12	0.10	0.16	0.11	0.10	0.36	0.08	0.06
Greece	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ireland	0.37	0.28	0.33	0.22	0.14	0.07	0.25	0.14	0.00
Italy	0.26	0.29	0.26	0.30	0.28	0.29	0.30	0.39	0.28
Luxembourg	0.22	0.17	0.29	0.27	0.14	0.10	0.17	0.20	0.00
The Netherlands	0.30	0.27	0.24	0.18	0.22	0.13	0.33	0.14	0.03
Portugal	0.32	0.42	0.42	0.39	0.46	0.41	0.43	0.49	0.27

	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Spain</b>	0.63	0.56	0.58	0.56	0.72	0.67	0.61	0.75	0.35
<b>Sweden</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
<b>United Kingdom</b>	0.32	0.21	0.25	0.22	0.18	0.12	0.31	0.37	0.19
<b>EU-15</b>	<b>0.25</b>	<b>0.24</b>	<b>0.21</b>	<b>0.21</b>	<b>0.20</b>	<b>0.15</b>	<b>0.28</b>	<b>0.22</b>	<b>0.10</b>
<b>Czech Republic</b>				0.14	0.20	0.13	0.14	0.11	0.00
<b>Estonia</b>				0.25	0.19	0.14	0.16	0.08	0.00
<b>Hungary</b>				0.28	0.29	0.26	0.12	0.24	0.00
<b>Latvia</b>				0.19	0.30	0.10	0.07	0.05	0.00
<b>Lithuania</b>				0.41	0.41	0.22	0.36	0.21	0.03
<b>Malta</b>									
<b>Poland</b>				0.39	0.34	0.32	0.39	0.22	0.10
<b>Slovakia</b>				0.00	0.00	0.00	0.00	0.00	0.00
<b>Slovenia</b>				0.05	0.06	0.06	0.10	0.14	0.00
<b>EU-10</b>				<b>0.34</b>	<b>0.32</b>	<b>0.27</b>	<b>0.34</b>	<b>0.20</b>	<b>0.08</b>
<b>Bulgaria</b>							0.52	0.40	0.11
<b>Romania</b>							0.25		0.26
<b>EU-2</b>							<b>0.28</b>		<b>0.25</b>

Source: FADN

The trend in milk production costs has of course an impact on profitability. The evolution of average gross margins for EU dairy farms has been discussed in the descriptive chapter (see Section 2.5.4). Since gross margins consider only operating costs, they are largely positive in all Member States (see Table 39 in the descriptive chapter). However, when one considers all costs, including imputed family labour and capital costs (as those reported in Table 4), net economic margins become largely negative for many EU farms in most Member States. In fact, as reported in Table 5, even in 2007-08, the years in which milk prices were at their top, the share of profitable farms was above 50 percent only in Spain and Belgium, while the EU15 average reached 28 percent at the maximum. Of course, in 2009, the year of the big milk crisis, we observed a dramatic drop, with only 10 percent of EU-15 farms (and 8 percent of EU-10 farms) obtaining a positive net margin, with this indicator being zero for 13 Member States. Since most profitable dairy farms are the largest producers in each Member State, the share of the “profitable milk” is roughly twice the share of profitable farms, but the general picture does not change: most EU dairy farms are working with negative net margins. Since their gross margins are largely positive, this means that farmers are implicitly accepting a lower remuneration of family labour and capital, a phenomenon that is quite common in agriculture.

However, the most worrying element in terms of competitiveness of EU dairy farms is the fact that the share of profitable farms tends to decline over time: this is what we observe in virtually all Member States in 2000-06, before the big price turbulence. Thus, the restructuring process that is going on in the EU dairy sector, with a decrease in the number of farms and an increase in their size, has not been sufficient to increase profitability and competitiveness. As mentioned above, the pressure created by price volatility, both on the input and on the output side, has strongly reduced the potential benefits of restructuring. Moreover, most of the non-profitable farms are likely to be those located in disadvantaged areas, where milk production has little viable alternatives. Thus, the territorial dimension of any policy package is likely to be very important in any post-quota policy design.

Finally, in order to judge the international competitiveness of EU milk production, we should compare EU milk production costs with those of the main export competitors of the EU. The most comprehensive information on milk production costs worldwide is collected by the International Farm Cost Network (IFCN). The IFCN data are collected through a network in which 134 typical dairy farms from 44 countries are analysed<sup>15</sup>. In Table 6, we report such data referring to the major productive areas in the world. As it is well known, the leading area in world dairy export is Oceania, and, in 2011, this area has still a strong cost advantage with respect to both North-America and the EU. The upper bound of the cost range for Oceania coincides with the lower bound of

<sup>15</sup> The IFCN reference sample is clearly very small and we have no guarantee on its representativeness. Thus, any conclusion drawn from these data should be taken with extreme caution.

the EU-15 range (represented by costs of production in the UK and Spain). On average, the EU-15 has still the highest milk production cost worldwide, followed by North-America, which means that, without the import tariffs currently in place, EU domestic bulk products like butter and SMP could be replaced, at least partially, by lower cost non-EU products.

**Table 6: Costs of milk production in different areas of the world in 2011 (€/t)**

EU-15	280-650
EU-10	250-350
North America	280-490
Middle-East	300-400
Africa	100-250
South America	140-350
Asia	210-350
Oceania	210-280

Source: Elaboration from IFCN

Unfortunately, we do not have data to analyse the competitive position of the EU in the market of high quality differentiated dairy products. As mentioned in the previous sections, many dairy operators claim that demand of high quality cheese is likely to increase at a faster rate as compared to other types of cheese, especially in non-EU markets. Since these products are highly differentiated, the competition on price should not be the main problem. The main point is whether processing firms of niche products like PDO/PGI/organic cheeses have the skills to implement adequate marketing strategies for selling their products in non-EU markets. In this area, the role of POs, IBOs and PDO/PGI promotion bodies in supporting export strategies of their members is likely to be crucial.

#### 2.5.4 Need of investments in the production and processing industry

The *need of investments in the production and processing industry* is strictly linked to the discussion on production costs and profitability carried out in the previous section. As mentioned above, all studies carried out in recent years show that milk production is characterised by strong economies of scale (Witzke et al., 2009; Kempen et al., 2011; Wieck and Heckeley, 2007). This seems to be reflected by the path of structural change that is going on in the EU dairy sector. In Table 7, it is clear that, in all EU Member States, the number of farms has declined quite dramatically in recent years, while Table 8 shows that their average size (i.e., number of dairy cows) has increased substantially.

**Table 7: Number of dairy farms in EU Member States**

	2005	2007	2010
Austria	54 580	49 450	47 740
Belgium	15 180	13 320	11 400
Bulgaria	152 560	120 820	85 950
Cyprus	240	240	200
Czech Republic	6 780	5 620	3 100
Denmark	6 630	5 380	4 250
Estonia	9 210	6 080	3 520
Finland	16 940	14 390	11 910
France	103 850	93 120	82 600
Germany	110 370	101 070	89 760
Greece	9 780	8 020	5 780
Hungary	16 250	12 170	11 370
Ireland	23 820	21 320	18 460
Italy	61 020	62 790	52 130

	2005	2007	2010
<b>Latvia</b>	50,900	43 690	30 050
<b>Lithuania</b>	170 790	123 170	85 020
<b>Luxembourg</b>	970	1 090	810
<b>Malta</b>	180	190	140
<b>The Netherlands</b>	23 530	24 510	19 810
<b>Poland</b>	727 100	651 050	425 780
<b>Portugal</b>	15 860	13 500	10 450
<b>Romania</b>	1 134 400	1 012 410	624 990
<b>Slovakia</b>	13 460	11 540	6 300
<b>Slovenia</b>	19 710	19 200	10 950
<b>Spain</b>	42 390	37 290	29 460
<b>Sweden</b>	8 550	7 100	5 620
<b>United Kingdom</b>	26 310	27 520	23 540

Source: Eurostat

However, this strong structural adjustment did not impact very much on average milk production costs. In fact, the data reported in table 4 show a slight declining trend in the EU-15 from 2000 to 2007, but a strong upward trend in 2008-09. This means that the cost advantage due to economies of scale was not sufficient to rebalance the huge cost increase due the surge in feed prices. In addition, as reported in table 5, only a small share of EU dairy farms (around 30 percent in years of high milk prices, and only 10 percent in years of very low prices) are profitable.

The question is whether in a post-quota environment these trends are likely to change. In general, we expect that the presence of milk quotas has made more difficult the structural adjustment process, since any farm wishing to increase its milk production had to face the cost of buying/renting additional milk quotas, and the price of quotas has been very high for many years, especially in countries with very high production potentials (i.e., The Netherlands, Germany) or in countries structurally producing over quotas (Italy). Thus, quota removal should make dairy farm enlargement less costly and should accelerate structural adjustment, especially in the most productive countries. In this sense, we expect an increase in investments in dairy farms, and for sure policies supporting investments (i.e., new barns, new milking systems, new technologies), like those included in the second pillar as part of the CAP Rural Development Program, are likely to be beneficial.

Of course, this process may create difficulties in the most disadvantaged areas, where costs cannot be competitive even if farms increase in size. Thus, specific policies should be implemented for these areas.

A strong structural adjustment process took place also in the processing sector, as documented by the data provided in the descriptive chapter<sup>16</sup>. However, in many countries the concentration ratio is already very high, since a few processing firms (either private or cooperative) hold a very high market share (see Table 35 in the descriptive chapter). The only exceptions are the Mediterranean countries (Spain, France, Italy and Greece), where production of high quality dairy products (PDO/PGI/organic) plays a relevant role, and this typically takes place in small and medium enterprises (SMEs). In a non-quota environment, this structural adjustment process is likely to continue, especially in Mediterranean countries, since an increase in the average size of dairies is required to exploit future market opportunities. In fact, as discussed in the previous sections, such opportunities are typically export opportunities in non-EU markets, for which SMEs need to develop adequate managerial and marketing strategies, which are extremely difficult to develop in the smallest firms. In this sense, we expect an increase in investment also at the processing level, and any policy supporting such investments is likely to be very beneficial.

<sup>16</sup> See Tables 44-47 in section 2.6.



**Table 8: Average number of dairy cows per farm in EU Member States**

	2005	2007	2010
Austria	9.8	10.5	11.3
Belgium	36.2	39.3	45.7
Bulgaria	2.3	2.9	3.9
Cyprus	101.0	94.4	102.6
Czech Republic	65.0	74.1	122.9
Denmark	85.1	101.4	133.7
Estonia	12.5	17.7	27.3
Finland	18.8	20.6	24.3
France	37.4	41.0	45.0
Germany	38.4	40.3	46.4
Greece	17.2	19.6	22.7
Hungary	17.7	21.8	21.6
Ireland	45.4	49.6	58.0
Italy	30.5	30.1	35.2
Latvia	3.4	4.2	5.5
Lithuania	2.9	3.2	4.1
Luxembourg	40.6	36.7	55.6
Malta	40.4	42.5	48.1
The Netherlands	60.9	59.9	74.6
Poland	3.9	4.3	5.9
Portugal	18.1	20.2	26.6
Romania	1.5	1.6	1.8
Slovakia	14.4	15.4	24.5
Slovenia	6.6	6.5	9.9
Spain	23.6	26.1	30.9
Sweden	46.0	52.1	61.9
United Kingdom	78.5	71.0	78.3

Source: Elaboration from Eurostat data

## 2.6 Conclusion and policy recommendations drawn directly from the analysis

The analysis carried out on the various aspects of EQ2 has led to several policy implications that are summarised below.

In terms of market orientation of EU dairy production, the EU dairy industry seems quite “inflexible” in reorienting its production in line with the evolution of domestic and world demand (i.e., reducing production of bulk products such as butter and milk powders and increasing production of cheese, especially high quality PDO/PGI/organic cheeses where possible). In this respect, some elements of the recent milk package may play an important role. In fact, well-functioning IBOs may help farmers and processors to be more reactive to demand changes, through a proper diffusion and interpretation of market information, as well as with some active policies helping processors to develop their export skills. For the case of PDO/PGI cheese production, such activities should be carried out in collaboration with the promotion bodies. This is especially relevant in Southern and Eastern EU countries, where the structure of dairy processing is still very fragmented and SMEs have more difficulties in developing such skills. Another important role of IBOs may be that of drawing up standard contracts for the contractual relationships along the chain, especially those between farmers and processors. A proper mechanism of premiums/penalties could in fact help milk producers and dairy processors to reorient production toward the most promising products and markets.

In terms of the distribution of the value added along the chain, again the elements of the “milk package” can play an important role: POs can help in increasing the bargaining power of farmers, while IBOs can promote a more transparent and efficient functioning of the supply chain. However, in order to make these organisations

more effective, some conditions should be fulfilled. First, the size of both POs and IBOs should be adequate. In order to play a relevant role in the negotiations with processors, POs must represent a large number of milk farmers, while IBOs must represent a relevant share of farmers and processors at the regional/national level. Moreover, POs must be true commercial POs that can manage the amount of milk they represent on behalf of their members; otherwise they cannot play their role in the bargaining process. On these points, the European/National legislations should be very clear in establishing adequate size limits on both POs and IBOs and in establishing clear rules on the nature of POs.

However, although POs and IBOs can certainly play a role in improving the functioning of the dairy supply chain, their role should not be over-emphasised. In order to be successful, these organisations require an adequate “culture” of the dairy operators and, especially in countries where there is no previous experience in this area, one should expect some concrete results only in the medium term.

Another important element of the milk package that may help market orientation of EU dairy production is the possibility of implementing production plans for PDO/PGI cheeses, which may help in stabilising cheese supply and reducing cheese price volatility. This instrument is new, but dairy operators seem quite interested in applying these plans, as long as they are established with appropriate criteria, that consider not just the market interested by supply management (i.e., the specific PDO/PGI cheese subject to the plan), but also its relationships with other markets. For example, a production plan should consider the potential impact on the markets of alternative destinations of milk, as well as on competing cheese on the consumer side, that may suffer negative consequences of supply management (i.e., excess production and low prices).

The increase in milk production costs that took place in all EU-27 Member States in 2007-08 has been linked to the commodity price volatility and the corresponding increase in feed prices. Thus, as discussed also in EQ1, policies addressing price volatility should be at the top of the agenda for the post-quota environment, where such volatility is expected to continue. The proposals included in the recent CAP reform include a new income stabilisation tool in the second pillar<sup>17</sup> that should be adequately financed, since losses are likely to be widespread in years of very low milk prices. In this respect, when designing such a tool, one may take inspiration by similar programs implemented in other countries. For example, the US Average Crop Revenue Election (ACRE) program requires that participating farmers agree on a reduction of their regular direct payments in order to obtain a larger coverage in years of low prices. The idea is that their total income (including the payments) may be slightly lower in years of high/average prices, while the coverage of income losses would be guaranteed in years of low prices. Thus, the amount of payments foregone finances the income stabilisation tool. A similar approach could be implemented in the EU, in order to guarantee coverage of all producers incurring in a relevant income loss in years of low prices.

Finally, on the issues of restructuring and investment in milk production and dairy processing, it is very likely that the non-quota environment will create incentives to invest in order to increase the size of dairy farms and dairies. Thus, any policy supporting investments, like those traditionally included in the second pillar of the CAP, are likely to be beneficial and should be adequately promoted and financed.

In synthesis, our main policy recommendations can be summarised as follows:

- Promote the role of IBOs as market orientation tool for all actors of the milk supply chain.
- Revise the European/National legislation on POs and IBOs, in order to make them more effective (i.e., revise the minimum size; revise the rules governing POs).
- Promote a “responsible” use of production plans for PDO/PGI cheeses.
- Promote a financially “sustainable” implementation of the income stabilisation tool under discussion in the post-2013 CAP reform package.
- Provide adequate financing to all investment support tools (like those traditionally included in pillar II).

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<sup>17</sup> Based on the legal proposals presented in November 2011, producers may claim income support in areas where the drop of income exceeds 30% of their average annual income in the preceding three-year period. Such income insurance payments will be managed by mutual funds and shall compensate farmers for not more than 70% of the income lost.

### 3. How could a possible buy-out scheme be operated in a workable and effective way?

#### 3.1 Interpretation and comprehension of the key terms of the evaluation question

Key terms in EQ3: *buy-out scheme*

A *buy-out scheme* (according to the OECD definition) is a supply control tool based on voluntary participation, by which producers agree to limit their production or productive capacity under the provision of compensatory payments (an example for the dairy sector is the Cooperatives Working Together (CWT) herd reduction program in the USA).

According to the concluding remarks of the "Report of the European Parliament and the Council on the evolution of the market situation and the consequent conditions for smoothly phasing out the milk quota system" (European Commission, 2010), the perspectives for the dairy markets appear to be favourable; thus, the buy-out scheme should be considered only as an exceptional measure on the market, mainly to account for increased price volatility. The measure should be based on Article 186 of the Council regulation on the single CMO (as amended by EC Regulation 1140/2009):

(article 186)

The Commission may take the necessary measures in the case of the following situations, when those situations are likely to continue, thereby disturbing or threatening to disturb the markets:

(a) with regard to the products of the sugar, hops, beef and veal, milk and milk products, sheepmeat and goatmeat sectors, where the prices on the Community market for any of those products rise or fall significantly

(b) with regard to the products of the pigmeat, eggs and poultrymeat sectors and, with regard to olive oil, where the prices on the Community market for any of those products rise significantly.

#### 3.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

In order to answer EQ3, we need first information on the likelihood and the potential size of the scheme. The above report states that "*experience gained during the milk crisis shows that it may be sufficient to take 1 or 2 percent of overall milk production out of the market to correct imbalances*". However, this estimate is based on experience from a period when a quota scheme was in place, and thus it should be integrated with conclusions drawn from answers to EQ1 and EQ2 concerning the likely evolution of milk supply and prices.

#### 3.3 Description of the method(s) used and an indication of its (their) limitations

To answer EQ3, we need to first analyse data on market dynamics in the dairy sector; considerations drawn from answers to EQ1 and EQ2 will provide background information for answering EQ3. Thus, the limitations of this approach are the same already discussed in EQ1 and EQ2 and are related to the uncertainty linked to market dynamics in the future and to the difficulties in properly modelling the impact of quota removal and price volatility

#### 3.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

The issues that should be considered in the analysis are:

- a) The theoretical economic impact of such a scheme; a buy-out scheme should be an exceptional measure, and therefore its triggering should be the result of unexpected events on supply and demand, producing temporary market imbalance. Demand and supply unexpected shocks are not equally likely, and we need to identify the main causes for these shocks; furthermore, in previous years, shocks on domestic supply were softened by the existence of a production quota, thus 'lessons from the past' should be critically evaluated.

- b) The characteristics of the scheme: a buyout scheme, according to the above definition, aims to reduce deliveries during market crisis (i.e., market imbalance), but such reduction can be reached either through a withdrawal of milk production or through a reduction in the dairy herd. Of course, the rationale of the two measures is different: by considering the buyout scheme as an exceptional measure, we implicitly favour the adoption of production withdrawal, since herd reduction implies a permanent change in the structure of production. Further, a herd reduction may imply a 'delayed' response in terms of levels of milk deliveries.
- c) The modalities for defining the amount of the compensatory payments (a prefixed payment, a payment based on a formula, a payment based on auctions).
- d) The financing of the scheme and the impact on the budget (do we expect a co-financing from producers? can we estimate the cost of the scheme?).
- e) The triggering of the scheme, which is usually related to deteriorating market conditions (prices); should prices be the unique indicator for triggering the scheme? Should we consider a multi-dimensional indicator for market imbalance?
- f) The relationships with other measures (e.g., the role of POs and IBOs in improving coordination along the supply chain, that should guarantee a higher market stability, and the possibility for PDO/PGI cheese to set up temporary supply control plans).
- g) The implications on the functioning of the supply chain.

### 3.5 Evidences on the various aspects of EQ3

A buy-out scheme is a 'supply control' (i.e., limiting production or withdrawing production) tool based on voluntary participation. A buy-out scheme thus may be introduced to address contingencies but also to solve structural problems of the sector. In the first case, we may use the option of temporary withdrawing milk production from the market, without changing the animal stock; in this case, farmers should act on the feed ration (for example reducing the level of concentrates) or on the dry period of cows in order to temporary reduce milk production/deliveries. In the second case, i.e., in presence of structural excess supply, the buy-out scheme may be implemented acting on the capital stock, as in the case of the voluntary herd reduction program in the US dairy sector, the Cooperatives Working Together (CWT).

According to the report of the European Commission (2010), in case of serious imbalance, a buy-out scheme could be considered for introduction as an exceptional measure allowing producers, on a voluntary basis, to *reduce their deliveries against compensation*. As such, the spirit of the measure should be that of controlling for contingent market imbalance, while, after the crisis, farmers should go back to their "regular" level of production,

From a theoretical point of view, the functioning of the scheme is straightforward; domestic market imbalances (i.e., low prices) can be due to unpredictable shocks on demand and/or supply. Recall that the total demand is made by domestic demand + export demand. On the other hand, domestic imports are low with respect to exports: in 2011, the value of imports is about 15 percent of the value of exports, and thus we may consider imports as marginal in our theoretical analysis. Let us consider the very simple representation of the milk market (more sophisticated representations are of course possible), with equilibrium between demand and supply. Define:

inverse total demand:

$$P = \alpha - \beta Q + \varepsilon$$

(domestic) supply:

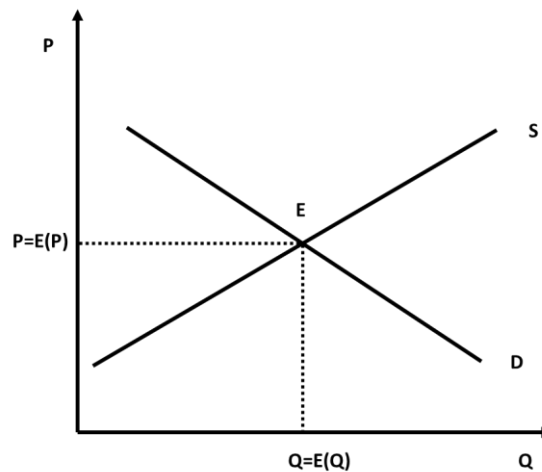
$$Q = \gamma + \delta E(P) + \mu$$

$\varepsilon$  and  $\mu$  are two random parameters, with zero mean, accounting for unpredictable shocks on demand and supply (a positive value for  $\varepsilon$  implies a rightward parallel shift in demand, i.e., demand expansion,

and analogously a positive value for  $\mu$  implies a rightward parallel shift in supply, i.e., supply expansion). Also note that the demand shock  $\varepsilon$  is in fact a composite shock, accounting for changes in domestic supply as well as changes in demand/supply conditions (net trade demands/supplies) from the major players in the international market. It is then reasonable to expect shocks on demand to be more relevant in determining fluctuations in domestic prices.

$E(P)$  is the producers' expected price, at which (lagged) production decision are taken;

$Q$  and  $P$  are equilibrium quantity and price, respectively.



As we can see in the figure, under 'normal' circumstances (i.e., no unexpected shocks on demand and supply) and assuming that producers' price expectations are rational, the equilibrium is reached in E, where price equilibrium coincides with producers' price expectations.

In fact, solving the above simple model, we have that:

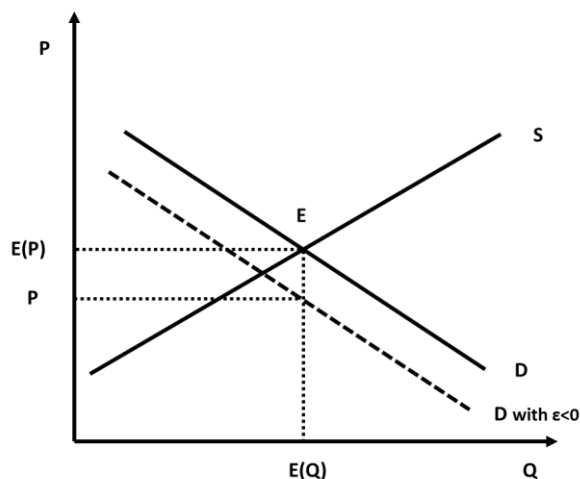
$$P = (\alpha - \beta\gamma) - \beta\delta E(P) + (\varepsilon - \beta\mu)$$

and then rational expectations (i.e., taking expectations for the price equilibrium expression) imply that:

$$E(P) = \frac{(\alpha - \beta\gamma)}{1 + \beta\delta}$$

The resulting equilibrium price can be seen as a 'fair' price, otherwise we would require a structural intervention on excess supply (a buy-out scheme resulting in a reduction of the productive capacity, i.e., reducing the herd size in the EU). Therefore, a first element to be considered, and analysed considering previous answers to EQ1 and EQ2, is the existence of a structural imbalance that may be hidden by the actual market conditions. As discussed in EQ1 and EQ2, analysing data and projections, it is likely that the milk sector in the EU does not display a structural excess in productive capacity.

Thus, rational producers should decide to produce the quantity  $E(Q)$ , but market equilibrium will then depend on the actual demand and supply conditions; as an example, suppose that we have a negative shock on demand, then the equilibrium will be given by:



Thus, any demand contraction (i.e., a negative  $\varepsilon$ ) and supply expansion (i.e., a positive  $\mu$ ) will generate a price decrease:

$$\frac{dP}{d\varepsilon} = 1 > 0$$

$$\frac{dP}{d\mu} = -\beta < 0$$

while, on the other hand, any demand expansion (i.e., a positive  $\varepsilon$ ) and supply contraction (i.e., a negative  $\mu$ ) will generate a price increase.

Of course, the above simple theoretical framework will also allow for market imbalances leading to higher prices, which is also an unwanted situation, given its impact on consumers' prices. For example, although not explicitly traced in the above model, we could introduce the effect of an increase in production costs (expectations for an increase in feed prices that can be accounted for as a market force shifting supply toward the left, implying a reduction in programmed supply).

As discussed above, a demand contraction may be due to an unexpected reduction in domestic consumption and/or to 'negative' conditions on the international market, producing a contraction in export demand (a reduction of import demand in the net importing countries and/or an expansion of export supply in net exporting countries). The resulting shock may then amplify common shocks in other countries. For these reasons, we think that demand shocks, as defined above, should be more critical for market balance.

The demand shock  $\varepsilon$  and, to a less extent, the supply shock  $\mu$  can also account for the increased volatility that characterises world agricultural markets (i.e., through an increase in the variance of the distribution of the shocks), and therefore for the increase in business risk. Although in the above very simple model the role of the variance is not accounted for, a few elements can be discussed. For example, volatility (i.e., higher uncertainty for producers) may affect producers decision (in general, the usual wisdom is that an increase in uncertainty will reduce production as a self-insurance tool for producers). In this respect, the shift toward decoupled policy (SFP) produces some mixed effects, that have been largely analysed. For example, Sckokai and Moro (2006), although not in the context of milk production, have shown that the 'insurance' effect on production decisions provided by the farm payment may in fact be relevant. A rough indication of the impact of a supply shock can be given: assuming that market variables (price and quantity) and shocks are taken in logarithms, then in the above expression, the coefficient  $\beta$  measures 'price flexibility', which is, according to some estimated figures, about 3 (this indicates that a 1 percent change in the supplied quantity will produce a 3 percent change in price). Recall that price flexibility is approximately the inverse of quantity elasticity.

The buy-out scheme will mainly deal with a situation in which market prices are too low; this possibility is seen as more likely according to the most recent evolution of prices, i.e., increase in volatility and fluctuations due to different causes, as discussed in EQ1. In order to set up an actual buy-out scheme, we need to make a few

considerations about possible advantages and disadvantages of such a policy measure, stressing the critical elements of the scheme.

First, some preliminary considerations can be made on the actual need of implementing such a scheme. According to our discussion for EQ1 and EQ2, the available projections are overall quite encouraging, mainly for the consolidation of global demand for dairy products; nonetheless, all the discussed caveats must be kept in mind (diverging results from different models, limitations, perfect competition assumption, no model considering explicitly price volatility). Given the current market situation and trends, it appears that a buy-out scheme as an instrument for controlling a structural weakness of the dairy sector (i.e., a structural excess in productive capacity) is likely not necessary.

However, lessons from the most recent years lead many experts to argue that short-term crises may create large market imbalances: in 2008-2009, milk prices collapsed to very low levels, and a similar pattern, although not as dramatic, has characterised 2012. Even though these crises may not originate from the sole milk market (as we said above, there is a tendency of agricultural commodity prices to behave similarly, and also to move together with other commodity prices, mainly energy prices), a buy-out scheme may be considered as an instrument to deal with their negative effects on milk producers' income.

In any case, a buy-out scheme should be introduced as a complementary tool, adding to the existing intervention measures. In the milk sector, a public intervention is still in place, working as a safety net to control for market imbalance, using public stocks (buying-in of butter and SMP), although on a limited guaranteed quantity (30,000 tonnes for butter and 109,000 tonnes for SMP). Further, other price support tools currently in place are private storage aids that are mainly targeted to control for seasonal price fluctuations, and export refunds<sup>18</sup>, as well as other aids scheme that may help in marketing dairy products. These restrictions are viewed as too stringent to be able to control critical market imbalances (they correspond to about 600,000 tonnes, since the guaranteed quantity for butter is the most constraining one, which in turn correspond to less than 0.5 percent of total EU milk deliveries). The buy-out scheme should work as an additional voluntary program, by which producers would receive compensation as a result of withdrawing production from the market.

However, the practical implementation of a buy-out scheme addressing a critical market imbalance implies several problems:

- 1) defining the market conditions that should activate the scheme
- 2) monitoring the actual reduction in milk deliveries of farmers' claiming compensation
- 3) establishing the amount of compensation.

Concerning the first problem, we should consider the criteria for fixing the price floor (and/or the price ceiling) that should activate the scheme, i.e., the price level that should be considered as a signal of an important market crisis. This implies considering a large set of information on market behaviour and on dairy farms' cost structure. In fact, it is important to consider that within the EU countries, we register a large variability in raw milk prices as well as in milk production costs (see the discussion of these issues in EQ2), while for bulk processed products (SMP and butter) differences are lower. We believe that the buy-out scheme should be designed in order to account for these differences and should be tailored in such a way to represent a true income support for milk farmers.

This leaves several open questions:

- a) Should this price floor be set on a regional basis? In other words, do we expect the scheme to work at the EU level or to be implemented in order to account for national/regional crises? The answer is not easy, since milk is a commodity that can be processed into very different products, and Member States are differently specialised. Furthermore, this will require understanding the relations among regional/national markets, in order to ascertain the existence of a price leadership of some markets with respect to others. There is evidence that, at least for certain dairy products, some markets may

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<sup>18</sup> The use of export refunds is currently limited by the WTO regulations, and we also expect that under the next WTO agreement export refunds will be totally banned.

reflect a price leadership, and thus such markets should be carefully monitored. For example, in the case of Italy, due to the relevant import flows of raw milk, milk prices in Germany, Austria and France may be considered 'representative' of the Italian situation: in fact, in the Northern part of Italy, some contracts are defined using a price index computed from a 'price formula' that includes such international prices.

- b) Should the price floor (or, more generally, the index triggering the scheme) be based on a 'price formula' combining different elements? In the above simple theoretical framework, the milk price level is the only critical element that triggers the scheme, but of course what is relevant for farmers is not just prices (i.e., revenues) but income (i.e., revenues minus costs). We think that the use of a price formula including also elements related to the cost trends should be more indicative of a 'market crisis' (again, in Italy a similar price formula, including domestic and international milk and dairy prices, as well as feed prices, has been proposed as a reference for the bargaining process between farmers and processors in a specific regional dairy supply chain). In our view, given the high volatility that has been characterising agricultural prices for the last few years, this alternative may be seen as more reliable for dealing with market crises.

Thus, while finding the appropriate triggering scheme may be rather complicated, addressing the second problem (i.e., monitoring the actual individual reduction in milk deliveries) may be even more difficult. In fact, farmers claiming compensation should demonstrate an actual reduction in their milk deliveries, which implies having a precise benchmark to which deliveries under the buy-out scheme should be compared. Since milk production has a strong seasonal component in many EU Member States, one may think to compare monthly deliveries of a farmer joining the scheme with deliveries in the corresponding month of the previous year. However, this system has several practical implementation problems. First, it requires maintaining a (costly) public database of individual monthly milk deliveries, that, in a no-quota environment, would not be required as it is under the current quota system. Second, such comparison (i.e., milk deliveries in the current month vs. milk deliveries in the same month of the previous year) implies assuming that the structure and the management of production of that farmer is exactly the same after one year. Again, while this may be reasonable under a quota system (if a farmer does not buy/sell quotas), in a no-quota environment, we should expect a much more flexible management of the dairy business, such that observing a change in monthly deliveries may be the result of specific choices of the farmer (i.e., change in number of cows, change in the feed ration driven by changes in the price of feed) as well as of random factors affecting production (i.e., weather conditions).

Finally, the third problem (i.e., establishing the amount of compensation) would also be rather difficult. In fact, a "fair" compensation should correspond to the income forgone as a result of reducing production. If participating farmers act on the feed ration (reducing concentrates) and/or on the dry period of cows, reducing production implies a reduction in revenues but also a reduction in costs, and this second element is clearly very difficult to compute, since it is extremely variable across the Member States and across farms in each Member State. For example, one may rely on some average per cow costs of different feed rations and propose a compensation based on a per cow income reduction, but this requires a lot of information, including a public individual database on the number of milking cows of each dairy farmers. Otherwise, one should convert such calculations in an average compensation per kilogram of milk.

In conclusion, for all the three implementation problems mentioned above, there are many technical difficulties that would make the buy-out scheme almost unmanageable. In addition, one should also consider that a buy-out scheme implemented following the above lines may not reach the target of reducing production in the amount required for correcting market imbalance. According to the above cited document of the European Commission<sup>19</sup>, "experience gained during the milk crisis shows that it may be sufficient to take 1 or 2 percent of overall milk production out of the market to correct imbalances and restore stability". Thus, we take this figure as a rough indication of the size of the scheme. Taking 2011 as a reference, with a total amount of milk delivered to dairies equal to 138.6 million t, the Commission estimates imply that in case of a serious market crisis, about 2.1 million t should be withdrawn from the market (as we said, we consider this quantity as exceeding the effect of other intervention measures), corresponding to about 1.5 percent of the total EU deliveries. Since the buy-out scheme should work on a voluntary basis, we cannot expect that all farmers would

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<sup>19</sup> It should be also stressed that in a subsequent report, there was no explicit reference to a buy-out scheme for the milk sector (European Commission, 2012c).



join the scheme. However, as long as we wish to obtain only a temporary reduction in production, without any structural reduction in the dairy herd, the percentage reduction that each farmer may offer cannot be very high. Thus, the scheme may be successful only if many farmers join the scheme, and this can be guaranteed only if the compensation is a strong incentive to participate (i.e., exceeding the actual income forgone for reducing production).

Based on these considerations, one may try to make a rough estimate of the cost of the scheme. For example, with a compensation of 0.05 €/kg of milk withdrawn from the market, and a target of 2.1 million tonnes, the scheme would roughly cost €105m.

Of course, an alternative would be that of compensating producers for reducing production by reducing the dairy herd: however, this option is not feasible to correct imbalances due to market crisis, but can be considered as a long run measure to keep market balance and stabilise the sector (it can be maintained as an option for the future, i.e., if the market will result as structurally imbalanced). Such an option could have been considered more in-depth if the soft-landing period would have shown a structural trend towards overproduction, but the current situation indicates that quota removal is not going to dramatically affect milk production in the near future (see EQ1). Thus, we think that this option should not be considered, at least in the short-medium term.

In conclusion, we think that all the above technical/economic difficulties would make the buy-out scheme unmanageable as a tool for obtaining a temporary reduction in milk deliveries and correcting serious market imbalance.

### 3.6 Conclusion and policy recommendations drawn directly from the analysis

Based on the above discussion, we believe that the implementation of a buy-out scheme should not be seen as a priority for the Commission, especially according to the original concern of mitigating negative impacts in the soft-landing period. Evidence coming from the data available for the last years seems to indicate that the abolition of quota will not be disruptive for the milk market.

However, the increasing instability of the world markets and some contrasting evidence on world forecasts on dairy markets for the next decade may cause serious imbalances in the near future, such that the current provisions of the CAP may not be sufficient to cope with. Thus, the option of providing further tools to deal with these situations may be worth some attention, for both the case of excessive price drops and the case of excessive price rise. But such tool should not take the form of a buy-out scheme targeted to a temporary reduction in milk production by individual farmers, typically obtained managing the feed ration (i.e., reducing concentrates) and/or the dry period of cows.

In fact, the implementation of the scheme would imply several difficulties on some key technical aspects, like the definition of the market conditions that should activate the scheme, the monitoring of the actual individual reduction in milk deliveries and the definition of a “fair” compensation for farmers joining the scheme. Moreover, one may raise serious doubts on the capacity of the scheme to reach a given target of production withdrawn from the markets, unless one gives strong incentives to farmers (i.e., overcompensates their income loss). Thus, in conclusion, if one wishes to address market imbalance with an intervention tool, it would be much more practical to temporarily reinforce the safety-net intervention measures already in place for butter and SMP (i.e., public intervention and private storage aids).

In synthesis, since the most serious impact of price volatility is on farmers’ income volatility, rather than thinking to a buy-out scheme of this type, the main policy target of the EU should be that of implementing appropriate income insurance schemes. For example, the income stabilisation tool likely to be implemented as part of the second pillar of the post-2013 CAP goes in the right direction (see EQ1 and EQ2 for a discussion). Refining and reinforcing such tool is likely to be much more effective than implementing a buy-out scheme.

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**AGRI-2012-C4-04 - Analysis on future developments in the milk sector**

Prepared for European Commission - DG Agriculture and Rural Development

Opinion Report

Expert Name: Prof. Dr. Ir Joost M.E. Pennings

**Theme 1: Market balance and competitiveness**

## 1. How will the balance between supply and demand be affected by market forces, organisational systems of the supply chain (in particular POs and IBOs) and policy measures, including market support mechanisms, in a non-quota regulatory framework?

### 1.1 Interpretation and comprehension of the key terms of the evaluation question

The key terms in the evaluation question are market forces, organisational systems, policy measures and market support systems. In this report, market forces are interpreted as the aggregate influence of self-interested buyers and sellers on price and quantity offered in the market. Organisational systems are interpreted as the (membership-based) association of persons/companies striving to meet certain economic/social needs. Policy measures are interpreted as the legal instruments through which specific EU policies are implemented. Market support mechanisms are interpreted as systems and/or institutions supporting and regulating the market in its functioning.

### 1.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

The analysis criteria are organised according to the three main themes: market forces, organisational systems and policy measures.

#### **1.2.1 Market forces**

The influence of market forces, in a non-quota regulatory framework, on the balance between supply and demand is assessed along six criteria:

- Market power in terms of information availability
- Market power in terms of price-bargaining power
- Extent of transparency and integration of the supply chain
- (Expected) Consolidation (restructuring) of farmers and processing industry
- International milk and milk-product markets
- Expected milk and input price volatility at farm level

**Market power in terms of information availability** covers the type and quality of information available to market participants as well as the time of availability. Any incongruence in information availability across market participants may distort the balance between supply and demand and leads to skewed price signals.

**Market power in terms of price-bargaining power** comprises, amongst others, the milk market's structure. That is, monopolistic/oligopolistic vs. free competition, in terms of market share, concentration and number of participants at each stage of the marketing channel, and extent of vertical integration in the milk chain.

**Extent of transparency and integration of the supply chain** refers to the free flow of information in the marketing channel and the extent to which stages of the marketing channel are integrated from an ownership perspective, i.e., the extent to which milk processing facilities are owned by dairy farmers.

**(Expected) Consolidation (restructuring) of farmers and processing industry** discusses expected future changes in dairy farming and processing after abolishing the milk quota framework in terms of consolidation, possible constraints for dairy farmers when consolidating, for example, caused by environmental regulations and/or feed supply constraints, and restructuring of the dairy-processing industry in the context of international dairy markets.

**International milk and milk product markets** refers to how international milk (product) markets will change because of the abolishment of the milk quota. Will trade increase or decrease, and, more importantly, will prices become more or less volatile?

**Expected milk and input price volatility at farm level** discusses the variation of milk and input price volatility for farmers in the past and the expected level of volatility in the future.

The analyses to assess the analysis criteria are based upon different quantitative and qualitative information sources. These sources include the theoretical analysis and descriptive chapter of this document (TADC), the report prepared for the DG AGRI in 2011 called "Evaluation of CAP measures applied to the dairy sector" (CAP), the March 2013 edition of the commodity price dashboard (DASH)<sup>20</sup> and the presentation describing the market situation prepared for the European Commission of Agriculture and Rural Development (AGRI)<sup>21</sup>. Additional information is retrieved/elicited from Eurostat. The data used for these analyses, including references to the respective source, are listed in Appendix 1.

### **1.2.2 Organisational systems**

The influence of organisational systems, in a non-quota regulatory framework, on the balance of supply and demand is assessed along three criteria:

- Heterogeneity of the organisation of milk producers in the Member States
- Heterogeneity of the organisation of the milk industry in the Member States
- Influence of Producer Organisations (POs) and Inter-Branch Organisations (IBOs) on the negotiation power of the respective partners and subsequently on price setting and price smoothing

**Heterogeneity of the organisation of milk producers in the Member States** refers to the differences between EU countries in the organisation of dairy farmers with regard to selling and processing milk. Topics include price information systems, collective milk sales and/or processing and their impact on the balance between supply and demand.

**Heterogeneity of the organisation of the milk industry in the Member States** refers to the differences between EU countries regarding a private versus a cooperative milk-processing industry.

**Influence of POs and IBOs on the negotiation power of the respective partners and subsequently on price setting and price smoothing** reflects on how the organisational structure of both the dairy farmers and the processing industry, in terms of ownership and control, can impact demand and supply and how shocks may cause price volatility.

The analyses to assess the analysis criteria are based upon different quantitative and qualitative information sources. These sources include the theoretical analysis and descriptive chapter of this document (TADC), the report prepared for the DG AGRI in 2011 called "Evaluation of CAP measures applied to the dairy sector" (CAP) and the presentation describing the market situation prepared for the European Commission of Agriculture and Rural Development (AGRI)<sup>22</sup>. The data used for these analyses, including references to the respective source, is listed in Appendix 2.

<sup>20</sup> [http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/dashboard/food03\\_2013\\_en.pdf](http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/dashboard/food03_2013_en.pdf)

<sup>21</sup> [http://ec.europa.eu/agriculture/milk/presentations/market-situation\\_en.pdf](http://ec.europa.eu/agriculture/milk/presentations/market-situation_en.pdf)

<sup>22</sup> [http://ec.europa.eu/agriculture/milk/presentations/market-situation\\_en.pdf](http://ec.europa.eu/agriculture/milk/presentations/market-situation_en.pdf)

### **1.2.3 Policy measures**

The influence of policy measures, in a non-quota regulatory framework, on the balance between supply and demand is assessed along three criteria:

- Influence of policy measures in the Milk Package<sup>23</sup> under normal circumstances and in the event of a crisis situation. The following are the main policy measures proposed in the Milk Package:
  - Promote the usage of contracts
  - Recognise IBOs
  - Promote bargaining power and influence of POs and IBOs on price setting and smoothing by fostering collective negotiation for contract terms by IBOs
  - Regulate the supply of protected designation of origin (PDO/protected geographical indications (PGI) cheeses)
  - Enhance transparency in the market by allowing IBOs to perform activities such as improving the knowledge and transparency of production in the market, promoting the consumption of dairy products and the exploration of potential export markets, carrying out research and market studies, promoting innovation and improving product quality
- Impact of grain, cereal and forage prices on milk production and milk prices
- Margin risk management by farmers
  - The financial viability and flexibility of dairy farmers under normal circumstances, and their financial viability and flexibility during crisis situations, for example during under- or overproduction
  - The financial buffer capacity of dairy farmers, currently and in a non-quota regulatory framework
  - The role of futures markets on managing dairy farmers' margins – complementarities with EU policy measures – Hedging Effectiveness

**Influence of policy measures proposed in the Milk Package** under normal circumstances and in the event of a crisis situation assesses how specific tools proposed in the milk package influence supply and demand in normal circumstances and how they impact supply and demand in crisis situations. The impact and effectiveness of these tools will be discussed qualitatively.

**Impact of grain, cereal and forage prices on milk production and milk prices** refers to the impact that changing feed prices will have on the supply and demand of milk.

**Margin risk management by farmers** refers to how dairy producers can manage their margin risk in a non-quota regulatory framework. The existence and extent of a natural hedge between inputs (feed) and outputs (milk) is assessed. This natural hedge has become particularly relevant since we have seen a strong increase in feed price volatility. The relation between feed and milk partly drives the volatility of the farmer's margin. Whether farmers can handle this margin volatility depends, amongst others, on their financial flexibility, their financial buffer capacity, and, even more importantly, the availability of effective and efficient risk management tools. This raises the question whether current and proposed risk-management instruments provided by private markets complement EU policy measures.

The analyses to assess the analysis criteria are based upon different quantitative and qualitative information sources. These sources include the theoretical analysis and descriptive chapter of this document (TADC) and the report prepared for the DG AGRI in 2011 called "Evaluation of CAP measures applied to the dairy sector" (CAP). Additional information is obtained from Datastream and EUFADN. The data used for these analyses, including references to the respective source, are listed in Appendix 3.

### **1.3 Description of the method(s) used and an indication of its (their) limitations**

The answers to the question will be based on a combination of methods. First, a theoretical framework and a conceptual model with several hypotheses will be established based on the knowledge of the expert and in-depth interviews with dairy industry stakeholders. Second, hedging effectiveness spreads and correlations between milk prices, i.e., spot and forward/futures prices will be examined.

<sup>23</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:094:0038:0048:EN:PDF>

The quantitative and qualitative data sources listed in Appendices 1-3 are used to assess the influence of market forces, organisational systems and policy measures on supply, demand and the balance between the two. Table 1.3.1 shows the research design. The impact of market forces on supply (link 1), demand (link 2) and the balance between supply and demand (link 3) will be examined. The impact of organisational systems (link 4-6) and policy measures (link 7-9) will be examined via a similar approach. More specifically, first the relationships between market forces, organisational systems, and policy measures with supply, demand and balance (e.g., the links in Table 1.3.1) is discussed in the current context. Subsequently, we discuss how these relationships may change in a non-quota regulatory framework. Finally, conclusions and policy recommendations are provided to answer the question posed by DG AGRI.

**Table 1.3.1 Research Design/Framework**

	Supply	Demand	Balance
Market forces	Link 1	Link 2	Link 3
Organisational systems	Link 4	Link 5	Link 6
Policy measures	Link 7	Link 8	Link 9

Table 1.3.1

#### 1.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

The milk market is the main driver of the price-formation process. EU instruments that may complement market forces are examined to reach the goals defined by DG-AGRI: ***a viable dairy sector, both under normal circumstances and in crises situations. In the latter case, we propose combining policy instruments with private market initiatives to manage crises. In particular, farmers should be able to efficiently and effectively hedge their risks.***

Hence, this Expert Report is based on the DG-AGRI request to gain insight in milk/milk product price volatility after the abolishment of the milk quota system in 2015 and to assess which (combination of) measure(s) is (are) most favourable to manage the volatility of dairy farmers' profit margins. Key, in this respect, is providing a roadmap that enables dairy farmers to manage their margin risk in an effective and efficient manner by means of private and public measures to sustain a financially viable dairy industry in the EU.

A spot- and futures market would require an independent, objective and transparent coordinating institution, which fine-tunes the needs of buyers and sellers, develops contract specifications, and provides objective and transparent market and price information. Subsequently, the raw milk contract, a European milk index, and intermediaries need to be created. Finally, participants should have an adequate knowledge base to actively engage in trading on the market.

##### 1.4.1 Description of current dairy market

In this section, we describe the current dairy market in the context of market forces, organisational systems and policy measures in relation to supply and demand. The sources used in these analyses are provided in Appendices 1-3.

##### Market forces

###### *Market power in terms of information availability*

The data shows that farmers have increased farm scale, measured by an average increase of 84 percent in the average number of dairy cows per farm according to the available data from 2000 to 2012, to exploit economies of scale the last decade. In addition, the number of dairy farms decreased by 47 percent between 2003 and 2010 and the average production volume capacity per farm (measured by the distribution of dairy cows over herds of different size classes) increased by 2 percent for the largest size class and decreased for the smaller size classes by approximately 2 to 3 percent from 2000 to 2007. On the other hand, total volume of milk produced and collected increased by 7.14 percent between 2000 and 2011, average labour productivity increased on average by 1.44 percent per year in the EU-15 from 2003 to 2007 and increased on average 1.19

percent per year in the EU-10 from 2004 to 2007. At last, aggregate yield increased as well, on average with 29 percent in the EU-27 from 2001 to 2010. Large differences remain between the Member States in terms of aggregate yield and average production volume capacity per farm, although differences have decreased in terms of aggregate productivity of farms. Overall, production is shifting towards specialist dairy farms.

Overall, the number of milk collecting enterprises increased from 2000 to 2009. It is hard to determine the sector's growth over time as many countries have omitted to supply the precise figures; however, the number of milk collection centres increased by 23 percent between 2000 and 2006. The difference between milk collection centres and enterprises collecting milk is that the former only collects milk to sell it directly without any processing or transforming, while the latter buys milk from farmers or collection centres in order to transform the product. More important is that some concentrations can be observed as the number of collection centres and enterprises collecting milk decreased in most Member States. Moreover, the number of enterprises producing cheese and butter decreased by 11.79 percent and 19.42 percent between 2000 and 2009 (approximated with the available data); however, production capacity of the remaining enterprises increased as cheese production increased by 17.95 percent and butter production only slightly decreased by 1.05 percent from 2000 to 2011. Furthermore, production and processing is highly diverse in the EU: there are large differences between the total volume of different dairy products produced and processed between the Member States in 2011. Moreover, the production of cheese, milk and whey increased by 17.95 percent, 7.14 percent and 26.77 percent, respectively from 2000 to 2011, while the production and processing of butter and SMP have been rather volatile, ultimately decreasing 1.05 percent and increasing 3.98 percent, respectively from 2000 to 2011. Only WMP is produced 35.83 percent less over the same time period. Finally, average productivity (measured by the average number of dairy cows per collection centre and average processed milk per enterprise) highly differed per Member State in 2009 and the change in productivity between 2003 and 2009 was not always positive.

The total costs of milk production for specialist dairy farms have on average increased in the EU-10 by 30.09 percent and were rather volatile in the EU-15 between 2000 and 2007. Specific costs followed a similar pattern and are an important part of overall input costs. In 2006 and 2007, the increase of specific costs was 15 and 23 percent for the EU-15 and EU-10, respectively, while non-specific costs have increased only slightly.

The milk price has been volatile from 2000 to 2012 and there are clear differences between Member States, for example Lithuania experienced the highest volatility of 24.22 percent and Italy the lowest of 7.60 percent, while the EU-15 and EU-10 experienced on average a volatility of 10.18 percent and 12.21 percent, respectively over the period. Also, the average farmer's share of the consumer price for milk is different across Member States and has, on average, decreased from 42.30 percent in 2000 to 34.58 percent in 2011.

Consumption patterns differed across Member States from 2007 to 2011 though, overall, the consumption of milk and butter is stable while the consumption of cheese increased slowly from 16.7 kg/capita to 17.1 kg/capita in the EU-27.

#### *Market power in terms of price-bargaining power*

Farmers far outnumbered processors every year and have been increasing their farm scale (by 84 percent) from 2000 to 2012. However, there are few farmers producing substantial amounts of raw milk annually to have market power.

The Gini coefficient<sup>24</sup> for each Member State is listed in Table 1.4.1 and shows the dispersion of economic significance between farmers within Member States. As a proxy for economic significance, farm's economic size is used. Economic size is measured by the Standard Output (SO)<sup>25</sup> (in euro), which is the average monetary value of the agricultural output at farm-gate price, in euro per hectare or per head of livestock. Appendix 4 describes calculation of the Gini coefficient.

<sup>24</sup> The Gini coefficient is a measure of statistical dispersion and theoretically ranges from 0 to 1; lower values indicating more equal distributions, higher values indicating more unequal distribution.

<sup>25</sup> [http://epp.eurostat.ec.europa.eu/statistics\\_explained/index.php/Glossary:Standard\\_output\\_\(SO\)](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Standard_output_(SO))

**Table 1.4.1 Gini coefficient for dairy farm holdings per Member State**

Member State	Gini coefficient
Belgium	0.31
Bulgaria	0.70
Czech Republic	0.54
Denmark	0.20
Germany (until 1990 former territory of the FRG)	0.40
Estonia	0.75
Ireland	0.32
Greece	0.52
Spain	0.52
France	0.34
Italy	0.58
Cyprus	0.21
Latvia	0.69
Lithuania	0.61
Luxembourg	0.23
Hungary	0.71
Malta	0.40
Netherlands	0.26
Austria	0.45
Poland	0.53
Portugal	0.55
Romania	0.44
Slovenia	0.51
Slovakia	0.84
Finland	0.35
Sweden	0.32
United Kingdom	0.40

Table 1.4.1-1 Source: Own calculations based on data from Eurostat. For the calculation, annual data on number of dairy farm holdings per NUTS region and Member State by economic size of 2010 was used. Each Member State had more than three data points spread over the economic size categories.

Table 1.4.1 shows a large heterogeneity in farm size distribution within EU Member States. That is, the Gini coefficients for dairy farm holdings differ largely between Member States indicating large differences in dispersion. As such, in some Member States, distributions are much more equal than in others. For example, the dairy farms in the Netherlands are far more homogenous in economic size (Gini of 0.26) than for example in Hungary (Gini of 0.71). This may indicate that market power structures within EU countries differ.

The Gini coefficient for dairy enterprises collecting milk and milk collection centres is calculated in a similar fashion as the Gini coefficient for dairy farm holders, see Appendix 4.

**Table 1.4.2 Gini coefficient for dairy enterprises collecting milk and milk collection centres per Member State**

Member State	Gini coefficient enterprises collecting milk	Gini coefficient milk collection centres
Belgium	0.76	n.a.
Bulgaria	n.a.	n.a.
Czech Republic	0.47	n.a.
Denmark	0.80	n.a.
Germany (until 1990 former territory of the FRG)	0.64	0.34
Estonia	n.a.	n.a.
Ireland	0.66	n.a.
Greece	0.33	n.a.
Spain	0.72	0.77
France	0.76	0.51



Member State	Gini coefficient enterprises collecting milk	Gini coefficient milk collection centres
Italy	0.60	0.53
Cyprus	0.44	n.a.
Latvia	0.62	n.a.
Lithuania	n.a.	n.a.
Luxembourg	n.a.	n.a.
Hungary	n.a.	n.a.
Malta	n.a.	n.a.
Netherlands	n.a.	n.a.
Austria	0.73	n.a.
Poland	0.67	0.70
Portugal	n.a.	n.a.
Romania	0.42	n.a.
Slovenia	n.a.	0.57
Slovakia	n.a.	n.a.
Finland	n.a.	n.a.
Sweden	0.75	n.a.
United Kingdom	0.74	n.a.

**Table 1.4.2 Source: Own calculations based on data from Eurostat. The calculation is based on annual data of 2009 representing the number of enterprises collecting milk and the number of collection centres per collected milk volume category. Only Member States with more than three data points spread over the milk collection categories are taken into consideration. For Member States with three or less data points, no Gini coefficient was calculated (e.g., not available n.a.)**

Eurostat describes collection centres as dairy enterprises collecting milk or cream to transfer it in whole or in part to other enterprises without any processing. The descriptive chapter of this document explains that these centres sell the commodities in their own name to dairies. They are defined as in Article 2(2) of the Council Directive 96/16/EC. Dairy enterprises collecting milk on the other hand, as described by Eurostat, are dairies and agricultural holdings purchasing milk or milk products from agricultural holdings or collection centres with a view to transform them into milk products. These are referred to in Article 2(1) of the Council Directive 96/16/EC. The main difference between the two types of dairy enterprises is the purpose for which the dairy product underlying the transaction is bought.

The Gini coefficients for dairy enterprises collecting milk and milk collection centres vary less (and are in general higher) across the Member States, indicating less differences in dispersion between the Member States and more unequal distributions (than farm holdings). That is, it seems that the variability of farm holdings size across EU Member States is larger than for the collecting and processing firms. This could indicate that the consolidation in the milk chain has progressed more in the upper part of the milk chain (collecting and processing firms) than in the lower part of the chain (milk producers), which may impact the market power (im)balance and hence the way market forces drive supply and demand.

#### *Extent of transparency and integration of the supply chain*

About 58 percent of the total raw milk deliveries were made by members of cooperatives to their cooperatives (mainly in the EU-15), 20 percent was delivered based on individual contracts between producers and processors, 8 percent was delivered through producer delivery groups and 2.5 percent is delivered through other types of producer-processor relations. Spot markets play a residual role for milk that has not been contracted or delivered to cooperatives. For most of the Member States, the contractual arrangements have remained rather unchanged while the importance of the cooperatives has grown due to concentration and an increase in turnover.

#### *(Expected) Consolidation (restructuring) of farmers and processing industry*

As previously mentioned, farms have scaled up (by 84 percent on average) to exploit economies of scale over time and milk processors slightly increased in number from 2000 to 2009, while processors of cheese and butter declined by 11.79 percent and 19.42 percent, respectively over the same time period. Processors of powder dairy products did not show a specific trend for growth or decline in number. Concentrations are

observed as most processors are located in one or a few countries and large amounts of raw milk are processed and collected annually by the largest collection centres.

As described earlier, the farm gate milk price has been quite volatile (measured in terms of the coefficient of variation) and differs per Member State (e.g., the maximum volatility of 24.22 percent in Lithuania and the minimum volatility of 7.60 percent in Italy from 2000 to 2013). Gross margins on operating cost per t have on average decreased from 145.73 EUR/t of milk in 2000 to 126.48 EUR/ t of milk in 2008 and the share of profitable milk producing farms has decreased as well after 2003. Overall, the uncompetitive segment of the EU's milk-producing capacity has increased its share till 2007 based on the CAP document (2011, Figure 8.3). Finally, the market share for cooperatives differs per Member State, but the trend shows a concentration of cooperatives that is supported by an increasing number of milk and dairy cooperatives from 1305 in 2003 to 2323 in 2008, bringing together 3.47 and 4.90 million farmers, respectively. In addition, there are multipurpose cooperatives not included in this number that also encapsulate milk and dairy production.

#### *International milk and milk-product markets and expected milk and input price volatility at farm level*

Average feed costs were rather stable up to 2006, after which an increase is observed of 15 percent and 23 percent in the EU-15 and EU-10, respectively. Per Member State the costs differ, as does the milk price, despite evidence of convergence for the latter.

The EU milk price volatility was 7.16 percent over 2000-2007, and rose to 11.41 percent during 2007-2012. Clearly, the price volatility has become more volatile over time, and the increase in milk price volatility was larger in the EU than on the world market, even though the actual level of volatility was still lower. See Charts 7 and 8 of the commodity price dashboard March 2013 edition<sup>26</sup> in Figures 1.4.1 and 1.4.4, respectively.

**Chart 7 Dairy: EU agricultural market and consumer price developments (January 2000 until March 2013, Jan2000=100)**

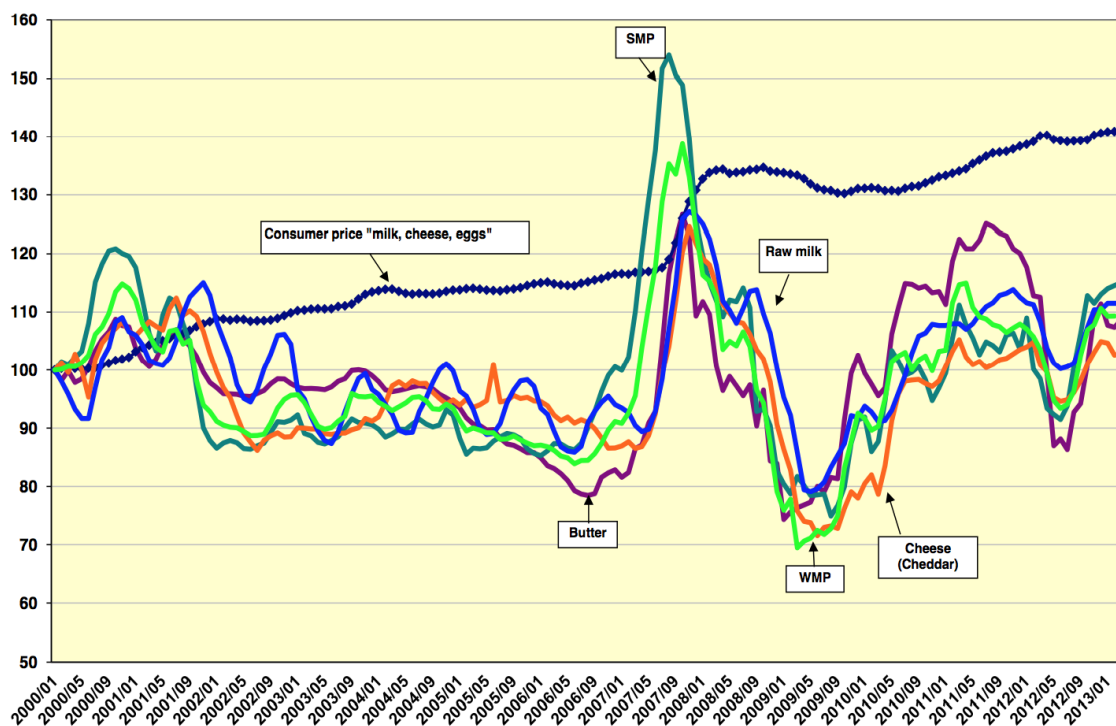


Figure 1.4.1 Source: commodity price dashboard March 2013 edition

<sup>26</sup> [http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/dashboard/food03\\_2013\\_en.pdf](http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/dashboard/food03_2013_en.pdf)

**Chart 8 Dairy: international price developments (January 2000 until March 2013, Jan2000=100)**

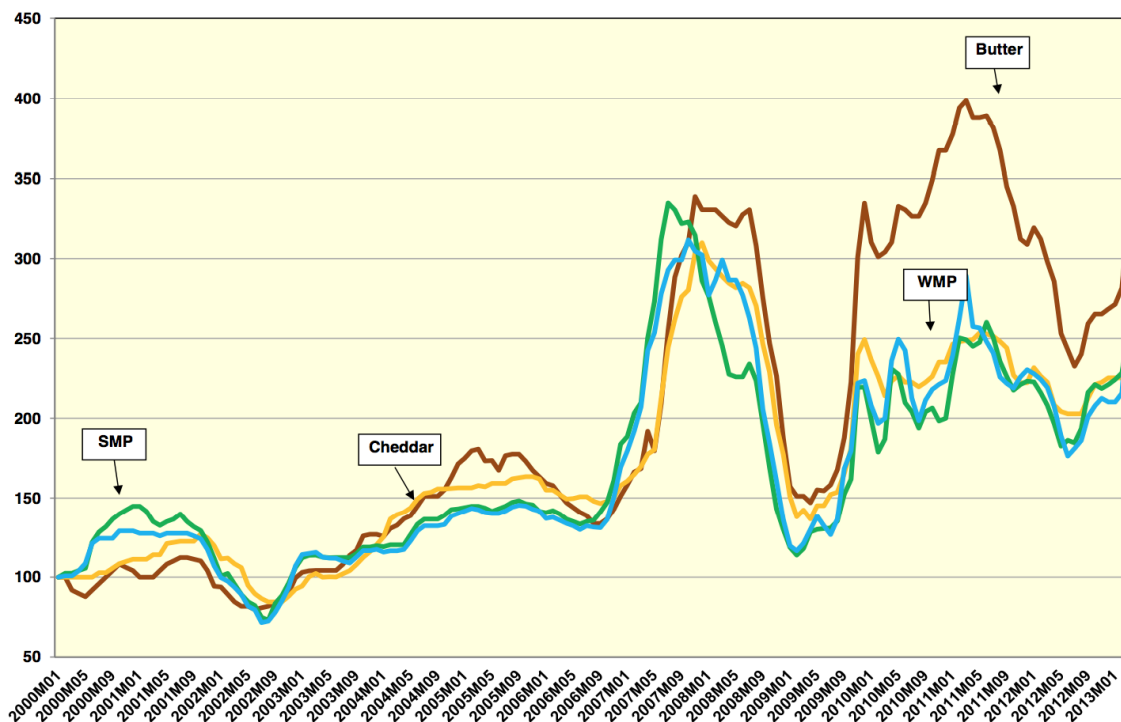


Figure 1.4.2 Source: commodity price dashboard March 2013 edition

To gain further insight into the volatility of dairy products, we calculated the coefficients of variation of the EU internal market prices for dairy products. Table 1.4.3. shows that the price volatility of dairy products is large, especially for non-cheese products, in particular whey powder with a coefficient of variation of 33.92 percent.

**Table 1.4.3 Coefficient of variation of other dairy products**

Dairy product	Coefficient of variation
Butter	18.25%
SMP	20.98%
WMP	17.09%
Cheddar	13.73%
Edam	12.30%
Gouda	12.50%
Emmental	9.10%
Wheypowder	33.92%

Table 1.4.3 Sources: Own calculations and weekly commodity prices from the market situation according to the European Commission for Agriculture and Rural Development<sup>27</sup>. The coefficient of variation is calculated by dividing the standard deviation of the market price by the average market price of the commodity from January 2007 to March 2013.

<sup>27</sup> <http://ec.europa.eu/agriculture/milk/presentations/>

## Organisational systems

### *Heterogeneity of the organisation of milk producers in the Member States*

Milk production is highly regionalised, with three Member States producing half of the milk in the EU.

### *Heterogeneity of the organisation of milk industry in the Member States*

The production and processing of milk products is highly diverse in the EU. In 2011, Germany, France and Italy were the biggest cheese producers, together accounting for 60 percent of the total production. Germany and France were also the biggest butter producers in 2011, together covering 60 percent of the total butter production. France and Denmark were the biggest WMP producers in 2011; together they produced 56 percent of the total. Germany, France, Belgium, Luxembourg and Poland were the main SMP producers, together reaching 75 percent of the total production in 2011. Finally, in the same year, Germany, The Netherlands, the UK, Italy and Poland were the main whey producers, together producing around 70 percent of the total production.

### *Influence of POs and IBOs on the negotiation power of the respective partners and subsequently on price setting and price smoothing*

There is no data available on contracts between farmers and processors; however, the concentration and turnover of cooperatives increased over time, even though this is highly Member State-specific. In 2011, the farmers' share of the consumer price for milk is far lower than 50 percent and showed a declining trend.

## Policy measures

### *Influence of policy measures proposed in the Milk Package<sup>28</sup> under normal circumstances and in the event of a crisis situation.*

The CAP document explains that the policies after 2003 provided EU markets with less protection than previously. When the world milk price rises above the intervention milk price, the export refunds and intervention systems no longer function nor do they provide protection. In addition, the importance of decoupled payments has increased since 2003, with payments varying between 5 and 20 percent of the average milk price in the EU-15 and beyond 20 percent in the EU-10. As previously mentioned, milk price volatility has increased.

As described in the theoretical analysis and descriptive chapter of this document, the removal of milk quotas will compress producers' margins and producers might be exposed to more volatile prices in the medium term. The quotas on milk production, subsidised exports, import protections and public intervention have in general facilitated a gap between the European and world milk prices and in this way managed domestic price volatility. **The direct payment measures can be seen as a financial buffer tool supporting producers' income and hence protecting producers from market instability.** In addition, POs have demonstrated to play a key role in rebalancing bargaining power and stabilising prices and income through concentration and planning of supply.

### *Impact of grain, cereal and forage prices on milk production and milk prices: The extent to which dairy farmers have a natural hedge within their portfolio*

To gain insight in the financial risks that farmers face, we need to examine the residual risk that farmers have. A dairy farm operation can be seen as a portfolio of inputs (feed, energy, interest rates, etc.) and outputs (milk). In case inputs and outputs are perfectly correlated, farmers' profit margin risk is low. Stated differently: are increases in input prices offset with increases in output prices? If the latter would be the case, a natural hedge occurs in the dairy farmers' portfolio. In that case, an increase in volatility in input and output prices would not be a problem and hence would not increase the risk adjusted cost of capital for dairy farmers.

The CAP document (2011) stresses that caution should be observed when linking an increase in feed costs to an increase in milk prices. Feed costs also increase when crop prices increase, which is more likely to be the case in the period examined. Feed costs remained rather stable until 2006, after which they have increased dramatically. Milk prices, on the other hand, have been rather volatile over the entire period examined, with an increase in volatility in the last years.

<sup>28</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:094:0038:0048:EN:PDF>

An analysis of the continuous average settlement prices of milk, corn, wheat, soybean and oats futures contracts and the continuous settlement prices on the same commodity futures contracts in the US may serve as an illustration and are displayed in Tables 1.4.4-1.4.7<sup>29</sup>.

Trading frequency of all future contracts is daily.

Changes in continuous average settlement price are calculated by subtracting  $p_n$  with  $p_{n-1}$  with  $p$  being the continuous average settlement price, and  $n$  the day number. The correlations between nominal changes in continuous and continuous average settlement price are displayed in Tables 1.4.4 and 1.4.5.

**Table 1.4.4 Correlation between the changes in continuous average settlement price (\$)**

	Milk class III	Milk class IV
Corn	0.152**	-0.006
Wheat	0.156**	0.009
Soybean	0.173**	0.003
Oats	0.168**	-0.001

Table 1.4.4 For the milk class III contract, daily price changes are for the period 17/01/07 until 12/04/13. For the milk class IV contract, daily price changes are for the period 27/01/09 until 12/04/13. Superscript \*\* and \* denote two-tailed statistical significance at 1 percent and 5 percent level, respectively. Source: Own calculations based on Datastream data.

**Table 2.4.5 Correlation between the changes in continuous settlement price (\$)**

	Milk class III	Milk class IV
Corn	0.086**	-0.011
Wheat	0.070**	0.048
Soybean	0.065*	-0.005
Oats	0.068**	0.066*

Table 1.4.5 For the milk class III contract, daily prices are for the period 18/09/07 until 12/04/13. For the milk class IV contract, daily prices are for the period 27/01/09 until 12/04/13. Superscript \*\* and \* denote two-tailed statistical significance at 1 percent and 5 percent level, respectively. Source: Own calculations based on Datastream data.

Percentage changes in continuous average settlement price are calculated by dividing the change in continuous average settlement price ( $p_n - p_{n-1}$ ) by the continuous average settlement price ( $p_{n-1}$ ). The correlations between the percentage changes in continuous and continuous average settlement price are displayed in Tables 1.4.6 and 1.4.7.

**Table 1.4.6 Correlation between the changes in percentage of the continuous average settlement price**

	Milk class III	Milk class IV
Corn	0.139**	-0.0030
Wheat	0.155**	0.0076
Soybean	0.157**	0.0084
Oats	0.155**	-0.0091

Table 1.4.6 For the milk class III contract, daily price changes are for the period 17/01/07 until 12/04/13. For the milk class IV contract, daily price changes are for the period 27/01/09 until 12/04/13. Superscript \*\* and \* denote two-tailed statistical significance at 1 percent and 5 percent level, respectively. Source: Own calculations based on Datastream data.

**Table 1.4.7 Correlation between the changes in percentage of the continuous settlement price**

	Milk class III	Milk class IV
Corn	0.095**	-0.008
Wheat	0.088**	0.056
Soybean	0.056**	-0.005

<sup>29</sup> [http://www.cmegroup.com/trading/agricultural/files/AC-226\\_DairyProductBroch\\_final.pdf](http://www.cmegroup.com/trading/agricultural/files/AC-226_DairyProductBroch_final.pdf)

Oats	0.076**	0.076*
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**Table 1.4.7** For the milk class III contract, daily prices are for the period 18/09/07 until 12/04/13. For the milk class IV contract, daily prices are for the period 27/01/09 until 12/04/13. Superscript \*\* and \* denote two-tailed statistical significance at 1 percent and 5 percent, level respectively. Source: Own calculations based on Datastream data.

From the significance and magnitude of the changes in (percentage) of the settlement prices, one can conclude that changes in price from feedstuffs such as corn, wheat, soybean and oats, are not fully translated into changes in the milk price. Therefore, there is a limited natural hedge between the price of feedstuffs and the milk price. As such, feedstuffs, as an example of an important input, have limited impact on milk prices. This shows that farmers would be unable to transfer the change in price for feedstuffs to a change in milk price.

#### *Margin risk management by farmers: Managing the residual risk*

Input costs for specialist dairy farms have varied from 2000 to 2007 in the EU-15, while they have increased in the EU-10 by 30.09 percent in the same time period. Specific costs, of which feed costs are an important component, differ per Member State. Non-specific costs have a rather fixed character and have increased slightly over time. On the other hand, the output price has been volatile (11.41 percent for 2007-2012), as previously mentioned.

To further analyse the natural hedge within a farmer's portfolio and hence the residual risk of dairy farmers, we examine the correlation between feed for grazing livestock and farm net income for each Member State and the correlations between the nominal and percentage changes between the two variables. Table 2.4.8 shows these correlations. Note that the correlations are calculated with annual data from 1989 until 2009, and the Member States only have data from the year they entered the EU. Therefore, countries having less than six observations have been excluded from the table. The table does not show a particular pattern.

**Table 1.4.8** Correlation between feed for grazing – farm net income per Member State

Member State	Correlation Feed for grazing - Farm net income	Number of observations correlation Feed for grazing – Farm net income	Correlation nominal change Feed for grazing - Farm net income	Number of observations correlation Feed for grazing – Farm net income	Correlation percentage change Feed for grazing - Farm net income	Number of observations correlation percentage change Feed for grazing - Farm net income
(BEL) Belgium	0.570**	21	-0.018	20	0.088	20
(DAN) Denmark	-0.713**	21	-0.346	20	-0.09	20
(DEU) Germany	0.807**	21	0.501*	20	0.500*	20
(ELL) Greece	0.767**	21	-0.117	20	-0.102	20
(ESP) Spain	0.750**	21	0.413	20	0.227	20
(FRA) France	0.312	21	0.344	20	0.431	20
(IRE) Ireland	0.636**	21	-0.281	20	-0.176	20
(ITA) Italy	0.862**	21	0.663**	20	0.620**	20
(LUX) Luxembourg	0.352	21	-0.117	20	0.02	20
(NED) Netherlands	-0.274	21	-0.129	20	-0.077	20
(OST) Austria	0.458	15	0.432	14	0.205	14
(POR) Portugal	0.957**	21	0.423	20	0.268	20
(SUO) Finland	0.358	15	0.225	14	0.334	14
(SVE) Sweden	0.723**	15	0.211	14	0.035	14
(UKI) United Kingdom	0.685**	21	0.134	20	0.286	20

**Table 1.4.8** Annual data for the period 1989 until 2009 is used for all variables. Superscript \*\* and \* denote statistical significance at 1 percent and 5 percent level, respectively. Correlations with less than six observations have not been included in this table. Source: Own calculations based on EUFADN data.

Feed for grazing livestock (-EURO), code number SE310, is described by the database<sup>30</sup> as concentrated feedingstuffs (including mineral licks and preservatives), coarse fodder, expenditure on the use of common grazing land, expenditure on agistment, cost of renting forage land not included in the UAA for equines, cattle, sheep and goats. Farm net income (-EURO), code number SE420, is described by the database as the remuneration to fixed factors of production of the farm (work, land and capital) and remuneration to the entrepreneurs risks (loss/profit) in the accounting year.

The correlation Feed for grazing – Farm net income is approximated by calculating the correlation between the Feed for grazing and the farm net income for each Member State. The correlation nominal change Feed for grazing – Farm net income is created by calculating the difference in Feed for grazing for each year, equivalently for the farm net income for each year, and then deriving the correlation between the change of Feed for grazing and the change of farm net income for each Member State. The correlation percentage change Feed for grazing – Farm net income is created by calculating the difference in Feed for grazing and dividing this by the Feed for grazing in the earlier year. Doing this for each year for both variables, one can then derive the correlation between the percentage change of Feed for grazing and the percentage change of farm net income for each Member State.

Table 1.4.8 shows variation in the natural hedge of EU dairy farmers: for example, in the Netherlands there is a low natural hedge in the portfolio of a dairy farmer: the correlation between input and farm income is insignificant. In Italy on the other hand, there seems to be some extent of a natural hedge (correlations are relative large and significant). Hence the residual risk for Dutch farmers seems larger than for Italian dairy farmers. The factors affecting the residual risk on dairy farmers, that is, the natural hedge, and why it differs across countries is not known yet and further research is needed.

*The financial viability and flexibility of dairy farmers in normal conditions, and their financial viability and flexibility during crisis situations (e.g., under/overproduction), including the financial buffer capacity per farm, currently and after the quota will have been abolished.*

The gross margin on operating costs per ton has decreased from 2000 to 2007, with two downward peaks. The gross margins differ across the Member States as do the decoupled payments. The CAP document (2011) did not observe cost reductions; hence it is difficult to argue that farmers will be able to compete better in a more competitive environment.

*Impact of negative externalities, social factors, environmental and country planning constraints on regional production*

The evolution of all farm holdings and specialist dairy holdings in both types of LFA regions and in non-LFA areas is remarkably similar according to the CAP document. Generally, specialist dairy farms retained an above-average share in all areas, with country-specific exceptions, such as Sweden.

#### ▪ Preliminary observations and conclusions

**The effect market forces have on supply (link 1), demand (link 2) and the balance between the two (link 3) (see Table 1.3.1 for the research framework)**

The expectation is that market power in terms of information availability will increase both on the demand and on the supply side. The aggregate effect will be in favour of the demand side. Farmers and processors are increasing their economies of scale and continuing to specialise and concentrate. In the short-term, large differences in production, production capacity and yield between Member States will persist, despite signs of convergence in productivity. Moreover, farmers are exposed to large deviations in milk price and input costs and the latter are increasing for some Member States. As a consequence, farmers' gross margins are under pressure and will become more volatile. Also, farmers face decreasing margins of consumer milk price paid to them. Processors, on the other hand, have been able to slightly increase their share of the consumer milk price.

Market power in terms of price-bargaining power will increase both on the demand and on the supply side. The effect on the balance will be in favour of the demand side. Farmers far outnumber processors even though both sides are increasing economies of scale. As such, processors enjoy more market power. However, as stated in the report "Support for farmers' cooperatives" (2012) by Bijman, Iliopoulos, Poppe, Gijssels, and

<sup>30</sup> [http://ec.europa.eu/agriculture/rica/database/database\\_en.cfm](http://ec.europa.eu/agriculture/rica/database/database_en.cfm)

Hagedorn, Hanisch, Hendrikse, Kühl, Ollila, Pyykkönen and Bijman et al. (2012), a large market share for cooperatives in the dairy sector may increase the price level and reduce price volatility. Thus, for certain Member States, where the concentration and participation in cooperatives is already high, price-bargaining power may be more balanced in the chain.

The extent of transparency and integration of the supply chain will increase on the supply and demand side due to the increase in importance and concentration of cooperatives. This may increase the extent of transparency and integration of the supply chain. However, large differences exist between Member States concerning the aspect of cooperatives. As such, short-term improvements might be limited due to the already high participation of cooperatives in certain Member States or, where cooperatives are less common, hesitation from farmers to participate as the concept of cooperatives is less known to them. Contractual arrangements do not show a particular pattern with the limited information available and they will not increase the extent of transparency and integration within the supply chain as these contracts are often private bilateral contracts.

The (expected) consolidation (restructuring) of farmers and processing industry will increase on both the supply and demand side. The demand side is expected to consolidate quicker as currently more concentration has occurred already, hence the effect on the balance will be in favour of the demand side. Farmers and processors will continue or even increase the speed to specialise and concentrate to exploit economies of scale. **In addition, the concentration of cooperatives will persist and it is necessary for farmers to have a risk management policy in place as financial buffers have decreased and are expected to decrease even more.**

The international milk and milk product markets and the expected milk and input price volatility at farm level is expected to increase. The input price volatility at farm level is expected to remain volatile while the level of input prices is expected to increase. The level of the EU milk price volatility is expected to increase to the level of the world milk price volatility.

**The effect organisational systems have on supply (link 4), demand (link 5) and the balance between the two (link 6) (see Table 1.3.1 for the research framework)**

The heterogeneity of the organisation of milk producers in different Member States will remain and/or will increasingly be more regionalised.

The heterogeneity of the organisation of milk industry in different Member States will remain dispersed, however concentration will occur.

The influence of POs and IBOs on the negotiation power of the respective partners and subsequently on price setting and price smoothing may increase on the supply and demand side. Negotiation power and information in the supply chain could be focused more on the demand side, as concentration is larger for processors. However, the increasing importance of cooperatives in some countries could provide some influence to balance the market power as described by Bijman et al. (2012). The authors state that a large market share for cooperatives in the dairy sector can, besides many other benefits, increase the price level and reduce price volatility. As such, negotiation power and information in the supply chain is influenced by the formation and power of cooperatives.

**The effect policy measures have on supply (link 7), demand (link 8) and the balance between the two (link 9) (see Table 1.3.1 for the research framework)**

The influence of policy measures proposed in the Milk Package under normal circumstances and in the event of a crisis situation strengthened the position of farmers respectively to processors. The importance of decoupled payments has increased while the intervention systems and export refunds have decreased in importance due to the increased milk price. However, the increased milk price volatility in combination with the low natural hedge within the farmers' portfolio (that is the low correlation between input costs and milk price) is a serious threat to the viability of dairy farmers. This is highlighted, as farmers are not being able to transfer the increase in feed prices to the milk price. Instead, gross margins have deviated substantially over the past years and this is expected to continue in the future.



The financial viability and flexibility of dairy farmers under normal conditions and their financial viability and flexibility during crisis situations (e.g., during under- or overproduction), including the financial buffer capacity of dairy farmers, currently and in a non-quota regulatory framework will not be in favour of the farmers. Gross margins and the share of competitive milk producers have decreased over time. In addition, cost reductions have not been observed. As such, the financial buffer capacity, financial viability and financial flexibility have not increased. Decoupled payments on the other hand provide additional financial viability. But, **with increasing input costs and milk price volatility, the financial viability and flexibility is increasingly under pressure.**

The impact of negative externalities, social factors, environmental and country planning constraints on regional production does not seem large for the supply or demand side. The evolution of all farm holdings is similar for LFA and non-LFA regions according to the CAP document (2011). As such, the impact is considered not to be highly significant.

## 1.5 Conclusion and policy recommendations drawn directly from the analysis

### 1.5.1 Analysis criteria summarised

#### *Research question:*

How will the balance between supply and demand be affected by market forces, organisational systems of the supply chain (in particular POs and IBOs) and policy measures, including market support mechanisms, in a non-quota regulatory framework?

The research question is assessed along three themes, each consisting of a number of analysis criteria. The influence each analysis criteria has on the supply, demand and consequently on the balance between the two, is summarised in Table 1.5.1. Section 1.4.2 elaborates on the expectation of the influence of each analysis criteria.

**Table 1.5.1 Analysis criteria with their expected influence on the balance of supply and demand according to the expert opinion (summary)**

	Balance
<b>Market forces</b>	
<i>Market power in terms of information availability</i>	-
<i>Market power in terms of price-bargaining power</i>	-
<i>Extent of transparency and integration of the supply chain</i>	+
<i>(Expected) Consolidation (restructuring) of farmers and processing industry</i>	-
<i>International milk and milk product markets and expected milk and input price volatility at farm level</i>	0
<b>Organisational systems</b>	
<i>Heterogeneity of the organisation of milk producers in the Member States</i>	-
<i>Heterogeneity of the organisation of the milk industry in the Member States</i>	-
<i>Influence of POs and IBOs on the negotiation power of the respective partners and subsequently on price setting and price smoothing</i>	+
<b>Policy measures</b>	
<i>Influence of policy measures proposed in the Milk Package</i>	+
<b>Other factors</b>	
<i>Impact of grain, cereal and forage prices on milk production and milk prices</i>	-
<i>Margin risk management:</i>	
<i>Financial viability and flexibility of dairy farmers</i>	+
<i>Financial buffer capacity per farm</i>	+

### 1.5.2 Hypotheses per theme

1. *The balance between supply and demand will be negatively affected by market forces.*

The reason is the asymmetry in information availability and market power between producers and the processing industry. This asymmetry is expected to increase in a non-quota regulatory framework, *ceteris paribus*.

2. *The balance between supply and demand will be negatively/positively affected by organisational systems.*

The concentration of the producers versus processors is skewed (see e.g., the Gini coefficients) and may increase in a non-quota regulatory framework, *ceteris paribus* and hence have a negative influence on the balance. On the other hand, an increasing role of POs and IBOs may impact the balance positively.

3. *The balance between supply and demand will be positively affected by policy measures.*

Policy measures that complement existing initiatives on risk management and that are able to eliminate the asymmetries regarding information availability and market power can contribute to a better balance between supply and demand. The Milk Package proposals can facilitate this transition of farmers managing their own margin risk by means of risk management instruments that may be developed by private markets. Policy measures that help and stimulate farmers to increase their financial buffer will positively impact the balance.

### 1.5.3 Conclusions per theme

*The effect market forces have on the balance between supply and demand*

Market forces in a non-quota regulatory framework may cause imbalances because of increased asymmetry in information. This asymmetry is driven by the concentration of processors, and, more importantly, the fact that increasing consolidation in the processing industry will amplify the difference in market power, despite the expected consolidation of farmers. Furthermore, milk and milk product markets will become more internationally linked and the volume of milk and milk products that are traded internationally are expected to increase. This also is expected for the main input markets (feed). The analyses show that the natural hedge in the producers' portfolio is relatively low and hence dairy farmers are exposed to a significant amount of **profit margin risk, which will increase in a non-quota regulatory framework.**

*The effect organisational systems have on the balance between supply and demand*

Organisational systems that provide information and coordination along the whole dairy marketing channel may balance supply and demand. However, such organisational systems are not in place yet. Cooperatives may adopt that role to increase market transparency between each stage of the value chain. POs and IBOs must prepare organisational systems for a non-quota regulatory framework to ensure a transparent price formation process and details on value added. In addition, futures markets for milk and milk products may also play an important role in the price discovery process and hence making markets more transparent, thereby eliminating information asymmetries. Farmers' responsiveness to changes in demand and supply may increase when dairy farmers have more financial buffer and are able to lower their risk-adjusted cost of capital, which can be accomplished by reducing the volatility in their profit margin.

*The effect policy measures have on the balance between supply and demand*

In a non-quota regulatory framework, policy measures that complement the expected changes in the context of risk management are important to ensure a healthy balance. In particular, producers need to have tools available to reduce the volatility in milk prices and input costs. These tools must be market based. This ensures that the heterogeneity we observe in the dairy sector is recognised and that farmers can manage risk specifically, i.e., manage risk that is specific to their farm operation. That is, in the EU, dairy farmers differ regarding cost structure, output structure, etc. hence general policy measures will be inefficient and not effective. Having policy measures that stimulate and or complement *market-based* risk management tools allow producers to adopt that type of risk management strategy that best fits the producer's needs. The policy measures in the Milk Package can facilitate this process.

### 1.5.4 Policy recommendation per theme

*The effect market forces have on the balance between supply and demand*

Price and volume information asymmetries in the chain must be eliminated. Hence, a clear price and volume information platform, in which volumes and prices are recorded at different levels of the market chain in a timely and accurate fashion, is highly recommended. Those information platforms can be organised by the sector, supra-national government (EU) or by private markets. The advantage of private markets (e.g., futures markets) is that prices are based on actual transactions and hence that the quality of price information is relatively high. Not only price information is important but also reliable volume data (both for milk as well as the major inputs), here an important role must be played by an independent information agency. To ensure that dairy farmers can capitalise on the market forces, farmers need to have market-based tools available to manage profit risks, thereby lowering their cost of capital and hence making them more flexible to respond to changing supply and demand conditions. It is recommended that there is a central coordination body that coordinates how to develop these market-based risk management instruments, to ensure that farmers are educated about how to use them and to make sure that EU policy measures complement these risk management instruments instead of cannibalising them. That is, a roadmap needs to be developed, coordinated by, for example, the EU. In this regard, it is interesting to mention that DG-Agri recently established the EC Expert Group on Agricultural Commodity Derivatives and Spot Markets. The Expert Group is a consultative entity whose tasks are to provide advice and expertise to the Commission services in relation to the functioning of the agricultural commodity derivatives and spot markets, the implementing of existing EU legislation and policies and the preparation of legislative proposals and policy initiatives in this field. The Group is composed of representatives of EU Member States and key stakeholders active in the agricultural sector and/or having activities relevant to the agricultural commodity derivatives and spot markets. To further ensure that dairy farmers can use market-based tools, such as futures, effectively to manage profit risks, regulatory frameworks that are specific for commodity financial markets should be in place. MIFID and the European Securities and Markets Authority (ESMA) may need to adopt the specific characteristics that commodity futures and options have in comparison to other financial instruments. For example, the hedging effectiveness of commodity futures is much more complex to identify than for financial instruments that are defined for currency or securities.

*The effect organisational systems have on the balance between supply and demand*

Stimulating POs in combination with providing them a legal framework to act seems valuable. The heterogeneity that we currently observe in organisational systems may be reduced in a non-quota regulatory framework as the consolidation of farmers and processors will continue and chains become more international. POs may play a role in reducing credit and counter party risks that can be caused by market-based risk management tools. That is, POs focusing on managing risk for dairy farmers may be an interesting avenue to explore. The first experiences in the Belgium hog industry of risk management cooperatives are positive. In November 2012, the first Pig Trading Companies were established representing 15 percent of the Belgium hog production. The Pig Trading Companies are risk management cooperatives owned and managed by farmers. These cooperatives manage the hog margin risk by simultaneously using various futures markets (amongst others wheat, corn, canola and hog futures markets) to reduce the volatility in margins.

*The effect policy measures have on the balance between supply and demand*

Policy measures must (1) stimulate a market-based solution (such as the creation of a futures market) and (2) complement these market-based risk management instruments. The most important task for policy makers will be to provide a road map for dairy farmers to help them manage margin risk and to coordinate private market initiatives to develop these risk management instruments. Only when farmers can become true marketers and risk managers, can there be a viable dairy sector.

### **1.5.5 General conclusion and discussion**

The analyses above indicate that farmers are currently not necessarily ready to be viable after the abolishment of the milk quota, particularly in the event of a crisis. The market power imbalances in the chain and the low natural hedge that dairy farmers have in their portfolio drive this observation. Market imbalances and the volatility in the profit margins of farmers are a true challenge for the dairy sector after the quotas are abolished. DG-AGRI's goal to have ***a viable dairy sector, both under normal circumstances and in crisis situations after the quotas have been abolished can only be obtained when farmers have risk management tools available and knowledge to use them.*** That is, farmers will need risk management tools, such that they can take calculated risk and hence can be viable in both normal and crisis situations. Since dairy farmers have a low natural hedge in their own portfolio, risk management tools are needed such that farmers can hedge part

of their profit margin risks. On the input side (feed and energy), these risk management tools are already available (futures contracts in grain and energy complex have been established and are quite liquid). However, on the output side, the current dairy futures are not effective. The US dairy futures show a relative low hedging effectiveness for EU producers and the dairy contracts that recently have been established for milk products (cheese and powder) for the European market are not effective for EU dairy farmers (caused by basis risk and low liquidity). In addition, these private instruments (like futures contracts) are rather complex for dairy farmers and hence education and training will be key. Cooperatives, IBOs and farmers' unions may facilitate this knowledge gap and may also be actively involved in co-developing risk management tools that effectively can be used to hedge dairy farmers' profit margins. Because of the concentration on the processing side, reliable milk price quotes are becoming scarce. That is, the quality of price data may weaken over time because of asymmetry between the supply and demand sides of milk in terms of concentration. This poses a challenge for dairy farmers since they are hindered to make fully informed decisions. Here, there is a role to be played by local, national or supra national governments and IBOs. Interestingly, the risk management instruments (e.g., futures) mentioned above cannot only play a role in managing the dairy farmers' portfolio risk but these markets can make the market transparent as they ensure a transparent price discovery process, thereby reducing information asymmetries. The current direct payment measures can be seen as a financial buffer tool supporting producers' income and hence protecting producers from market instability. Abolishment of these payments should be done simultaneously with helping dairy farmers to manage price risk by facilitating the introduction of price risk management instruments and teaching farmers how to use them to make sure that the viability of dairy farmers can be ensured. More research and policy coordination is clearly called for.

## 2. How will those elements affect the sector's competitiveness in terms of added value and portfolio of products, ability to react to changes in demand, competitive position of the EU in the world market, and need of investments in the production and processing industry?

### 2.1 Interpretation and comprehension of the key terms of the evaluation question

In addition to the key terms used in Chapter 1, we focus in this chapter on the terms "added value" and "the competitive position of the EU in the world market". Added value in this context is interpreted as the increase in market value as a result of a change in form, location or availability of milk, excluding the costs of material and services used to create this change. The competitive position of the EU in the world market is interpreted as the comparative ability and performance of the EU dairy industry to sell dairy products to the world market.

### 2.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

The analysis criteria are organised according to four main themes:

- Added value and the portfolio of products
- Ability to respond to changes in demand
- Competitive position of the EU in the world market
- Need of investments in the production and processing industry

First, the **added value and the portfolio of milk products** are reviewed. This requires insight into the concepts added value per kilogram of milk, farm net value added per annual work unit (FNVA/AWU), and the change in portfolio of milk products, including the share of cheese, milk powder and other dairy products, as well as an understanding of the expected changes herein in a non-quota regulatory framework.

Second, the **ability to respond to changes in demand** is assessed. Hence, the flexibility of the production and the processing industry in terms of production volume and product portfolio is examined. This includes an evaluation of the speed with which farmers and processors react to market changes, and an evaluation of the financial resilience of farmers in a non-quota regulatory framework. The extent to which producers and processing industry can respond to changing market condition depends, amongst others, on (1) technical factors (how fast can one increase/decrease herd size and corresponding input capacity (dairy parlour, feed demand, etc.)) and (2) financial factors, that is producers' financial resilience. In this report, we focus on the latter.

Third, the **competitive position of the EU in the world market** is examined. For this, the international positioning of European milk and milk products is examined with respect to the world market in terms of production costs and intangible assets, such as quality and brands.

Finally, the **need of investments in the production and processing industry** is reviewed. To this end, the extent and necessity of restructuring on the regional level, the effectiveness of policy measures to foster fast and prosperous development, and the current and future regional production distribution are examined. This review devotes special attention to Eastern Europe due to its growth potential in dairy and grain production.

The analyses to assess the analysis criteria are based upon different quantitative and qualitative information sources. These sources include the theoretical analysis and descriptive chapter of this document (TADC), the report prepared for the DG AGRI in 2011 called "Evaluation of CAP measures applied to the dairy sector" (CAP), the March 2013 edition of the commodity price dashboard (DASH)<sup>31</sup> and the presentation describing the market situation prepared for the European Commission of Agriculture and Rural Development (AGRI)<sup>32</sup>. Additional statistics and commodity prices are obtained from European Commission Agriculture and Rural Development (AGSTAT)<sup>33</sup>. The data used for these analyses, including references to the respective source, is listed in Appendix 5.

### 2.3 Description of the method(s) used and an indication of its (their) limitations

The answers to the question are based on a combination of methods. A theoretical framework and a conceptual model with several hypotheses will be established, based on the knowledge of the expert.

*In the analyses, the concepts added value and the portfolio of products, the ability to respond to changes in demand, the competitive position of the EU in the world market, and the need of investments in the production and processing industry will be linked to market forces, organisational systems of the supply chain and policy measures.*

**Table 2.3.1 Research design/framework to answer the question**

	<b>Sector's competitiveness (added value and portfolio of products)</b>	<b>Ability to respond to changes in demand</b>	<b>Competitive position of EU in the world market</b>	<b>Need of investments in the production and processing industry</b>
<b>Market forces, organisational systems and policy measures</b>	Link 10	Link 11	Link 12	Link 13

Table 2.3.1

<sup>31</sup> [http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/dashboard/food03\\_2013\\_en.pdf](http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/dashboard/food03_2013_en.pdf)

<sup>32</sup> [http://ec.europa.eu/agriculture/milk/presentations/market-situation\\_en.pdf](http://ec.europa.eu/agriculture/milk/presentations/market-situation_en.pdf)

<sup>33</sup> <http://ec.europa.eu/agriculture/milk/presentations/>

## 2.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

To be able to remain competitive in terms of added value and portfolio of products, to be able to react to changes in demand, for the EU to retain its competitive position in the world market, dairy producers and the dairy industry need risk-management instruments. *Uncertainty about prices in the future, and hence uncertainty regarding margins and profits, leads to underinvestment in production and processing capacity and underinvestment in innovation as firms do not, or cannot, use external capital markets to recoup the cash flow shortfalls.* Instead, they forgo the investment entirely (Minton et al. (1999))<sup>34</sup>. Lower cash flow volatility may result in a lower cost of capital and a lower discount rate as it is generally associated with low risk (Srivastava et al. (1998, 1999)). Dairy farmers and processors require a minimum of certain returns to be willing to invest in value-added products, brands, markets and to make long-term investments. As such, we propose combining policy instruments with private market initiatives to manage risk. In particular, farmers should be able to efficiently and effectively hedge their risk, thus ensuring a competitive, innovative and viable dairy industry.

### ▪ Description of current dairy market

In this section, we describe the current dairy market in the context of market forces, organisational systems and policy measures in relation to the sector's competitiveness, ability to respond to changes in demand, competitive position of the EU in the world market and need of investments in production and processing industry. The sources used in these analyses are provided in Appendix 5.

#### Added value and portfolio of products

##### *Change in added value per kilogram of milk*

As described in Section 1.4.1, the EU production volume of milk, cheese and whey increased by 17.95 percent, 7.14 percent and 26.77 percent, respectively since 2000 to 2011, while the production of butter and SMP remained rather stable during the time period examined, ultimately decreasing 1.05 percent and increasing 3.98 percent respectively, and the production of WMP declined by 35.83 percent over the same time period.

The coefficients of variation of several dairy commodities are displayed in Table 3.4.1. As shown, the coefficients for the price of milk, SMP and butter have increased over time. Figure 3.4.1 displays the market price level of several dairy products from January 1997 until March 2013. See also Chart 7 of the commodity price dashboard March 2013 edition<sup>35</sup>.

**Table 2.4.1 EU coefficient of variation**

	1997–2012	1997-2006	2007-2012
Milk price	9.12%	6.45%	11.39%
SMP price	13.7%	7.6%	17.5%
Butter price	11.3%	8.3%	15.0%
Cheddar price	17.0%	12.3%	13.3%
Edam price	8.8%	8.6%	8.9%

Table 2.4.1 Monthly data has been used from January 1997 until December 2012. The coefficient of variation is calculated by dividing the standard deviation of the prices over the average of the prices for the respective period. Source: own calculations and regulation (EC) No 479/2010 Article 2, Eurostat, European Commission – Agriculture and Rural Development<sup>36</sup> and Estimations DG AGRI-C4, FAM, LTO and CLAL.

Table 2.4.1 shows that the volatility of the milk price has increased over time, and that this milk price volatility increase is larger than for milk products as also is illustrated by Figure 2.4.1 and Chart 7.

<sup>34</sup> <http://leeds-faculty.colorado.edu/bhagat/CashflowVolatilityInvestment.pdf>

<sup>35</sup> [http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/dashboard/food03\\_2013\\_en.pdf](http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/dashboard/food03_2013_en.pdf)

<sup>36</sup> [http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/index\\_en.htm](http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/index_en.htm)

**Figure 2.4.1 European Union market prices dairy products**

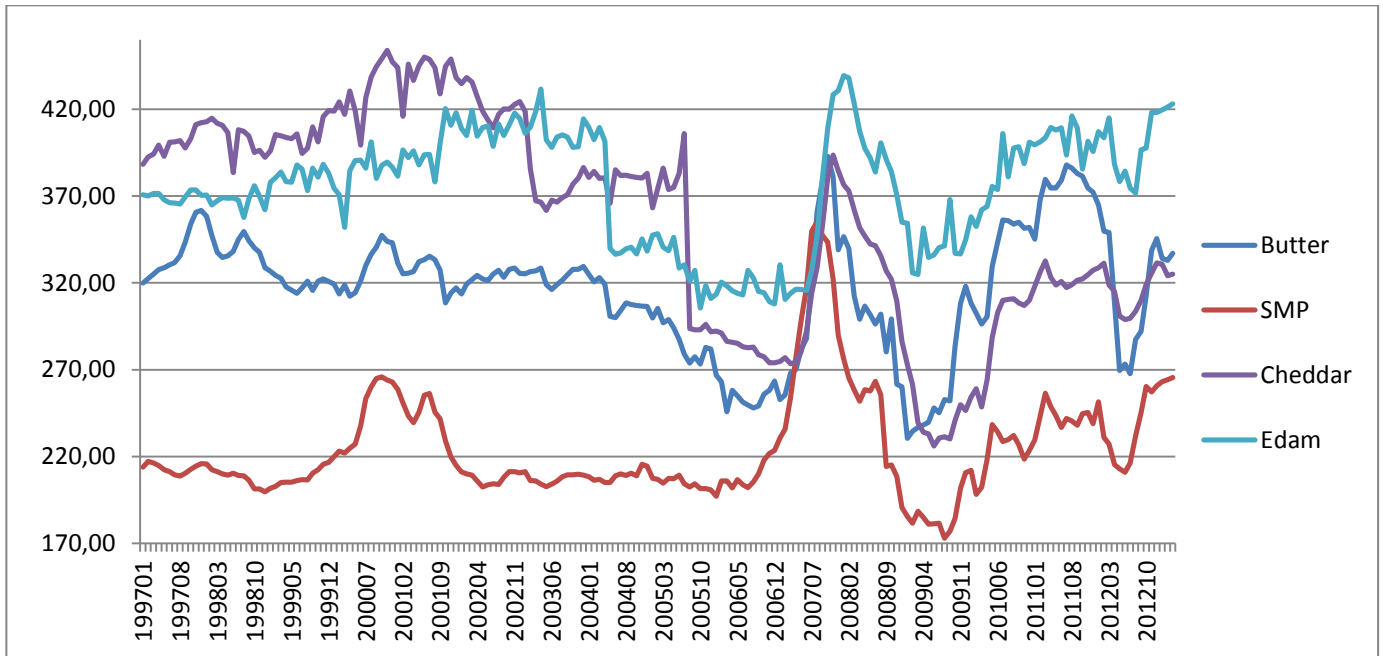


Figure 2.4.1 Monthly data of EU market prices from January 1997 until March 2013. Source: European Commission – Agriculture and Rural Development<sup>37,38</sup>.

<sup>37</sup> [http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/market-prices-until-2006\\_en.pdf](http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/market-prices-until-2006_en.pdf)

<sup>38</sup> [http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/market-prices-from-2007-monthly\\_en.pdf](http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/market-prices-from-2007-monthly_en.pdf)

**Chart 7 Dairy: EU agricultural market and consumer price developments (January 2000 until March 2013, Jan2000=100)**

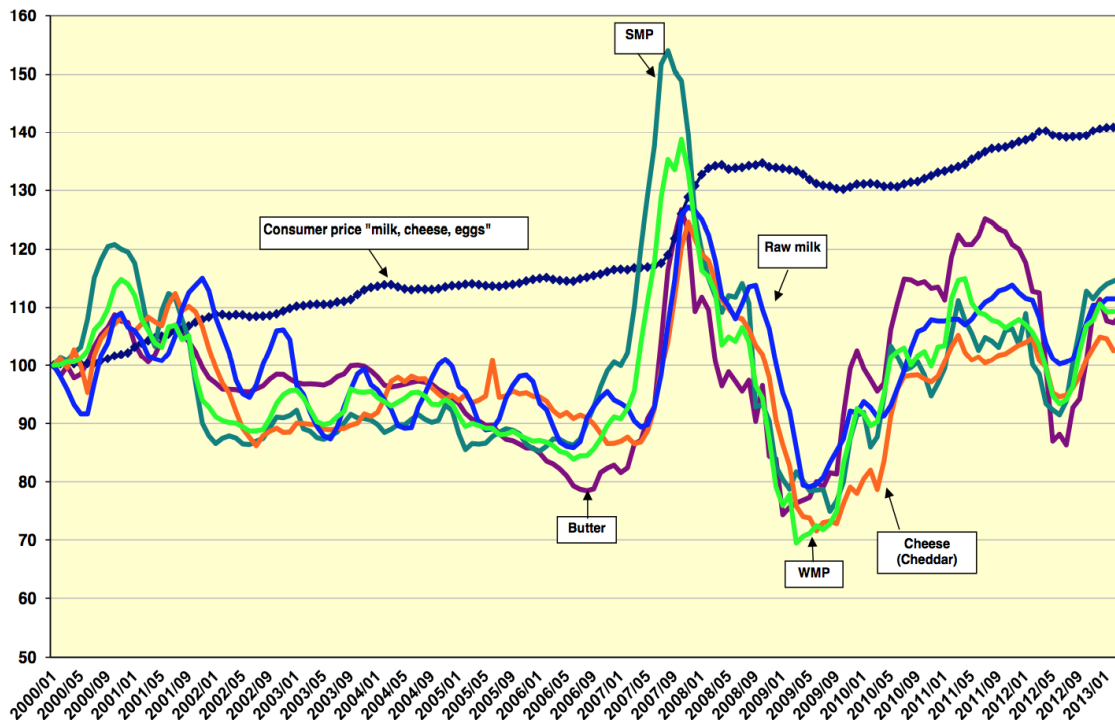


Figure 2.4.2 Source: Commodity price dashboard March 2013 edition

### Change in portfolio of milk products

The production and processing of dairy products is highly diverse in the EU. The production of milk, cheese and whey has increased with 17.95 percent, 7.14 percent and 26.77 percent, respectively since 2000 to 2011, while the production and processing of butter and SMP have been rather volatile, ultimately decreasing 1.05 percent and increasing 3.98 percent, respectively. Only WMP is produced 35.83 percent less.

In 2011, Germany, France and Italy were the biggest cheese producers; together they produced 60 percent. Germany and France were also the biggest butter producers in 2011; together they produced 60 percent. France and Denmark were the biggest WMP producers in 2011; together they produced 56 percent. Germany, France, Belgium, Luxembourg and Poland were the main SMP producers; together they produced 75 percent in 2011. In the same year, Germany, the Netherlands, the UK, Italy and Poland produced around 70 percent of the total whey production.

### Ability to react to changes in demand

*Flexibility of production and processing industry in terms of production volume and product portfolio:*

a. *Evaluation of the reaction speed of farmers and processors to market changes (market orientation and innovativeness)*

The excess supply of butter peaked in 2002, then declined gradually until 2006 and dropped in the last three years. A similar pattern occurred for SMP. For WMP, excess supply fluctuated around a stable number and disappeared in 2007. The structural excess for cheese shows a similar pattern, with the exception that in 2009, the excess was up to normal levels again. The CAP document (2011) does not state whether the higher excess supplies observed in 2009 mark a return to the situation prior to 2007 or merely a temporary increase due to the depressed state of the EU milk sector in 2009.

In addition, the fluctuation in self-sufficiency ratios from 2000 to 2009, ranging for butter between 105-113 percent, for cheese between 105-106 percent, for SMP between 108-135 percent and for WMP between 185-263 percent, shows that processors are able to adapt their product mix more easily during the year by



switching between butter and SMP or WMP in response to market conditions than by switching between cheese and the powder dairy products.

*b. Financial resilience of farmers after the milk quota is abolished*

Gross margins over operating cost per ton have decreased from 145.73 EUR/ton of milk in 2000 to 126.48 EUR/ton of milk in 2008. In addition, they differ across Member States, as do decoupled payments. Also, the share of profitable dairy farms decreased after 2003, a trend only reversed due to the higher milk price. Cost reductions were not observed, hence it is difficult to assess whether farmers can compete in a more competitive environment.

**Competitive position of the EU in the world market**

*International positioning of European milk and milk products with respect to the world market in terms of production costs and intangible assets (quality)*

The specific production costs of specialised dairy farms varied in the EU-15 and have increased by 30.09 percent in the EU-10 from 2000 to 2007. Compared with the main exporter of butter and SMP, Oceania, the EU was in 2001 and 2003 on average 260 percent more expensive and in 2007 it was still by far the most expensive producer in the world.

Milk quality, in terms of fat and protein content, has remained quite stable. However, variations in milk quality exist among the EU Member States showing a tendency towards a positive correlation between yield and fat content on the Member State level.

*How far will dairy prices have to deviate between international markets before trade will occur between the different international dairy markets?*

The volume of exports increased from 2000 to 2011, and European dairy imports are insignificant by comparison. Volume and monetary value are generally in balance. International trade of milk products will be determined by transportation costs, market regulation (that is access to international markets) and market position (brand and distribution channel). We may expect that market regulation and market position of EU milk products can improve (particularly in the domain of quality and brands). Transportation costs have two components: actual transportation costs (energy) as well as environmental food print (i.e., food miles). Both are quite uncertain.

**Need of investments in the production and processing industry**

*How much restructuring is required to be competitive and where?*

In 2011, there are still large deviations in farm yield and productivity between the Member States. Also, the production capacity and input costs are different between Member States. It is expected that the dairy farmers in Eastern Europe can increase their competitive strength faster than the traditional dairy producing countries because of environmental (manure) constraints and availability of relatively cheap inputs (feed).

*Where does production take place now? And where will it be in the future?*

Milk production is highly regionalised; three Member States produce half of the milk of the EU. Overall, the share of production is shifting towards the specialist dairy farms and farms are increasing their farm scale on average by 84 percent from 2000 to 2012.

Milk production is expected to move to the East of Europe due to lower production costs and lesser environmental food print challenges. A potential obstacle may be the current processing, input and financial infrastructure in place in Eastern Europe.

▪ **Preliminary observations and conclusions**

**The effect market forces, organisational systems and policy measures have on the sector's competitiveness (link 10) (see Table 3.3.1 for the research design)**

Market forces will drive dairy farmers and processors to compete with other production regions in the world. From an added value and portfolio of product perspective, the EU dairy industry must be able to compete because of their good technical and research infrastructure, branding/marketing capacity and product quality. Like the milk prices, we expect that the "commodity" milk products, such as powder, butter and cheese will

show an increase in volatility making it necessary for also the processing industry to manage price risk in order to reduce their capital costs and hence ensure the ability to invest and prosper in the world markets. In addition, organisational systems that integrate more stages of the marketing channel (such as cooperatives), may enhance the sector competitiveness in terms of added value and portfolio of products.

**The effect market forces, organisational systems and policy measures have on the ability to respond to changes in demand (link 11) (see Table 2.3.1 for the research design)**

The fluctuations in the self-sufficiency ratios show that processors are able to adapt their product mix easily during the year. As such, for the processing industry, it is easier to react to changes in demand, for instance by switching production between butter, SMP or WMP.

The financial resilience of farmers in a non-quota regulatory framework is fragile as gross margins have decreased. In addition, cost reductions were not observed. As such, margin management should be of great importance for farmers when the quota is abolished, only then will producers have the ability to respond to changes in demand. Investments at the farm level are needed to be able to react to changes in demand. These investments require lowering the cost of capital at the farm level.

**The effect market forces, organisational systems and policy measures have on the competitive position of EU in the world market (link 12) (see Table 2.3.1 for the research design)**

To date, European dairy imports are relatively small compared to the exports. The international positioning of European milk and milk products with respect to the world market in terms of production costs and intangible assets (brands, quality) will become better; however, the EU is with respect to some dairy products more expensive than other producers in the world. Hence, market forces are expected to force changes on the production cost structure of EU dairy processors. To remain competitive, capital costs need to be lowered as well as fluctuations in profit margins, allowing dairy farmers to make the necessary investments. More and more marketing channels compete with each other instead of individual companies. Hence creating competitive milk-milk product chains will be crucial for the EU sector to compete internationally. Here again, cooperatives can play an important role. The competitiveness of the EU dairy sector is also impacted by the legal framework (sometimes constrained) in the context of environmental, consumer and animal laws. Large differences across countries may hinder an equal playing field.

**The effect market forces, organisational systems and policy measures have on the need of investments in production and processing industry (link 13) (see Table 2.3.1 for the research design)**

Large deviations between farm yield, productivity, production capacity and input costs are observed between Member States. Despite convergence, specialisation is noticed and should continue to increase margins so as to become more competitive.

Market forces will impose investments to both the production as well as the processing industry to deal with rapid changes in demand and hence the balance between supply and demand. It seems that the processing industry may be able to make these necessary investments. Whether dairy producers will be able to make these investments is unclear.

## 2.5 Conclusion and policy recommendations drawn directly from the analysis

### 2.5.1 Analysis criteria summarised

*Research question:*

How will market forces, organisational systems and policy measures (referred to as those elements) affect the sector's competitiveness in terms of added value and portfolio of products, ability to react to changes in demand, competitive position of the EU in the world market, and need of investments in the production and processing industry?

**Table 2.5.1 Influence of market forces, organisational systems and policy measures on the sector's competitiveness, ability to respond to changes in demand, the competitive position of the EU in the world market and the need of investments in the production and processing industry (Summary)**

<b>Market forces, organisational systems and policy measures</b>	
<b>+</b>	<b>Sector's competitiveness (added value and portfolio of products)</b>
	<i>Added value and portfolio of products</i>
	<i>Change in portfolio of milk products</i>
<b>0/-</b>	<b>Ability to respond to changes in demand</b>
	<i>Evaluation of the reaction speed of farmers and processors to market changes (market orientation and innovativeness)</i>
	<i>Financial resilience of farmers after the milk quota is abolished</i>
<b>0/+</b>	<b>Competitive position of EU in the world market</b>
	<i>International positioning of European milk and milk products with respect to the world market in terms of production costs and intangible assets (brands, quality)</i>
	<i>How far will dairy prices have to deviate between international markets before trade will occur between the different international dairy markets?</i>
<b>0/+</b>	<b>Need of investments in the production and processing industry</b>
	<i>How much restructuring is required to be competitive and where?</i>
	<i>Where does production take place now? And where will it be in the future?</i>

**Table 2.5.1**

### 2.5.2 Hypotheses and conclusions per theme

1. *Those elements will affect the sector's competitiveness in terms of added value in a positive way.*

The abolishment of the milk quota will allow for more innovation at the farm level (e.g., organic milk) but also at the processing level. Market forces will induce that process. Particularly, the current quality and innovative infrastructure of the processing industry must capitalise on that. However, since also the volatility in the three major milk products is increasing and expected to increase further, capital costs will rise, which may hinder investments in innovation and market orientation.

2. *Those elements will affect the sector's competitiveness in terms of portfolio of products in a positive way.*

Market forces will guide the optimal valorisation of milk (portfolio choice of producing fluid milk, butter, etc.) and will drive innovation of new usage of milk products or milk components (pharmaceutical). Also changes in organisational systems, in particular as these systems becoming more transparent can ensure increase in competitiveness.

3. *Those elements will affect the sector's competitiveness in terms of ability to react to changes in demand in a positive/negative way.*

Market forces, organisational changes and policy measures can enhance the reaction of producers and processors to changes in demand. However, the producers are the weak link: increasing production in a short time window can be costly if the financial buffers are low, apart from the technical production constraints. A drop in demand represents a similar challenge.

4. *Those elements will affect the sector's competitiveness in terms of competitive position of the EU in the world market in a positive way.*

The abolishment of the milk quota will have regional impact, that is, milk production may move to the regions that have the best processing industry infrastructure and the lowest cost of production (e.g., the lowest land values and feed costs). It is expected that there will be a redistribution of milk production such that the cost of production decline and hence the competitive position of the EU will increase. Particularly, the new eastern EU Member States will play an important role. However, currently the production cost at the EU level is significantly higher compared to regions outside the EU. Hence, farm level efficiency needs to increase. Whether farmers are able to make these efficiency changes depends, amongst others, on technical constraints

outside the dairy farm (environmental, quality, animal, etc.), the capacity of farmers to deal with financial risk and hence whether they have the ability to lower their capital costs.

*5. Those elements will affect the sector's need of investment in the production and processing industry in a positive/negative way*

The abolishment of the milk quota will increase milk price volatility and may increase imbalances in supply and demand and hence a need arises in the production and processing industry to invest to keep up with these changing market conditions. The challenge will be that in case there is no risk management in place, the cost of capital is going to increase, having a negative impact on the investment capacity of farmers. The processing industry is expected to be able to make the necessary investments to respond to changing needs.

### **2.5.3 Policy recommendation per theme**

*The sector's competitiveness in terms of added value.*

Market forces in the marketing channel (vertical) and international competition (horizontal) will determine the sector's competitiveness in terms of added value. The added value can be generated at the farm level (organic milk production), but will be most likely occur at the processing level (superior quality, branding and product innovation). Policy measures that stimulate research in new products and/or applications of milk and its components are recommended.

*The sector's competitiveness in terms of portfolio of products.*

The portfolio of products is determined by the processing industry by means of optimal valorisation models, driven by returns. This will become more transparent and easy after the quotas are abolished in the case that markets become more transparent (see Chapter 2). No specific policy measures is needed except for stimulation of market-based solutions to facilitate a transparent price formation process.

*The sector's competitiveness in terms of ability to react to changes in demand.*

Policy measures that provide insight into production and demand volumes and prices in a reliable matter are recommended. In addition, policy measures that can reduce the cost of capital and hence provide financial flexibility to the dairy sector as a whole are recommended. These policy measures may involve stimulating dairy farmers to generate financial buffers and to use risk management instruments.

*The sector's competitiveness in terms of competitive position of the EU in the world market.*

Market access is key. That is, policy measures that ensure international tradability of EU milk products without trade barriers are needed. In addition, policy measures that stimulate the development of chains that can compete as if it were a company will increase EU competitiveness.

*The sector's need of investment in the production and processing industry.*

Policy measures that help develop risk management instruments for milk and milk products (the commodity milk products) and that educate the actors in the chain to use them are recommended. This will lower capital costs and hence give the dairy industry the opportunity to make the necessary investments.

### **2.5.4 General conclusion and discussion**

The competitiveness and innovation/reaction power of the dairy industry in a non-quota regulatory framework is different for farmers than for the processing industry. Dairy farmers have rather little influence on the portfolio of milk products and can only respond to changing market conditions by changing production volume. To respond to changing volume demand, farmers have to have low capital costs to make investments. As we have seen in Chapter 2, the farmers' capital costs are rather high due to volatile profit margins. That is, the risk adjusted cost of capital of dairy farmers who do not have a risk management policy in place is high and as a result, will not be able to quickly respond to changing volume demand. This again stresses the importance of developing and teaching farmers to use risk management tools. In addition, the responsiveness of dairy farmers can be a constraint by local environmental laws, for example manure run off laws. The processing industry seems to be able to change their milk product portfolio rather quickly when there are changes in demand (e.g., consumer preferences).

The competitiveness of the dairy sector is not so much constrained by the processing industry. The crux is the production costs at the farm level. Here, a lot of heterogeneity is noticed across the Member States. Input costs (land values, access to feed and energy (including fertiliser) are key in this respect as well as climate (e.g., heat

and droughts). It is expected that the milk production will slowly move to the new East-European Member States and that, when they are able to lower their cost of capital, they are competitive in the world market (particularly when the quality can be an unique selling point).

To be competitive and in particular to respond to changes in the world dairy markets (and hence changing consumer patterns), the processing industry and farmers need to invest in production capacity flexibility systems as well as in marketing (brands: creating market-based assets and marketing channel systems) and risk management strategies. **It is important to stress that uncertainty about prices in the future, and hence uncertainty regarding margins and profits, leads to underinvestment in production, processing capacity and innovation caused by a high risk adjusted cost of capital. Having risk management tools available can facilitate the necessary investments, by lowering the risk adjusted cost of capital that is needed to have a viable EU dairy industry.**

### 3. How could a possible buy-out scheme be operated in a workable and effective way?

#### 3.1 Interpretation and comprehension of the key terms of the evaluation question

The key term in this analysis question is the buy-out scheme. The buy-out scheme, as described in the Soft landing report from the European Commission (2010)<sup>39</sup>, is interpreted as an exceptional tool to stabilise the market, proposed in the single CMO article that would allow milk producers, on a voluntary basis, to reduce their deliveries against compensation. Experience gained during the milk crisis shows that it may be sufficient to take 1 or 2 percent of the overall milk production out of the market to correct imbalances and restore stability.

#### 3.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

The following analysis criteria allow answering the question:

- Effectiveness of a buy-out scheme under normal circumstances and in crisis events in terms of
  - Price levels for dairy producers
  - Price volatility
- Efficiency of buy-out scheme: cost-benefit analyses
- The influence of the compensation level/price as a free “put” option for producers

The quantitative and qualitative information used to evaluate the analysis criteria are the following: literature overview of existing stock intervention schemes and their evaluation.

#### 3.3 Description of the method(s) used and an indication of its (their) limitations

We will use conceptual reasoning as a basis for providing propositions. Our conceptual reasoning is based on a conceptual reasoning and academic research.

#### 3.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

The buy-out scheme will be discussed and evaluated from a technical/dairy farm and market/implementation perspective.

From a technical point of view, it is difficult to implement a buy-out scheme at the dairy farm. Reducing milk production can be done by changing the feed ration rather dramatically, which may have an impact on the cow's health and reproduction capacity. Reducing milk production can also be established by slaughtering cows. The latter may cause negative spill-over effects in the meat markets. That is the sudden increase in

<sup>39</sup> [http://ec.europa.eu/agriculture/milk/quota-report/com-2012-741\\_en.pdf](http://ec.europa.eu/agriculture/milk/quota-report/com-2012-741_en.pdf)

number of cows being slaughtered may distort the meat markets, thereby negatively impacting other meat producing farmers. Reducing milk production may interfere with contractual arrangement that farmers have with processors. That is, farmers may not be allowed, from their contractual arrangements with processors, to significantly reduce milk production.

From a market perspective, a buy-out scheme provides dairy farmers with the wrong price incentives. Farmers will continue to produce too much milk even if there is a market imbalance. That is, for a farmer the optimal strategy, when there is a buy-out scheme in place, is to continue producing milk regardless of milk market price signals. The farmers know that the milk price will not drop dramatically because the buy-out scheme will compensate farmers that reduce their milk production. That is producing as much milk as possible regardless of price signals is the optimal strategy; such strategy ensures that the farmer will, when he does not opt for the buy-out scheme, receive “the new higher established market price (caused by the buy-out scheme),” or if he decides to reduce milk production, the compensation price. That is, the buy-out scheme hinders farmers to adjust their production based on supply and demand. This will hinder structural changes in the dairy sector having a negative impact on its competitiveness.

In a possible buy-out scheme, three policy parameters are crucial: The price compensation level, the duration of the scheme and the magnitude of the scheme in terms of kilograms milk that are “taken out of the market”. These three parameters must be determined by the buy-out scheme administrator.

What is the correct compensation price level? Is it the cost price? But then, what is the cost price for milk? The cost price for milk is different for different regions. The question then is, how can the administrator deal with this heterogeneity? Should the compensation price be region-specific? But that could create an unfair playing field and inhibits competition and hence the competitive strength of the EU dairy sector.

The duration of the buy-out scheme. How long can the administrator (or if financed through a level by farmers) finance such a scheme? If the administrator has a budget of X Euros, the market will know how long the administrator can continue to compensate farmers for not producing milk. That is, market participants will know when the administrator has to stop the buy-out scheme because the administrator cannot finance it anymore. Market participants will capitalise on this knowledge and will be able to squeeze the market. While the buy-out scheme may be “interpreted as an exceptional tool to stabilise the market, proposed in the single CMO article that would allow milk producers, on a voluntary basis, to reduce their deliveries against compensation”, the administrator will not know **a priori** how long the milk markets will be in crisis. In addition, what is a “crisis”?

Magnitude: How many kilograms milk are taken out of the market? How does the administrator know how much milk production reduction is needed to obtain a milk market price that satisfies the criteria of the administrator? Milk markets are dynamic and more and more international. It seems very difficult to find the right magnitude because of the continuously changing supply and market conditions.

International aspects. A buy-out scheme would only have any impact on the EU milk price if during such buy-out scheme, no milk or milk products are allowed to be exported or imported in the EU, otherwise the buy-out scheme will not be effective as milk and milk products from outside the EU may fill the production gap caused by the scheme.

### 3.5 Conclusion and policy recommendations drawn directly from the analysis

#### 3.5.1 Analysis criteria summarised

*Question:*

How could a possible buy-out scheme be operated in a workable and effective way?

#### 3.5.2 Hypotheses and conclusions per theme

##### 1. Effectiveness of buy-out scheme under normal circumstances, and in crisis events will be low

The effectiveness of a buy-out scheme under normal circumstances, and in crisis events will be low because the organisation of such a scheme is almost impossible. The main challenge is that the administrative body must

decide when, at what price level and for how long farmers must be compensated not to produce milk. Determining these three parameters is extremely difficult for the reasons outlined above.

#### *2. Efficiency of buy-out scheme is low*

The idea that the administrator knows when to activate this scheme and at what compensation level and for how long is incorrect: the administrator cannot for two reasons: (1) nobody can predict market prices and as such a (long-term) downward price trend is devastating for the scheme, and (2) the market knows the position of the administrator and hence traders are going to capitalise on it.

#### *3. The influence of an intervention price (buy-out scheme) as a free “put” option for producers in a free market on private market initiatives will have a negative impact on the supply-demand balance (See Chapter 2)*

The buy-out scheme will have a negative impact on private markets initiatives. A buy-out scheme is effectively giving producers a free put option. Hence there is, depending on the compensation level, less incentive for producers to use risk management instruments.

#### *4. Hedging efficiency and effectiveness of a futures/options market for milk and milk products in Europe when a buy-out scheme is in place will be low, that is a buy-out scheme will hinder the development of market-based risk management instruments*

The hedging effectiveness will be negatively influenced by a buy-out scheme. The reason is that by intervening in the market, the spot-futures price relationship becomes less predictable and hence the basis risk increases, lowering the hedging effectiveness.

#### *5. A buy-out scheme is not viable and its impact on market prices, production volume and production structure is not effective or efficient*

A buy-out scheme is not viable, because it is not effective and even more important not efficient. As said before, a buy-out scheme effectively provides farmers a free put option that has an unknown expiration date. From the finance literature, we know that such an option may have a very large value. This value has to be paid by the option writer: the buy-out scheme administrator. Hence the costs of such schemes can be very high.

### **3.5.3 Policy recommendation**

As outlined above, a buy-out scheme is not viable because one cannot design a scheme that is effective and efficient because (1) the administrator is not a true market actor (nor producer nor consumer), (2) nobody can predict price trends, when a negative price trend occurs, costs can be very substantial, (3) the administrator cannot determine the magnitude of the scheme (how much milk production reduction is enough to meet the goals of the administrator?) because milk markets and milk product markets are dynamic and international: how much reduction in milk production yields a satisfactory price? (4) the administrator cannot determine the duration of the scheme: one cannot predict how long a relative low price (caused by supply and demand imbalances) will occur (that is, how long will a crisis occur?) (5) the administrator will have a very difficult time in determining the correct price compensation level; should it be based on the cost price? Is it different for different Member States? (6) the buy-out scheme will decrease the competitive strength of the EU dairy sector; wrong and artificial price signals are introduced by the buy-out scheme (7) the market participants will know the position of the administrator and will squeeze the market and (8) the free put option (with unknown expiration date) implicitly given to producers by having a buy-out scheme may have a very large value (simple option pricing theory) and is implicitly paid by the buy-out scheme (9) there are possible temporary negative spill-over effects for the meat markets.

In the case a buy-out scheme would be implemented, clear objective (non-political) decision rules should be the backbone of the system and must be communicated to all market participants. Rules regarding how price levels are derived (what observable criteria are being used), and duration of buy-out scheme (what observable factors drive the duration, which also include the total budget that is allocated). In addition rules must be developed that determine how the rules regarding price level and duration will change in case markets and situations are structural changing. Hence such a system must be a mechanic, not political driven to at least avoid somewhat the drawbacks of such a system as outlined above. In addition such a system must take into account the spill-over effects that it may have (impact on meat markets). Furthermore, there should be strong support of dairy farmers for this system in the case that such system is financed by the dairy farmers themselves. It will take a lot of research time to design such a system (that is, to develop the decision rules) and to effectively implement it.

### 3.5.4 General conclusion and discussion

This expert report argues that market-based risk management instruments, such as commodity futures contracts may be interesting risk-management instruments for dairy producers after the milk quota have been abolished, with the potential of reinforcing the entire agricultural complex. However, for producers to benefit from for example, futures contracts, those instruments need to be (re)designed to offer higher levels of hedging effectiveness than they do today.

Profit margin volatility is the most important issue that dairy producers and processors face in a non-quota regulatory framework. The reason is that there is a low natural hedge in the portfolio of dairy farmers and, compared to the past, they have a relatively weak balance sheet, and hence price and margin risks translate quickly into financial risk, e.g., the chance of default.

Price and income risk in agriculture are related to price and revenue risk in the upstream and downstream industries. As supply chains gain importance, the question arises where most of the price and income risk is located. This issue is particularly important for dairy producers, who, on average, have a low equity position and whose capacity to absorb price risk is thus limited. Therefore, dairy producers have an even greater need for risk-management tools. The welfare effects of such tools are substantial, not only at the producer level, but for the entire agribusiness sector. Since the agricultural sector is so prominent in many rural areas in the EU, it seems particularly important to develop risk-management tools that fit the (hedging) needs of producers. In addition, these price risk management instruments make the market transparent thereby eliminating price information asymmetries, thereby causing a better market power balance as identified in Chapter 2. Furthermore, market-based price risk management instruments are a good substitute for a buy-out scheme. Since market-based price risk management instruments are truly market-based, the right incentive structure will occur in which farmers can manage their tailor-made risk (based on their financial situation and risk preferences) in the most cost-efficient way. The reduction in the cost of capital that can be obtained by farmers when they use these instruments properly can be used to make the necessary investments to remain competitive at the world stage. Clearly, a road map is called for to help farmers prepare for a non-quota regulatory period, and to help the dairy sector to transform it such that volatility and market competition become opportunities instead of threats. A coordination role – the coordinator to develop and execute the aforementioned road map – may be played by the EU.



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**Appendix 1 Data for the analysis criteria of the first theme “Market forces”***Data for the analysis criteria “Market power in terms of information availability”*

Reference	Data
TADC item #103 CAP Table 2.30	National number of companies producing milk
TADC Table 13 TADC Table 17 TADC Figure 4 TADC Figure 11 CAP Table 2.12 CAP Figure 2.6 AGRI slides 2-6	National and regional volume of milk and milk products produced
TADC Table 14 TADC Figure 5 CAP Table 2.31 CAP Table 2.32	National production volume capacity per farm
CAP Table 7.18 CAP Table 7.19 CAP Table 7.20 CAP Figure 7.3 CAP Table 8.2	National input costs per farmer per major type of input
TADC Table 25 CAP Figure 6.1 CAP Table 6.2 DASH Chart 7 DASH Chart 8 AGRI Slides 6-22	National farm gate milk price
TADC Table 16 TADC Figure 4 TADC Figure 5 CAP Table 7.10	National aggregate productivity
TADC Table 16 TADC Figure 4 TADC Figure 5 CAP Table 2.4	National aggregate cow yield per farm
TADC Table 42 TADC Table 43 TADC Table 44 TADC Table 45 TADC Table 46 TADC Table 47 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National number of companies processing milk and milk products
TADC Table 13 TADC Table 17 TADC Table 43 TADC Figure 28 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National volume of milk and milk products processed per company
TADC Table 43	National processing volume capacity per company
TADC Table 28 TADC Table 29 TADC Table 30 TADC Table 32 TADC Table 33 CAP Table 2.27 CAP Table 2.28	National milk and milk product consumption
TADC Table 26 TADC Figure 24 TADC Table 27 CAP Figure 7.2	Farmer share of the consumer milk price

*Data for the analysis criteria “Market power in terms of price-bargaining power”*

Reference	Data
TADC item #103 CAP Table 2.30	National number of companies producing milk
TADC Table 42 TADC Table 43 TADC Table 44 TADC Table 45 TADC Table 46 TADC Table 47 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National number of companies processing milk and milk products
Data retrieved from Eurostat	National Gini coefficient for farmers and processors

*Data for the analysis criteria "Extent of transparency and integration of the supply chain"*

Reference	Data
TADC item #219 TADC item #220 TADC Figure 25 TADC Figure 29 CAP p. 62	European and national market share cooperatives

*Data for the analysis criteria "(Expected) Consolidation (restructuring) of farmers and processing industry"*

Reference	Data
TADC item #103 CAP Table 2.30	National number of companies producing milk
TADC Table 13 TADC Table 17 TADC Figure 4 TADC Figure 11 CAP Table 2.12 CAP Figure 2.6 AGRI slides 2-6	National and regional volume of milk and milk products produced
TADC Table 42 TADC Table 43 TADC Table 44 TADC Table 45 TADC Table 46 TADC Table 47 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National number of companies processing milk and milk products
TADC Table 13 TADC Table 17 TADC Table 43 TADC Figure 28 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National volume of milk and milk products processed per company
TADC Table 25 CAP Figure 6.1 CAP Table 6.2 DASH Chart 7 DASH Chart 8 AGRI Slides 6-22	National farm gate milk price
TADC Table 26 TADC Figure 24 TADC Table 27 CAP Figure 7.2	Farmer share of the consumer milk price
TADC item #219 TADC item #220 TADC Figure 25 TADC Figure 29 CAP p. 62	European and national market share cooperatives
TADC Figure 27 TADC Table 39 TADC Table 40 CAP Table 7.9 CAP Figure 8.3	European and national average gross margin over operating cost (including and excluding decoupled payments and national aids)

*Data for the analysis criteria "International milk and milk-product markets" and "Expected milk and input price volatility at farm level"*

Reference	Data
TADC Table 25 CAP Figure 6.1 CAP Table 6.2 DASH Chart 7 DASH Chart 8 AGRI Slides 6-22	National farm gate milk price
TADC item #150 CAP Figure 6.5 CAP Table 6.6 CAP Figure 6.7 DASH Chart 7 DASH Chart 8 AGRI Slides 6-22	European and national volatility of milk price and milk products
CAP Table 7.18 CAP Table 7.19 CAP Table 7.20 CAP Figure 7.3 CAP Table 8.2	National input costs per farmer per major type of input

**Appendix 2 Data for the analysis criteria of the second theme “Organisational forces”***Data for the analysis criteria “Heterogeneity of the organisation of milk producers in the Member States”*

Reference	Data
TADC item #103 CAP Table 2.30	National number of companies producing milk
TADC Table 13 TADC Table 17 TADC Figure 4 TADC Figure 11 CAP Table 2.12 CAP Figure 2.6 AGRI slides 2-6	National and regional volume of milk and milk products produced

*Data for the analysis criteria “Heterogeneity of the organisation of the milk industry in the Member States”*

Reference	Data
TADC Table 42 TADC Table 43 TADC Table 44 TADC Table 45 TADC Table 46 TADC Table 47 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National number of companies processing milk and milk products
TADC Table 13 TADC Table 17 TADC Table 43 TADC Figure 28 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National volume of milk and milk products processed per company

*Data for the analysis criteria “Influence of POs and IBOs on the negotiation power of the respective partners and subsequently on price setting and price smoothing”*

Reference	Data
TADC item #219 TADC item #220 TADC Figure 25 TADC Figure 29 CAP p. 62	European and national market share cooperatives
TADC Table 26 TADC Figure 24 TADC Table 27 CAP Figure 7.2	Farmer share of the consumer milk price

**Appendix 3 Data for the analysis criteria of the third theme “Policy measures”***Data for the analysis criteria “Influence of policy measures proposed in the Milk Package<sup>40</sup> under normal circumstances and in the event of a crisis situation”*

Reference	Data
TADC item #32 TADC item #52 TADC item #57 TADC item #83 TADC item #91 TADC item #92 TADC Table 9 CAP p. 190 CAP p. 217	Consequences of national quota rents, (removal of) milk quotas, subsidised exports, import protections, public intervention, direct payments and POs

*Data for the analysis criteria “Impact of grain, cereal and forage prices on milk production and milk prices”*

Reference	Data
Datastream	Futures prices for milk, corn, wheat, soybeans and oats
CAP p.194	Linking feed and milk prices

<sup>40</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:094:0038:0048:EN:PDF>

*Data for the analysis criteria "Margin risk management by farmers"*

Reference	Data
<b>EUFADN</b>	Feed costs and farm net income
<b>CAP Table 7.18 CAP Table 7.19 CAP Table 7.20 CAP Figure 7.3 CAP Table 8.2</b>	National input costs per farmer per major type of input
<b>TADC Figure 27 TADC Table 39 TADC Table 40 CAP Table 7.9 CAP Figure 8.3</b>	European and national average gross margin over operating cost (including and excluding decoupled payments and national aids)
<b>CAP p. 70</b>	Evolution of farm holdings in LFA regions



#### Appendix 4: Gini coefficient calculation

To calculate the Gini coefficient, the cumulated proportion of dairy farm holdings (organised from the lowest to the highest economic size) per Member State is calculated for each economic size category. The smallest category encapsulates the share of farm holdings having an economic size smaller than 2,000 euros, followed by categories ranging from 2,000 to 3,999 euros, 4,000 to 7,999 euros, 8,000 to 14,999 euros, 15,000 to 24,999 euros, 25,000 to 49,000 euros, 50,000 to 99,999 euros, 100,000 to 249,000 euros, 250,000 to 499,999 euros. The largest category captures the share of farm holdings with an economic size of 500,000 euros or more. Then, the cumulated proportion of economic size per Member State is measured by multiplying the number of farm holdings per category per Member State by the middle point of each economic size category (with an exception for the last category where the border value is used due to uncertainty about the middle point of the economic size of this category). The middle points used for each category are (from smallest to largest category): 1,000, 3,000, 6,000, 11,500, 20,000, 37,500, 75,000, 175,000, 375,000 and 500,000 euros.

The Gini coefficient is calculated according to the following formula:

$$G_1 = 1 - \sum_{k=1}^n (X_k - X_{k-1})(Y_k + Y_{k-1})$$

In which  $G_1$  is the Gini coefficient,  $(X_k - X_{k-1})$  is the proportion of farm holdings per category,  $Y_k$  and  $Y_{k-1}$  are the cumulated proportions of economic sizes per category. Note, that both  $X$  and  $Y$  categories are ordered in a non-decreasing order.

The Gini coefficient for dairy enterprises collecting milk and milk collection centres is calculated in a similar fashion as the Gini coefficient for dairy farm holders. The cumulated proportion of enterprises/centres per category of milk collection and the cumulated proportion of volume collected per category have been calculated. Enterprises in the smallest category of collect less than 5,000 tonnes (t) per year, followed by 5,001 to 20,000t, 20,001 to 50,000t, 50,001 to 100,000t, 100,001 to 300,000t, 300,001 to 400,000t, 400,001 to 500,000t, 500,001 to 750,000t, 750,001 to 1000,000t. Enterprises in the largest category collect over 1000,000t per year. The collection centres in the smallest category collect less than 1,000t per year, followed by 1,001 to 5,000t, 5,001 to 20,000t, 20,001 to 50,000t, 50,001 to 100,000t. Collection centres in the largest category collect over 100,000t on an annual basis. Midpoints are 2,500, 12,500, 35,000, 75,000, 200,000, 350,000, 450,000, 625,000, 875,000 and 1000,000t for the categories of dairy enterprises collecting milk and 500, 3,000, 12,500, 35,000, 75,000 and 100,000t for the categories of collection centres.

The Gini coefficient is calculated according to the following formula:

$$G_1 = 1 - \sum_{k=1}^n (X_k - X_{k-1})(Y_k + Y_{k-1})$$

In which  $G_1$  is the Gini coefficient,  $(X_k - X_{k-1})$  is the proportion of collection centres/ enterprises per category per Member State,  $Y_k$  and  $Y_{k-1}$  are the cumulated share of volume collected per category per NUTS region. Note that both  $X$  and  $Y$  categories are ordered in a non-decreasing order.

**Appendix 5 Data for the analysis criteria to review the second question posed by DG ARG1***Data for the analysis criteria “Change in added value per kilogram of milk”*

Reference	Data
TADC Table 13 TADC Table 17 TADC Figure 4 TADC Figure 11 CAP Table 2.12 CAP Figure 2.6 AGRI slides 2-6	National and regional volume of milk and milk products produced
TADC Table 13 TADC Table 17 TADC Table 43 TADC Figure 28 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National volume of milk and milk products processed per company
Eurostat DASH Chart 7 DASH Chart 8 AGRI Slides 6-22 AGSTAT	European market prices for milk, SMP, WMP, butter, cheddar, edam and whey powder

*Data for the analysis criteria “Change in portfolio of milk products (share of cheese, milk powder etc.)*

Reference	Data
TADC item #103 CAP Table 2.30	National number of companies producing milk
TADC Table 13 TADC Table 17 TADC Figure 4 TADC Figure 11 CAP Table 2.12 CAP Figure 2.6 AGRI slides 2-6	National and regional volume of milk and milk products produced
TADC Table 42 TADC Table 43 TADC Table 44 TADC Table 45 TADC Table 46 TADC Table 47 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National number of companies processing milk and milk products
TADC Table 13 TADC Table 17 TADC Table 43 TADC Figure 28 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National volume of milk and milk products processed per company

*Data for the analysis criteria “Evaluation of the speed of farmers and processors to react to market changes (market orientation and innovativeness)”*

Reference	Data
CAP p. 61 CAP Table 10.2 CAP Table 10.3 CAP Table 10.4 CAP Table 10.5 CAP Figure 10.1	Excess stock of milk products over time

*Data for the analysis criteria “Financial resilience of farmers after the milk quota is abolished”*

Reference	Data
TADC Figure 27 TADC Table 39 TADC Table 40 CAP Table 7.9 CAP Figure 8.3	European and national average gross margin over operating cost (including and excluding decoupled payments and national aids)

*Data for the analysis criteria “International positioning of European milk and milk products with respect to the world market in terms of production costs and intangible assets”*

Reference	Data
CAP Figure 8.5 CAP Figure 8.6	European and competitors’ average milk production cost
TADC Figure 10 CAP Table 2.17	Quality of milk

*Data for the analysis criteria “How far will dairy prices have to deviate between international markets before trade will occur between the different international dairy markets?”*

Reference	Data
TADC Table 18 TADC Figure 12 TADC Figure 13 TADC Figure 14 AGRI Slides 23-34	National European imports and exports of milk products

*Data for the analysis criteria “How much restructuring is required to be competitive, and where?”*

Reference	Data
TADC Table 16 TADC Figure 4 TADC Figure 5 CAP Table 7.10	National aggregate productivity
TADC Table 16 TADC Figure 4 TADC Figure 5 CAP Table 2.4	National aggregate cow yield per farm
TADC Table 14 TADC Figure 5 CAP Table 2.31 CAP Table 2.32	National production volume capacity per farm
CAP Table 7.18 CAP Table 7.19 CAP Table 7.20 CAP Figure 7.3 CAP Table 8.2	National input costs per farmer per major type of input

*Data for the analysis criteria “What policy measures are most effective to foster fast and prosperous development of underdeveloped regions?”*

Reference	Data
TADC Table 41 CAP Figure 6.2 CAP Table 6.3 CAP Table 7.13 CAP Table 7.14 CAP Table 7.16 CAP Table 7.17 CAP p. 190	Average EU national coupled payments, decoupled payments, subsidies and national aid receipts

*Data for the analysis criteria “Where happens production now? And where will it be in the future?”*

Reference	Data
TADC Table 13 TADC Table 17 TADC Figure 4 TADC Figure 11 CAP Table 2.12 CAP Figure 2.6 AGRI slides 2-6	National and regional volume of milk and milk products produced
TADC Table 13 TADC Table 17 TADC Table 43 TADC Figure 28 CAP Table 2.29 CAP Table 11.2 CAP Table 11.3 CAP Table 11.4	National volume of milk and milk products processed per company

**AGRI-2012-C4-04 - Analysis on future developments in the milk sector**

Prepared for European Commission - DG Agriculture and Rural Development

Opinion Report

Expert Name: Prof. Dr. Ludwig Theuvsen

**Theme 1: Market balance and competitiveness**

## 1. Introduction

The following report is an independent expert opinion on the status quo and future of the European milk sector. It presents personal opinions; nonetheless, it is based on scientific expertise, existing empirical studies and model-based projections and own recent empirical results. Furthermore, the report also reflects the author's (and the author's working groups') long-standing experience with various managerial and structural aspects of dairy farming and milk processing in the EU.

The opinion report looks at the current situation in the milk sector and recent developments; for instance, regional shifts of dairy farming, but tries to avoid obvious duplications of the report prepared by EY. For this reason, the report sometimes refers to the descriptive and analytical data prepared by EY and occasionally quotes from this report. But it also aims at providing additional perspectives, for instance by referring to strategic management issues in the dairy industry. From this starting point, the report derives hypotheses concerning the future development of the sector in the post-quota era and recommendations for political measures, which are considered necessary for giving the dairy sector a stable framework after the end of the quota system and avoiding structural distortions and chaotic and unplanned developments of the sector.

The opinion report is written from a managerial perspective. This means that everything which happens in the sector is conceptualised as the outcome of farmers' and managers' decisions. From this perspective, the net exporting position of the EU, for instance, is a result of dairy company managers' decisions to enter international markets and diversify the spectrum of regional markets their companies serve. In a similar vein, regional shifts of dairy farming from less competitive to more competitive regions are not a law of nature but the outcome of farmers' decisions to invest into dairy farming or to disinvest as well as young farmers' decisions to continue or abandon their families' farming business.

Although based on professional expertise, empirical data and study results, some caveats apply to this report. The end of the milk quota system represents a structural break. Despite the soft landing approach applied by the EU, this break impedes simple extrapolations of prior developments. Furthermore, it is quite well-known from earlier studies of the EU agricultural sector that farmers' (and food industry managers') decision behaviour is characterised by the same anomalies as everyone else's decision behaviour. Therefore, unforeseen developments may be triggered by the end of a quota system which model-based projections can only very limitedly take into account.

## **2. How will the balance between supply and demand be affected by market forces, organisational systems of the supply chain (in particular POs and IBOs) and policy measures, including market support mechanisms, in a non-quota regulatory framework?**

### **2.1 Interpretation and comprehension of the key terms of the evaluation question**

#### Market balance and market forces:

Future market balance mainly depends on market forces, i.e., the development of supply and demand of milk and milk products.

#### Supply:

Supply includes the supply of raw milk by farmers and the supply of dairy products by processors. The product spectrum of dairy companies is subject to strategic decisions of firm managers. Therefore, a standardised input factor, such as raw milk can be transformed in a very broad spectrum of highly diversified outputs. Since convergence rates differ considerably between different dairy products (for instance, fresh or UHT milk on the one side and soft and hard cheeses on the other side), supplies of raw milk and dairy products can strongly diverge, both in terms of quantity and value.

#### Demand:

Demand comes from EU and non-EU-markets. Both sources of demand for dairy products have tended to develop very differently in recent years.

#### Organisational systems:

Organisational systems include all measures that have been or could be implemented to coordinate the various actors along the milk supply chain (vertical organisation) and on different levels of the supply chain (horizontal organisation) (Theuvsen 2003). From an organisational point of view, the vertical relationships between dairy farmers and dairy companies are most important (Deimel et al., 2008). The vertical organisation of milk supply chains is very much based on hybrid types of organisational structures, such as longer term contracts and/or cooperative agreements (Steffen et al., 2010).

#### Producer organisation:

A producer organisation (PO) is a horizontal form of organisation that helps farmers to coordinate their interests. All in all, there are very diverse types of producer organisations. Some mainly act as an instrument of countervailing power vis-à-vis more concentrated processors and retailers. Therefore, these organisations mainly play an important role during price negotiations with processors. Other producer organisations mainly coordinate processors and producers and help both sides to meet higher product or process quality standards. This type of organisation plays an important role in providing more differentiated products to European consumers at higher prices.

#### Interbranch organisations:

Interbranch organisations (IBOs) can carry out a wide spectrum of activities. They can, for instance, standardise contracts, ensure market transparency, coordinate research, conduct product development, improve knowledge exchange, or deliver wider CAP goals, such as environmentally friendly or, more generally, more sustainable production.

### Policy measure:

Policy measures are instruments – implemented in most cases by the EU – in order to ensure the accomplishment of certain political goals which are not taken into account by market forces (for instance, income stabilisation, limitation of milk price volatility, etc.).

## **2.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used**

It is assumed that EU and non-EU demand can only very limitedly be influenced by actors along the EU milk supply chain, for instance through marketing activities or product innovations. Therefore, demand can be more or less treated as an exogenous variable and the analysis of the future development of the dairy sector can primarily focus on supply-side effects.

From a supply chain management perspective, both dairy farmers and dairy companies have to be considered when assessing the future development of quantities delivered. This analysis has to take into account the strong linkages between production and processing: Without locally available competitive suppliers of raw milk, processors lack sufficient input at competitive prices and presumably will have to shut down production sites. Similarly, dairy farmers lack the opportunity to sell their raw milk if no competitive dairy companies can be reached within a reasonable distance. Therefore, only if production and processing are both competitive and, for instance with regard to quantities, develop into similar directions, milk production can successfully develop in a specific region or EU Member State. Vice versa, if the milk sector declines in a specific region or Member State, this is the outcome of a lack of competitiveness of milk production or processing or both.

Dairy farmers are price takers. Therefore, their competitiveness mainly depends on their ability to keep production costs below medium-term average milk prices. Owing to high investments mainly into buildings and milking technology, dairy farming is subject to considerable economies of scale (MacDonald 2012). Therefore, farm size has turned out to be an important determinant of cost competitiveness and, thus, success factor in dairy farming. Besides farm size, there are more determinants of costs of milk production such as labour costs and land costs (including opportunity costs of land). Despite the important role of costs, it should be noticed that in some highly differentiated market niches, other factors than costs can become more decisive factors for competitiveness, for instance artisan production methods, traditional recipes, more sustainable production technologies, higher animal welfare standards, or region-of-origin.

Whether or not farmers are willing to invest into dairy operations is not only determined by their cost competitiveness or the profitability of dairy farming but also by the attractiveness of alternative investments available to them. Empirical studies show that high returns on investments in alternative farm business operations, for instance biogas production, motivate farmers to redirect investment funds into these alternative investment opportunities (and, thus, refrain from expanding milk production) or even to quit dairy farming (Emmann and Theuvsen 2012; Feil 2011).

From a contingency theory perspective in strategic management (Zeithaml et al., 1988), the competitiveness of dairy companies mainly depends on their strategies and the fit between these strategies and firm (for instance, size, financial power or management know-how) and market characteristics (such as market size, customers' willingness to pay for higher qualities, etc.). Dairy companies have to define their corporate strategies (i.e., their product and market spectrum) as well as their competitive strategies (i.e., how to compete in a specific market). The successful implementation of corporate and competitive strategies depends on a fit between a firm's strategies and firm and market characteristics. Therefore, successful strategic management requires a careful analysis of external strategic opportunities as well as a firm's resources and capabilities (Johnson et al., 2011; Grant and Nippa 2006).

Owing to the division of labour in dairy chains, there is a need for coordination between farmers and processors. Coordination in organisational systems (in this case: supply chains) mainly takes place through structural mechanisms (for instance, contracts or vertical (dis-)integration) and communication (i.e., the exchange of information between supply chain partners) (Frese et al, 2012). Organisational systems, thus, have to be assessed regarding their potential contribution to coordinating critical relationships in the milk supply chain.

Policy measures shape the framework under which markets develop and supply chain relationships take place. Under widely liberalised market conditions, policy measures have to be evaluated with regard to their influence on the future development of sectors and markets.

To summarise, the following analysis criteria are paramount:

- The international competitiveness of the EU dairy sector
- The cost competitiveness of EU milk production
- Corporate and competitive strategies of dairy companies
- The contribution of organisational systems to the coordination of supply chain relationships
- The effects of policy measures on the future development of the dairy sector

The analysis is based on secondary data (as summarised in, for instance, EY 2013) and the results of empirical studies of the EU dairy sector. The validity of the quantitative and qualitative information used is generally good. Some minor caveats apply to the analysis of the corporate and competitive strategies of dairy companies in the EU since there is no official statistics available, which provides insights into how processors from the EU define their product and market spectrum and compete on international markets for dairy products.

### **2.3 Description of the method(s) used and an indication of its (their) limitations**

The at hand analysis combines supply chain management and strategic management perspectives. A supply chain management approach takes into account the structure of supply chains which are characterised by the horizontal and vertical division of labour along supply chains and the exchange of information between supply chain partners. It assumes that the future development of an industry is determined by the competitiveness of each stage of the supply chain as well as the quality of the interplay between supply chain partners. A strategic management approach applies a microeconomic approach which perceives the development of an industry as the outcome of farm and firm decisions vis-à-vis their economic and global environment.

From a methodological point of view, the analysis of the (cost) competitiveness of milk production in EU Member States is based on studies which have taken into account official statistics and other publicly available data sources (such as reports published by the European Dairy Farmers (EDF) group or the IFCN Dairy Network).

The description of the corporate and competitive strategies of dairy companies is based on case studies and other empirical and desk research which were recently conducted by the expert's research group. These qualitative studies also include a description of relevant firm characteristics. Some relevant firm characteristics, for instance marketing know-how or innovativeness, are very difficult to evaluate from an outside perspective.

The validity and reliability of data on EU dairy farming is good. Some caveats apply to relevant data on dairy companies, where the availability of valid and reliable data sources is limited. Furthermore, supply chain management and strategic management perspectives use quantitative data. But in the end, both approaches rely on qualitative re-interpretations of quantitative data to derive conclusions concerning future competitiveness and market developments. This qualitative step of the analysis can lead to misinterpretations, even if it is carefully and knowledgeably done.

## 2.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

### 2.4.1 Market forces

#### ***H. 1: Under liberalised market conditions, the competitiveness of dairy farms and dairy companies becomes more important.***

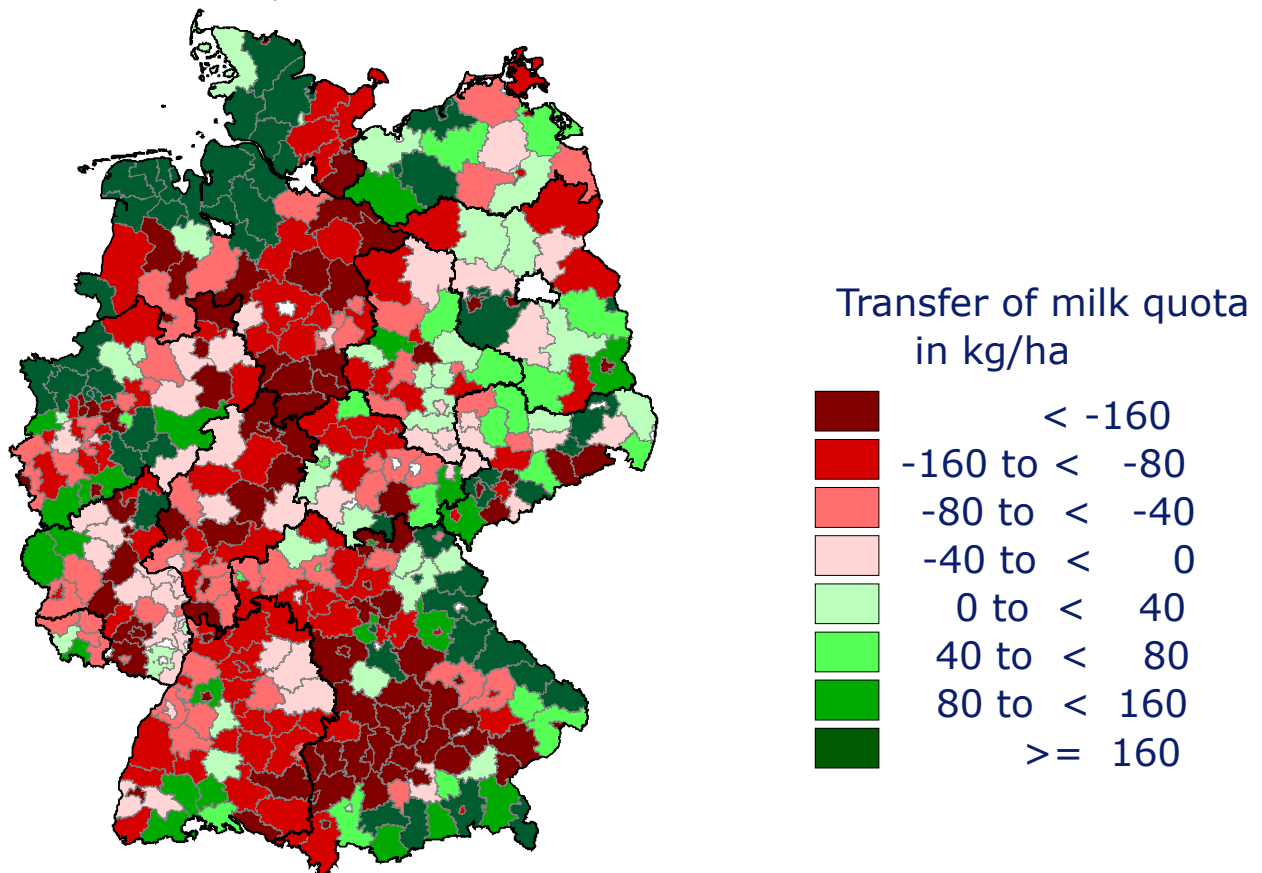
The milk quota system was established in 1984 in order to restrict milk production in the EU Member States. A fixed production quota for milk was attributed to each EU Member State. Member States found different solutions to handle the quota restrictions. France, for instance, administered the production quota mainly at the dairy company level whereas Germany distributed its quota to individual dairy farmers. In the latter case, farmers who delivered more raw milk than the quantity defined by their farms' quota were sanctioned through a so-called super levy, which made excess production financially highly unattractive. The milk quota system was not only a contribution to limiting the output of the EU dairy sector and, thus, helped to dry EU milk lakes and truncate butter mountains. It also slowed down the pace of structural changes in the EU milk sector since it prevented production from easily being shifted from one region to another. The smaller the quota regions were defined in the EU Member States and the more restrictive quota trade was organised, for instance through coupling quota to land, farms or livestock (EDF 2009), the stronger was the structure-conserving effect of the milk quota system. This helped to keep less competitive regions (and farms and dairy companies) in production and did not allow more competitive regions (and the farms and dairy companies located in these regions) to fully capitalise on their competitive advantage. This, of course, had effects on prices for milk and dairy products, the international competitiveness of dairy products from the EU and welfare: "after a quota imposition, low-cost efficient milk production is impeded at the expense of high-cost inefficient production" (Vavra 2006: 2).

By and by, the milk quota system in the EU was liberalised. In Germany, for instance, until 2007 there were 21 quota regions and production rights could only be traded within these regions but not between the 21 regions. This had a very strong structure-conserving effect since production was not allowed to move to more competitive regions; only changes in farm structure within the 21 regions were possible. In 2007, the former 21 regions were merged into two remaining quota regions ("East" and "West"), which allowed more flexible transfers of production rights. In France, quota trade was even more restricted due to the need to get the permit of a regional commission which carefully took into account criteria, such as farm structure, farm size, neighbouring dairy farmers, etc. Some flexibility was incorporated into the milk quota system through the permission to balance production accounts at the dairy company level and at the national level. To a certain extent, this allowed farmers and regions willing to produce more than their quota to partially replace farmers and regions where the quota was under-delivered.

Regardless of how the quota system was managed at the national level in EU Member States, it has always restricted the free movement of milk production not only between EU Member States but also between smaller regions within Member States and, even more important, between more competitive and less competitive farmers (and dairy companies). Until 2007, the Bavarian milk quota, for instance, could not be sold or rented to Northern German farmers. Other, although not all, Member States had introduced similar kinds of restrictions concerning quota trade (EDF 2009). Therefore, the most competitive farmers often had to defer their growth strategies due to the EU milk quota system; instead, less competitive farmers had the chance to stay in business. Or more competitive farms had to buy or to rent milk quota which considerably increased their production costs and strongly reduced their competitive advantage. After the introduction of a more liberal regime for trading milk quota, the so far more or less invisible structure-conserving effect became visible very quickly. After the liberalisation of quota trade, milk production quite promptly moved from less competitive to more competitive regions. Figure 1 illustrates this development by referring to changes in milk production in German counties between 2007 and 2012. Light and dark green colours represent areas that have attracted more milk quota during this period, whereas production decreased in light and dark red areas. Even more pronounced effects of a full liberalisation of the milk market can be expected in EU Member States, which so far have more thoroughly restricted quota trade (for instance, France, Belgium or Slovakia). Here a liberalisation will have even stronger effects with regard to the movement of milk production.



**Figure 1: Movement of milk quota via quota exchanges in Germany after the liberalisation of quota trade (2007 to 2012; Source: Lassen 2013 based on data of the German Federal Ministry of Nutrition, Agriculture and Consumer Protection)**



For a better understanding of the movement of milk production after the liberalisation of quota trade, it is interesting to characterise winner and loser regions. In Germany, winner regions (for instance, Landkreis Cuxhaven in Northwestern Germany) and dairy farms located in these regions are characterised as follows (Lassen 2011):

- Above-average farm size (German average: 48 milk cows; Landkreis Cuxhaven: 77 cows)
- Fast growth of production at the farm and the regional level
- Located in lowlands where soil and climate conditions are more favourable for efficient fodder production
- Intensive milk production (year-round in-door housing of milk cows; high milk yields; intensive use of concentrated feed; use of highly productive breeds such as Holstein Friesian; implementation of latest innovation in production technology such as automated milking systems)
- High regional livestock density
- Low opportunity costs of land due to high shares of natural grassland, which is not suitable for arable farming and, thus, less affected by high opportunity costs or rising rents for leaseland due to higher world market prices for agricultural products.

On the other hand, regions where farmers sell milk quota and/or do not fully deliver the quantities allowed by current quota are in most cases characterised by:

- Smaller farm size (for instance, Landkreis Hildesheim: 33 cows)
- Fewer farms with growth strategies and less aggressive farm growth
- Decrease of regional production volume
- Mountainous landscape with limited opportunities for growing highly productive fodder plants, such as maize or high opportunity costs for land due to good soil qualities which allow the production of wheat, sugar beets, rapeseed or other profitable crops affected by rising world market prices

- Low or medium (and, in many cases, decreasing) regional livestock density
- Low to medium milk yields due, for instance, to the use of dual-purpose (milk and meat) breeds, such as Simmental breeds and an, all in all, somewhat less intensive way of milk production.

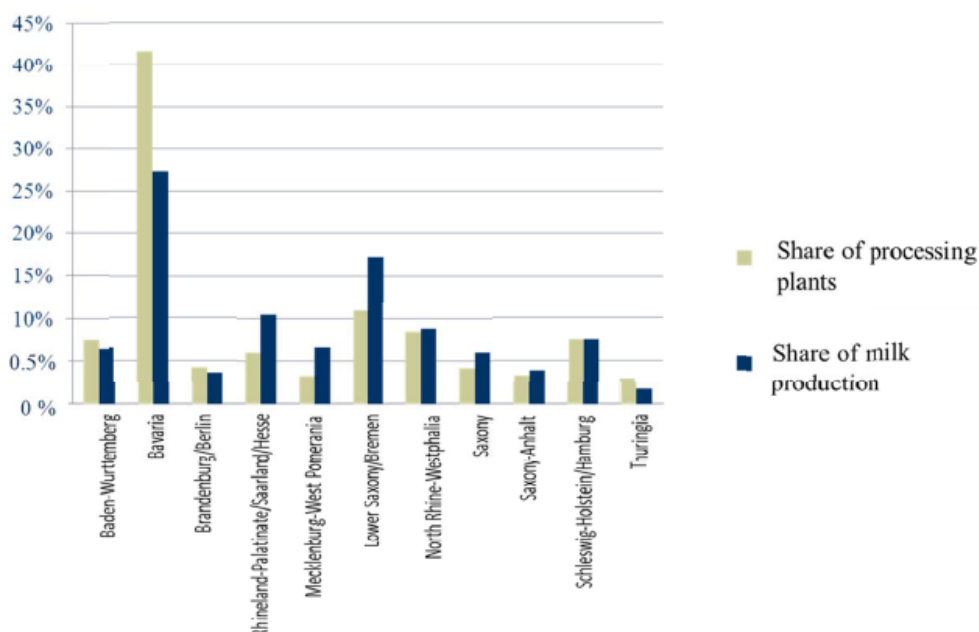
Dairy farms in regions with high opportunity costs for land often quit dairy production. In Germany, this is often the case where more profitable land use alternatives, such as biogas production have strongly gained relevance (Emmann and Theuvsen 2012). Table 1 compares two German counties with increasing (Landkreis Cuxhaven) and decreasing (Landkreis Hildesheim) milk production. Whereas Cuxhaven is a county with high shares of natural grasslands (where arable farming is impossible), Hildesheim is one of Germany's most productive arable farming regions where sugar beets and wheat are dominant crops.

**Table 1: Comparison of milk production in two German counties (Source: Landwirtschaftskammer Niedersachsen 2011)**

	County: Landkreis Cuxhaven	County: Landkreis Hildesheim
<b>Average herd size (cows)</b>	77	33
<b>Milk production (kg per ha)</b>	4.995	182
<b>Development of milk production (1991 to 2010)</b>	+47%	-45%

The situation at the farm level is very much paralleled by the situation in the dairy industry. Where milk production has increased due to favourable regional conditions, we often find large processors which have expanded their production capacities in recent years to cope with the growing milk quantities in their regions. The German states of Mecklenburg-Western Pomerania and Lower Saxony are typical examples where growing milk quantities have motivated dairy companies to invest into large, modern processing facilities. On the other hand, German regions with decreasing milk quantities, such as Baden-Wuerttemberg and parts of Bavaria are still characterised by a considerable number of small and medium-sized dairy companies which are now increasingly competing for scarcer raw milk supplies. Figure 2 illustrates that, for instance, the Bavarian share in milk processing sites is much higher than the region's share in milk production; this reflects the more medium-sized structure of the Bavarian dairy industry and an absence of pronounced growth strategies. Vice versa, the situation is different in Lower Saxony and Mecklenburg-Western Pomerania where the share of milk production is higher than the share of production sites. The latter reflects the growth strategies of dairy companies in these states due to the strong growth of dairy farming in their regions. The growth strategies have triggered higher investments; the outcomes of this are larger firm sizes and the use of more state-of-the-art technical equipment in dairy companies located in these states.

**Figure 2: Share of milk production and share of processing plants in selected German states (Source: Theuvsen 2010 based on Molkerei Industrie 2010)**



It is very likely that this development, i.e., the shift of production from less competitive to more competitive regions, will somewhat accelerate after the end of the milk quota system. As soon as the last restrictions have been abolished, the more competitive regions will gain market shares at the expense of less competitive regions. The latter will find it more and more difficult to compete with winner regions which are able to produce at lower costs. This trend will be strengthened by growing competitive pressures on dairy farms due to possibly decreasing milk prices after the end of the milk quota systems. More competitive farms will find it easier than less competitive farms to cope with decreasing milk prices. In a liberalised EU dairy sector, this development will more and more affect the regional distribution of milk production between EU Member States. Existing model-based projections have shown that the future development of dairy farming will be very diverse throughout the EU. Especially, those regions where quota rents are already low will strongly reduce their production whereas regions with positive quota rents will increase production and market shares (EY 2013). Witzke et al. (2009), for instance, propose that Austria, Belgium, Luxemburg and The Netherlands will significantly increase their milk production, whereas Denmark, Finland, Portugal, Sweden and the United Kingdom are expected to decrease their outputs.

Nonetheless, this development has its natural limits. Unlike pork and poultry production, dairy farming is closely linked to available land resources and the ability of farmers to produce roughage. Therefore, even more competitive regions cannot unlimitedly increase production. Other constraints such as limited access to debt capital and restricted availability of labour may also limit the expansion of milk production. Owing to recent shifts in the regional distribution of dairy farming, some of the more competitive regions, for instance, in the lowland areas close to the Northern Sea in The Netherlands, Germany and Denmark, have already utilised most of their production capacities. Furthermore, national and regional policies are often targeted at restricting a further growth of farm sizes and regional concentrations of livestock farming. These policies have already limited livestock farming in, for instance, The Netherlands; similar policies are now also more and more in place in other important milk producing countries, such as Germany. These and other restrictions leave room for milk production in less competitive regions so that it is very unlikely that the marginal supplier in the EU will be located in one of the most competitive regions. Nonetheless, despite these limitations to further shifts of milk production to more competitive regions, the least competitive regions will find it more and more difficult to compete with other regions. This can have strong effects on disadvantaged regions, such as mountainous areas and other marginal sites.

With regard to the future development of milk production in competing European regions, the competitive strategies of milk processors also have to be taken into account. Whenever processors are able to differentiate

their products and create a higher willingness to pay for differentiated product or process qualities, the role of cost competitiveness for the future development of milk production in a specific region will be reduced. There are interesting examples from, for instance, Austria, France, Italy or Bavaria that highly differentiated dairy products allow processors (and their suppliers) to stay in business although they are not able to compete on the basis of low costs.

***H. 2: The future development of the EU milk sector is very much determined by its international competitiveness.***

EU dairy farmers and processors serve domestic as well as international, third-country markets. Owing to widely saturated markets, ageing (and, in some cases, shrinking) populations and changing eating habits (for instance, growth of out-of-home market segments, growing popularity of vegan lifestyles, etc.), demand from several EU markets will remain weak in the future (BMELV 2008). This description is most applicable to Western and Southern European markets; in Central and Eastern Europe, some additional demand will result from future positive income developments so that these markets will provide additional growth opportunities and will be somewhat more attractive for European dairy companies (Pieniadz 2009). Furthermore, some selected markets segments such as cheese still show moderate growth rates at the EU-27 level (Lfl 2012).

Demand for dairy products in transformational and emerging markets, for instance the BRICS countries, including Russia and China, has been growing remarkably over the last decade. Russia has become one of the major importers of dairy products, such as cheese and butter, and remarkable changes in the consumption patterns of Chinese consumers have triggered a boom of the Chinese milk market. The latter as well as a lack of trust in domestic processors have helped to make China by far the largest importer of dairy products ([www.meine-milch.de](http://www.meine-milch.de)). Other countries, such as Algeria, Egypt, Saudi Arabia and Iran are often overlooked in descriptions of international market developments but are nonetheless very important net importers of dairy products. The EU dairy industry more and more participates in these positive market developments despite its still existing problems to compete with low cost producers from, for instance, Oceania. But in many non-EU countries, for instance China, European processors have been able to establish their products as premium alternatives to domestically supplied dairy products for more demanding high- and middle-income classes. These products do not exclusively compete on price but can be sold at higher prices due to higher product quality and/or better product differentiation and positive image effects (Gerlach et al., 2005). Beyond these higher-price market segments, the EU is also an important exporter of basic products, such as skimmed milk powder (SMP), whole milk powder (WMP), butter and whey ([www.meine-milch.de](http://www.meine-milch.de)).

Owing to its strong supply and the ability to implement successful internationalisation strategies that allow European processors to enter third-country markets, the EU has become an important net exporter of dairy products. In 2011, 3 million tons of dairy products were exported to non-EU markets. In milk equivalent, cheese (26 percent), SMP (18 percent) and WMP (13 percent) are the most important export products (Table 2). The total value of EU exports was more than 8.1 billion Euros in 2011 with cheese accounting for about 40 percent of the value of all exports. EU imports have sharply declined over the last decade and were down to only 206,000 tons in 2011. The value of imports was 618 million Euros; in 2011 cheese (67 percent) and butter (24 percent) represented major shares of EU imports of dairy products (EY 2013). Owing to the EU's role as one of the world's leading net exporter of dairy products, demand from third-countries is a decisive determinant of the future development of the dairy sector in the EU (BMELV 2008).

**Table 2: EU dairy products exports in milk equivalent (in % of the total dairy exports) (source: EY 2013 based on Comext data and other sources)**

Product	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Milk & cream	2%	2%	2%	2%	3%	2%	3%	3%	3%	3%	3%	3%
Cheese	21%	25%	25%	25%	25%	26%	29%	29%	27%	27%	27%	26%
Butter	6%	7%	9%	12%	11%	12%	10%	8%	6%	5%	5%	4%
SMP	15%	7%	8%	10%	11%	8%	4%	9%	8%	10%	14%	18%
WMP	24%	27%	23%	21%	20%	21%	20%	16%	21%	19%	16%	13%
Whey	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%

In a perfect market, the export price determines the milk price of net exporters. Without doubt, the EU has established several mechanisms to influence supply and demand of dairy products; for instance, the milk quota system, stock-keeping and export subsidies. Nonetheless, the milk quota system always had a very limited and only indirect impact on prices. The latter was mainly due to the milk quota system's (all in all quite limited) influence on world market supply and prices. Therefore, milk prices in the EU are nowadays determined by world market prices. Recent years have shown that there is usually a time lag of one to three months between changes of world market prices for tradable dairy products and changes of EU milk prices. Other important exporters, such as New Zealand, Australia and the United States face very similar situations; thus, the intensive world market integration has resulted in more or less similar prices for dairy products for all net exporting countries and regions (Fahlbusch 2010).

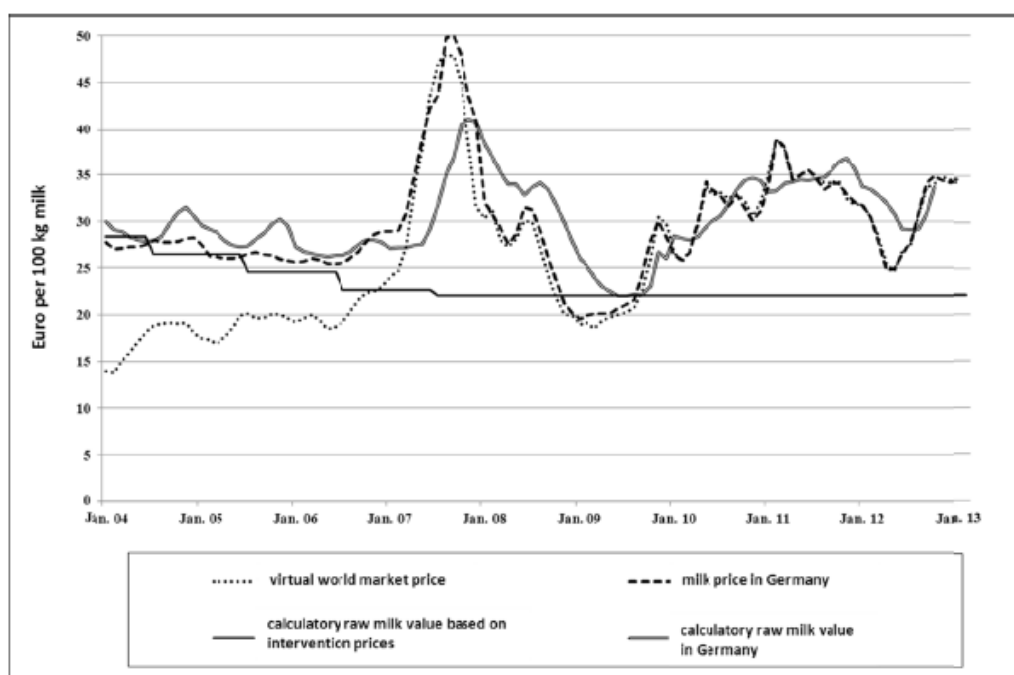
Under these conditions, the milk price is – at least in the long run – determined by the cost situation of the marginal supplier to the world market. Analyses of production costs and capacities show that it is very likely that this marginal supplier will be an EU dairy farmer (Fahlbusch 2010). More cost efficient suppliers, such as New Zealand do only have a very limited production capacity (New Zealand: around 17 billion kg/year; EU: close to 150 billion kg/year); therefore, due to capacity restrictions, the international cost leader New Zealand will not play the role of the marginal supplier to the world market. This means that there is only a very little risk that in the long run, EU dairy farmers will be confronted with very low prices set by international cost leaders and at which milk production is not possible in EU Member States. This also means that there is no competitive pressure that would force EU dairy farmers to attain the very low costs of international cost leaders, such as New Zealand. Furthermore, the marginal supplier is needed to meet demands from growing world markets for dairy products. Therefore, it is very likely that the EU will keep an important net exporting position in the future and, as a whole, will not become a net importer. Thus, milk production in the EU will remain possible and a main pillar of European farming and farm incomes in the future although production costs are somewhat higher than in competing countries. The main reason for this optimistic outlook is that the cost situation of the marginal supplier to the world market, who is presumably located in the EU, will have a strong influence on world market prices. But this also means: If the marginal supplier is a comparatively cost efficient EU dairy farmer, then there will be an enormous price pressure on less competitive dairy farmers in the EU who produce at higher costs.

The EU trade balance with dairy products varies remarkably over the years due to strong fluctuations of demand on world markets. The EU dairy product trade balance saw sharp increases between 2003 and 2004 and from 2009 on; but it also faced sharp declines, for instance between 2000 and 2001 (Table 3). Since around 2007, the strong dependence of the EU dairy sector on volatile world markets has resulted in a comparatively high volatility of milk prices in the EU. The milk price in the EU nowadays very much parallels world market prices, including the volatility characterising the world market (Figure 3). This situation will also strongly characterise the EU markets for milk and dairy products in the future.

**Table 3: EU dairy product trade balance in milk equivalent (in 10 000 tonnes) (source: EY 2013 based on Comext data and other sources)**

Product	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Milk & cream	32	30	31	34	48	37	40	44	45	44	60	75
Cheese	260	247	278	281	390	373	400	422	396	415	499	512
Butter	47	38	60	123	158	158	103	79	59	57	76	52
SMP	212	65	70	97	195	142	53	147	130	171	285	393
WMP	429	423	361	352	389	371	330	276	366	347	336	293
Whey	8	7	7	8	14	14	14	15	13	17	17	20
Total	1495	1209	1226	1291	1665	1559	1423	1519	1542	1635	1933	2096

**Figure 3: Development of various milk prices (Source: Fahlbusch et al., 2013)**



To summarise, it is obvious that the future development of the EU milk market is very closely linked with international market developments, both in terms of quantities and price developments (including milk price volatility). Therefore, it is crucial for EU dairy farmers and processors to sustain – or even improve – their international competitiveness, regardless of whether this improvement is due to decreasing costs or improved product differentiation. Furthermore, this tight integration of EU dairy farmers and processors into world markets strongly confines the effects of EU milk market policies.

**H. 3: International competitiveness is a function of the costs of milk production in EU Member States and the strategies implemented by EU dairy companies.**

To understand the international competitiveness of the EU dairy sector, a supply chain perspective which simultaneously takes into account producers and processors is paramount. Producers supply raw milk, but in the end dairy companies have to successfully sell their products on domestic and international markets. Furthermore, the ability of dairy companies to add value to a bulk commodity like raw milk is a decisive factor for the milk prices they can pay to dairy farmers.

Dairy products are input-intensive food products. This means that the costs of raw materials (in this case: mainly raw milk) represent major shares of final consumer prices. This is illustrated by the farmer's share of the consumer price for milk. This share is on average approximately 49 percent in the EU but varies considerably between the Member States (EY 2013, Table 26). A closer look at the cost structure of various dairy products reveals that the share of raw milk costs is between about 30 percent and 60 percent of final consumer prices. This share is the highest in the case of low-cost products with a very limited value added (for instance, UHT milk; in this case, the costs of raw milk account for about 50 percent of consumer prices) and in the case of dairy products which require considerable amounts of inputs due to losses during production (for instance, hard cheeses; costs of raw milk around 50 percent and in some cases even up to more than 60 percent of consumer prices) (Albrecht-Seidel and Redelberger 2007; Bodenstein and Spiller 2001).

Owing to the high share of raw milk costs, the cost competitiveness of farmers is very important for the prices and the (international) cost competitiveness of dairy products. This is the more the case, the more dairy products have to solely compete on price due to a lack of product differentiation. Therefore, farmers' cost competitiveness is most decisive in the case of bulk commodity products such as SMP, WMP, butter, whey or milk and cream. With regard to quantities, these products account for about two-thirds of EU exports of dairy products. The situation is somewhat different where dairy products with a higher potential for product differentiation are exported. In this regard, cheese is the most relevant product category since there are several opportunities (brand, variety, production method, region-of-origin, etc.) for differentiating cheese products. The higher differentiation potential of cheese is illustrated by a comparison of the shares of six important export products on a milk equivalent and a Euro basis. Table 4 shows that cheese represents only 26 percent of the export volume (in milk equivalents) but 40 percent of the value in Euros.

**Table 4: Export shares of six important product categories – milk equivalents vs. Euros (based on EY 2013, Tables and 19)**

	Percentage (milk equivalents) 2011	Percentage (Euros) 2011
Milk & cream	3%	4%
Cheese	26%	40%
Butter	4%	7%
SMP	18%	16%
WMP	13%	16%
Whey	1%	9%

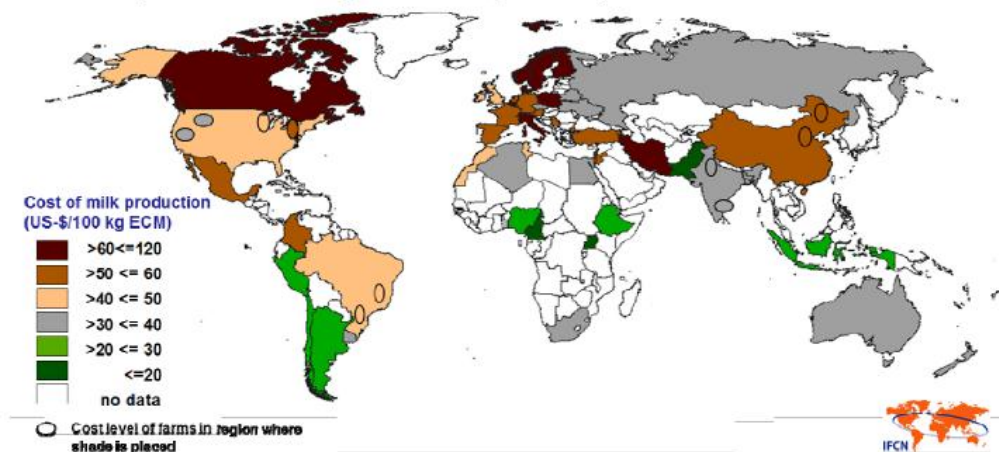
Since successful product differentiation creates customer loyalty and a willingness to pay for the more or less unique product characteristics, price (and, thus, costs) becomes less relevant as a competitive factor (Porter 1980). The more successful the differentiation of a product is, the less relevant are price and costs for gaining and sustaining competitive advantages and, thus, market shares on international markets. But since only a minority of dairy products can be differentiated successfully, cost competitiveness will always remain an issue in the dairy sector.

There are several organisations that provide empirical insights into the costs of milk production in various countries; the IFCN Dairy Network and the European Dairy Farmers group are among the most prominent organisations. Recent publications by the IFCN Dairy Network show that the EU has significant cost disadvantages compared to other major exporters of dairy products, such as New Zealand or the United States.

Full costs of milk production in Europe are at least US\$40 per 100 kg ECM (but in most EU Member States considerably higher), whereas low-cost competitors, such as New Zealand have production costs of less than US\$30 per 100 kg ECM (Figure 4).

**Figure 4: Costs of milk production in averaged sized farms in 2011 (in US\$/100 kg; Source: IFCN Dairy Research Center 2012)**

**Cost of milk production in average sized farms per country in 2011**



The study by Dusseldorf (2008) provides more in-depth insights into the various relevant cost categories in milk production (Table 5). It presents data from a sample (n=496; Lutter 2009) of European Dairy Farmers (EDF) members. The study shows that EDF farmers in Luxemburg had on average very high quota costs of 4.9 cents per kg milk in the survey year (2008). The top 25 percent EDF farmers had quota costs of only 1.1 cent per kg milk; the EDF average was 1.8 cent per kg of milk. Wille et al. (2009) present very similar results, also based on EDF survey data. These costs reflect the meanwhile high (although EU-wide strongly varying) quota prices in EU Member States. Only very recently, quota prices have declined considerably due to the expected expiry of the milk quota system (European Commission 2012).

**Table 5: Costs of milk production (Source: Based on Dusseldorf 2008; all numbers in cent/kg milk)**

	Average EDF	EDF top 25% <sup>1)</sup>
Revenues	40.8	39.2
Direct costs (sales of livestock, fodder production, insemination, etc.)	16.0	13.1
Labour costs	15.5	11.9
Quota costs	1.8	1.1
Building costs	3.9	2.9

<sup>1)</sup>EDF top 25 percent: classification is based on farm profitability (profit in Euro-Cent/kg milk)

The empirical results also show that quota costs were an important cost factor in previous years. For many European dairy farmers, it will be much easier to cover their full production costs after the abolition of the quota system. Therefore, the share of farmers who will be able to cover their full costs will increase after the expiry of the quota system (Table 6). This also implies that the international cost competitiveness of EU dairy farmers has already improved in recent years due to declining quota prices (European Commission 2012) and will further improve after the end of the milk quota system.



**Table 6: Share of EDF farmers who will be able to cover their full costs with and without milk quota (Source: based on Wille et al., 2009: 81; n=256)**

Milk prices	With quota costs	Without quota costs
20 ct/kg ECM	1%	1%
25 ct/kg ECM	6%	8%
30 ct/kg ECM	20%	29%
35 ct/kg ECM	45%	58%
40 ct/kg ECM	68%	75%
45 ct/kg ECM	87%	91%
> 45 ct/kg ECM	100%	100%

Raw milk is an important input and decisive cost factor; therefore, the cost competitiveness of dairy farmers is essential. But finally dairy products have to be sold on domestic and international markets by dairy companies. Their strategies, thus, have a strong influence on the future development of the EU milk sector and, hence, deserve a closer look. When doing so, two types of strategies have to be taken into account: corporate and competitive strategies of dairy companies (Grant and Nippa 2006; Johnson et al., 2011).

Corporate strategies answer the “twin questions: What are we producing and for whom?” (Oster 1995: 22). Or put differently: A corporate strategy defines the products a dairy company wants to produce and the markets where it wants to sell these products. In the dairy sector, a wide spectrum of alternative corporate strategies can be observed, from high degrees of specialisation to broad diversification of business activities, and from regional and domestic or international to multi-national and global strategies. With regard to the product spectrum, two things that have recently gained relevance are noteworthy. First, it can be observed that especially large, diversified dairy companies very carefully tailor their product spectrum to current (and often changing) market opportunities. When, for instance, cheese production is a more attractive use of raw milk compared to the production of UHT milk, these companies do not hesitate to redirect milk from less attractive to more profitable market segments. This can also include investments (for instance, into new capacities in cheese dairies) and disinvestments, for instance closures of production sites of less competitive products (Koch 2011). Second, major dairy companies strongly invest into research and development in order to find more profitable, innovative products which can be sold to other food manufacturers at higher prices. This allows these dairy companies to reduce their engagement in less profitable consumer market segments characterised by stagnating demand and high competitive pressures from retail companies, for instance low-price UHT milk and yoghurt markets. So far, only very few, predominantly case study-based empirical studies have been conducted on corporate strategies of European dairy companies (e.g., Theuvsen and Ebneht 2005; Dobson 2007; Juliá-Igual et al. 2011). Therefore, the picture of corporate strategies in the European dairy industry is still very incomplete.

With regard to market selection, recent empirical studies have highlighted the strong trend towards internationalisation in the European food industry. When entering international markets, the food sector preferably pursues a strategy of “concentric internationalisation”. This means that companies usually begin with establishing strong market positions in their domestic markets. Then they start to cautiously develop their international business activities in the form of a step-by-step process. In doing so, they often start with geographically and culturally proximate countries and then selectively extend the range of international markets served. This pattern of a gradual increase of international market activities can also be observed in the European dairy industry. As a consequence, many Central and Eastern European countries have strongly gained relevance for Western European dairy companies since they are perceived as attractive (due to market growth) and quite easily to serve (due to geographical and cultural proximity) markets. In the process of this development, market entry has taken place in EU as well as non-EU markets. The majority of European dairy companies still mainly rely on export strategies; some trailblazers have already made large foreign direct investments in order to get better access to emerging markets, tap local raw milk potentials and outperform local competitors (Theuvsen et al. 2010; Janze et al. 2011).

After defining the product and market spectrum, dairy companies have to choose between alternative competitive strategies. A competitive strategy defines how a food processor wants to compete in a specific market segment (for instance, cheese) and how the company wants to outperform its competitors. Generally speaking, companies (including dairy companies and other types of food processors) can choose between three generic types of competitive strategies (Porter 1980):

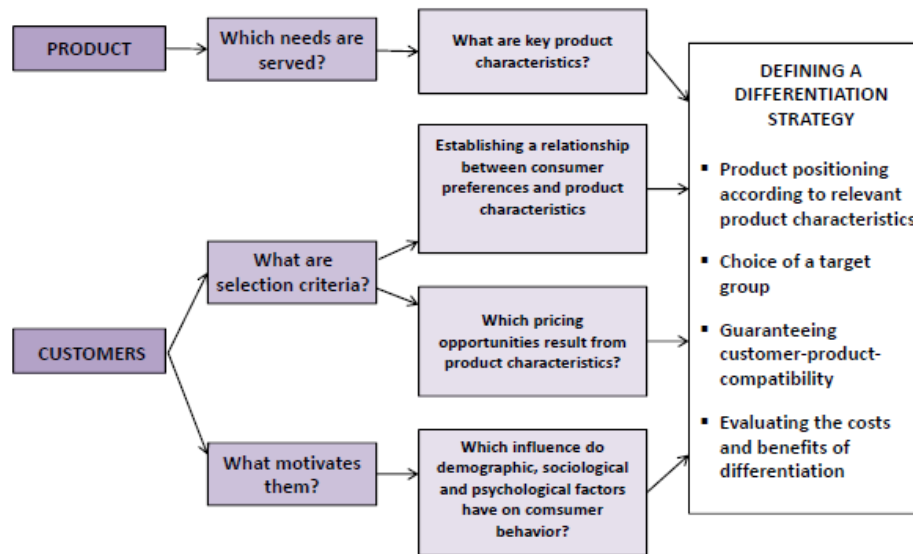
- **Cost leadership strategy:** Based on a cost advantage over competitors, the cost leader is able to compete on low prices and to outperform competitors by his ability to earn money even if increasing competition results in lower market prices for the processor's output.
- **Differentiation strategy:** In this case, the competitive advantage is based on product differentiation. Differentiation creates higher customer loyalty and a willingness of customers to pay more for differentiated products, which provide specific product characteristics these customers prefer and which are not offered by competing (low-cost) products. Differentiation can be based on various product traits, such as branding, higher safety standards, innovativeness, longer shelf-life, compliance with higher sustainability standards during production and processing, region-of-origin, traditional recipes and production methods, etc.
- **Focus strategy:** The dairy company offers a cost or a differentiation advantage for selected market segments. A focus strategy based on differentiated products can, for instance, address consumers who are interested in specific process qualities, for instance organic production, fair trade, or regional production. Business customers might be interested, for instance, in special service features, such as overnight delivery of intermediate goods. A cost focus often addresses market segments, such as customers buying larger quantities (for instance, restaurant chains or other out-of-home food providers). For these customers, tailor-made business processes are often implemented, which provide cost advantages to the selected market segments.

Combinations of the three generic types of competitive strategies, so-called hybrid strategies (Johnson et al. 2011), can also frequently be observed in the dairy industry. In this case, dairy companies establish, for instance, strong brands in price-sensitive mass market segments or aim at a cost-leadership position in niche markets. In other cases, dairy companies combine the production of branded products sold at higher prices with the production of low-price products under retailer-owned brands in order to better utilise their production capacities and realise economies of scale.

Cost leadership strategies depend on a dairy company's ability to produce at low costs. In the dairy sector, cost advantages mainly stem from low input costs (and, thus, low costs for raw milk) and the realisation of economies of scale mainly in production and distribution processes. Therefore, cost leadership strategies can only successfully be implemented by large dairy companies with cost-efficient suppliers. On domestic as well as international markets, the vast majority of products are sold in the low-price segment. In this segment, it is next to impossible for dairy companies to generate additional value added and, thus, create the opportunity to pay higher milk prices to dairy farmers. Instead, cost leaders have to accept market prices for bulk commodity dairy products on domestic and international markets. Therefore, they have to derive milk prices paid to farmers from the market prices the processors can earn on these markets.

Differentiation strategies, regardless of whether they are implemented in the wider market or in market niches, depend on the ability of dairy companies to successfully differentiate their dairy products. Whether it is possible or not to differentiate a dairy product depends on the product itself and the needs of the customers buying this product. With regard to product characteristics, it has to be clarified which needs the product serves and whether there are core product features, which would allow the creation of superior product qualities which have the potential to create above-average customer loyalty and trigger a higher willingness to pay for these special product characteristics. Furthermore, the potential buyers of differentiated products have to be analysed: What are the criteria according to which they choose dairy products? What are the motives behind their purchasing decisions? And to what extent are they willing to pay more for differentiated dairy products? Figure 5 summarises the core questions which have to be answered if a dairy company wants to differentiate its products.

Figure 5: Differentiating a product (Source: Grant and Nippa 2006)



Finally, the successful implementation of a differentiation strategy also depends on a firm's resources (Prahalad and Hamel 1990), for instance its ability to create innovative products (and, thus, its R&D capabilities), its marketing know-how, its (and its owners') willingness and solvency to invest sufficient financial budgets into product development and marketing strategies which foster the differentiation of dairy products, etc. If designed as a focus strategy, differentiation also requires a firm's deliberate decision to limit the size of its operations. Furthermore, the firms' ability to identify market segments in which specific needs can be satisfied and its ability to find downstream as well as upstream market partners who are willing to support the niche market strategy (through, for instance, the delivery of the sometimes very specific process qualities on which these strategies might be based or the provision of sufficient shelf-space for niche market products) are crucial for market success.

So far no comprehensive empirical studies on competitive strategies in the European dairy industry have been pursued. There exist only a few case study-based approaches with a very limited regional focus (for instance, Dobson 2007) and some papers on the competitiveness of the EU dairy industry (Wijnands et al. 2010) which have a broader scope. In a recent explorative qualitative empirical study conducted at the University of Goettingen, some light was shed on prevailing strategies of processors in the European dairy industry. With regard to firm size and competitive strategy, four prevailing clusters were identified:

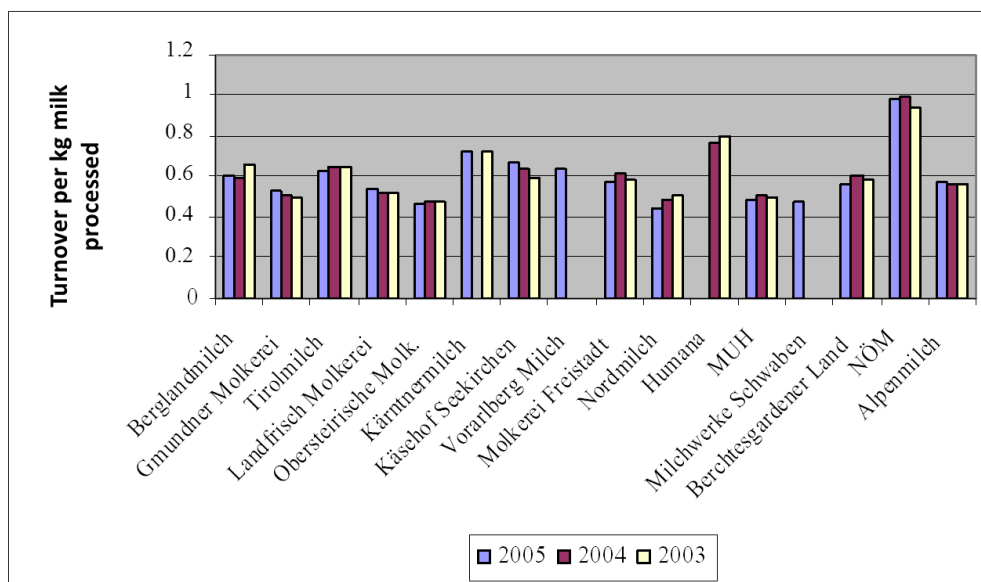
- Cluster 1 – Large cost leaders:** These dairy companies are of above-average size and pursue cost leadership strategies (sometimes supplemented by some elements of differentiation strategies, such as branding of dairy products). The majority of these processors are located in the core areas of European milk production, such as Denmark, Northern Germany, The Netherlands and France. Their large production volumes and cost-efficient suppliers allow these companies to exploit economies of scale and compete – domestically as well as internationally – in the low- or medium-price segment. The product spectrum is mainly characterised by bulk commodity products which allow no or only limited product differentiation. In this group, many large cooperatives but also a considerable number of private dairy companies can be found. In the literature, it is often argued that large cooperatives nearly inevitably belong to this group due to their obligation to process all milk quantities delivered by member farmers (which does not allow to strictly limit quantities, which is often necessary in markets for differentiated products) and their lack of financial power and the very limited willingness of their farmer members to pursue costly differentiation strategies (for instance, branding) (Theuvsen 2006; Cook 1995).
- Cluster 2 – International product champions:** These large processors have a very strong international focus. Based on a broad spectrum of more or less differentiated, sometimes innovative milk products, they have established an international production network. Therefore, sales on international markets

are no longer mainly based on exports from their domestic markets but stem from a network of international production sites. The French Lactalis Group as well as some other European market leaders belong to this small but important cluster.

- **Cluster 3 – Differentiated niche products specialists:** This group comprises small and medium-sized dairy companies. In some cases, these companies have a very limited product spectrum (for instance, herb butter or premium cheese varieties) but have managed to become market leaders in some small market segments through, for instance, strong brands, consistent premium quality or continuous product innovations. The product spectrum of other members of this cluster comprises niche market products, for instance regional or organic dairy products, products representing less intensive farming practices (for instance, hay milk or pasture milk), or domestic fair trade dairy products. In these (in most cases small) market niches, low prices are not the only arguments for selling these products and, thus, pressure on profit margins is much lower than in the segments for standard mass market products. These dairy companies are able to add more value to raw milk inputs and, thus, generate a higher turnover per kilogram of milk. Therefore, the differentiated niche products specialists are less dependent on cheapest inputs and are often able to pay higher prices to their suppliers. Figure 6 compares some Austrian medium-sized companies belonging to cluster 2 with some German cluster members (for instance, Berchtesgadener Land eG) as well as three large cost leaders (the former Nordmilch and Humana Milchunion, which have meanwhile merged to become Deutsches Milch Kontor (DMK) and Milch Union Hoheifel (MUH), which was recently acquired by the Scandinavian Arla group). The figure shows that the niche product specialists in Austria and Germany generate a higher turnover per kilogram of milk processed. This reflects their ability to generate more value added due to their presence in less price sensitive market niches. The differentiated niche product specialists are often located in areas where milk production has a long tradition, for instance due to high shares of natural grassland, but is less cost competitive due to less favourable natural conditions or prevailing small or medium-sized farm structures. This is, for instance, the case in major parts of Austria, Southern Germany and France where major shares of milk production come from mountainous regions and small and medium-sized, often diversified family farms.
- **Cluster 4 – The Mediterranean cluster:** Compared to other parts of Europe, the Mediterranean region has a much longer and stronger tradition of sophisticated, high-quality food products. “Terroir”, the close relationship between the region in which a food is produced and its quality attributes, is an idea widely shared in Southern Europe but hardly recognized in Northern and Eastern parts of Europe. This historically determined situation is also reflected in the dairy sector. A closer look at the EU list of PDOs and PGIs in Europe, for instance, reveals remarkable differences between Southern European countries and the rest of Europe. Whereas Italy, for instance, has protected 52 cheese varieties under EU legislation on PDOs and PGIs, Germany – representing a much larger milk production volume – has only registered 10 cheese varieties. France is the undisputed leader in this respect, having protected 73 cheese specialties. Similar differences can be observed with regard to other countries (see Table 7 for some examples from various European regions) and product categories. Based on the Mediterranean countries’ long-standing tradition of high-value food products, dairy companies from Italy and other countries in that region are able to export large quantities of high-value dairy products (for instance, premium cheese qualities) although milk production is often only limitedly competitive. Italy, for instance, is strongly dependent on imports of raw milk and (basic) dairy products, such as milk and cream but is nonetheless an important exporter of valued-added dairy products (EY 2013; [www.clal.it](http://www.clal.it)).
- **Cluster 5 – The Central and Eastern European cluster:** The Central and Eastern European countries underwent massive economic restructurings after the fall of the Iron Curtain. This fundamental transformation, which mainly took place during the 1990s, has also strongly affected and structurally shaped their food industries (Niederhut-Bollmann and Theuvsen 2008). After privatisation, massive foreign direct investments played a major role in improving the efficiency and competitiveness of food production in Central and Eastern Europe. Although foreign direct investments were very unevenly distributed with regard to regional concentration and sectoral distribution, some 20 to 60 percent of aggregate company capital in the Central and Eastern European food industry had been acquired by foreign investors until the middle of the last decade. Especially, attractive regional concentrated consumer markets, such as the Warsaw and Mazowieckie voivodship and the Budapest and Pest

county have been preferred target areas of considerable foreign direct investments (Jansik 2009). Already in the beginning of the 2000s, penetration of foreign capital in the dairy industry was >20 percent in Poland, >40 percent in the Czech Republic, close to 50 percent in Slovakia, and >75 percent in Hungary (Jansik 2004). As a consequence, major processors in these countries have been and are still in the hands of foreign investors. Table 8 gives an overview over some major foreign direct investments into the Polish, Slovakian and Bulgarian dairy industries. The overview shows that most major Western dairy companies have improved their market position by investing into local processors. Table 8 also underpins that the food industry – including the dairy sector – has been among the most attractive target objects for foreign direct investments. Strong local demand for food products, high logistic costs of many food products as well as a quick professionalisation of the retail business (Hanf and Dautzenberg 2007) have contributed to the high attractiveness of these investments. In many countries, foreign direct investments have contributed to fundamental changes in how the industry is organised (Belaya and Hanf 2010) and quick gains in international competitiveness of the local food industry (Heyder and Theuvsen 2008). This has allowed some Central and Eastern European Countries, for instance Poland, to emerge as important exporters to Western European markets for dairy products.

Figure 6: Turnover per kilogram milk in selected Austrian and German dairy companies (Source: Schlieckau et al. 2008)



**Table 7: Number of registered PDO and PGI cheese varieties in selected EU Member States (Source: DOOR database of the EU)**

Selected EU Member States	PDO and PGI cheeses
<b>Mediterranean countries:</b>	
France	73
Greece	22
Italy	52
Portugal	14
Spain	32
<b>Other EU Member States:</b>	
Belgium	8
Germany	10
Ireland	1
Netherlands	6
Poland	5
Sweden	1

**Table 8: Some foreign direct investments into the Polish, Slovakian and Bulgarian dairy industries (Source: Dries 2004)**

Dairy company	Country	Owner, country of owner, year of investment
Masowsze	Poland	Bel, France, 1993/1998
Hochland	Poland	Hochland, France/Germany, 2000
ICC Paslek	Poland	Land O' Lakes, USA, 1994
Warmia Dairy	Poland	Hoogwegt, Netherlands, 1995
Liptovska Mliekaren	Slovakia	Bongrain, France, 2000
Mliekospol	Slovakia	Sole, Italy, 2002
Rajo	Slovakia	Meggle, Germany, 1993
Nutricia Dairy	Slovakia	Friesland Coberco, Netherlands, 2000
Danone	Bulgaria	Danone, France, 1993
Meggle	Bulgaria	Meggle, Germany, 2000

The distinction between the various clusters described above provides a more in-depth understanding of the future of the European milk sector. Dairy companies belonging to clusters 1 and 2 will act as major players on international markets, some of them in the low-price segment, others in more differentiated and innovative market segments. Their ability to compete on international markets will have a strong influence on milk quantities produced in Europe and milk prices paid to farmers. Dairy companies which belong to the clusters 3 and 4 described above export smaller quantities but – compared to large cost leaders – get higher prices for their premium products. Therefore, these companies play an important role in adding value to a more or less standardised input factor – i.e., raw milk – and, thus, provide a sustainable strategy for successfully keeping milk production in less advantaged regions, for instance mountainous areas. Finally, Western dairy companies which have invested in Central and Eastern Europe are important contributors to a successful future development of the milk sector in these countries. Since milk processing is closely interwoven with milk production, foreign ownership does not pose a major challenge to the future of dairy farming in Central and Eastern Europe. Unlike major parts of the manufacturing industry, which are often labelled as “footloose

industries” (Eckey 1978), which can easily go elsewhere if other production sites promise higher returns on investment, the dairy industry is closely linked to its raw material base and, therefore, geographically less flexible. Nonetheless, Western investments into the Central and Eastern European food industry have strongly contributed to establishing new forms of organising the dairy chain (Belaya and Hanf 2010), which can be considered a severe threat to small-scale farming in countries, such as Poland, Bulgaria or Romania.

***H. 4: Farmers investments into milk production are a function of the profitability of milk production compared to alternative investments.***

The end of the milk quota system provides dairy farmers with the opportunity to make free choices concerning investments into new production capacities. This has motivated some observers to speculate on potentially high increases of production volumes in Europe after the end of the quota system. Most of these speculations are based on farmer surveys in which dairy farmers are asked about their future investments and their willingness to expand in milk production (Liste 2013). Despite these – at first sight: alarming – survey results, the majority of market observers still only see moderate increases of production in Europe (Anonymous 2013a). The tenor of most statements is that trends which have already shaped EU milk production in recent years, for instance the shifting of production from less competitive to more competitive regions, will also determine future developments. Recent years have provided ample evidence that a scenario of strong output growth is – at least at national and EU level – unrealistic. Several observations underpin this opinion:

- In recent years, most EU Member States have not fulfilled their milk quotas and have delivered less than allowed by the milk quota system (EY 2013, Figure 9). In this situation, the majority of farmers actually have already lived in a world without production quotas limiting their outputs. But despite this freedom and the actually decreasing relevance of the EU milk quota system, strong increases of milk production have not taken place. There is no reason to believe that this situation will undergo massive changes after the official end of the milk quota system.
- This perspective is supported by a recent publication by the United States Department of Agriculture (USDA 2012). The authors show that high input costs (mainly for feeding stuff) and, thus, low profitability of livestock farming have resulted in a remarkably reduced willingness of farmers to invest. This tendency can be observed in all major production regions, except China. Very recent reports from Brittany, the major milk production region in France, even report on farmers’ suicides due to high production costs, which do not allow them any longer to make a living from dairy farming (Anonymous 2013b). Under these conditions, massive investments into dairy farming seem very unlikely since high (and, at the same time, very volatile) agricultural prices and, thus, high and difficult to calculate feeding costs are expected to become permanent challenges in the future (OECD/FAO 2012).
- The dairy sector in all EU Member States is characterised by massive structural changes and high numbers of farmers (more or less) voluntarily leaving the sector. In Germany, for instance, 5% of all dairy farmers quit every year (Hüttel and von Schlippenbach 2010). In other European regions, the drop-out rates are even higher (for details see Figure 7). It is widely accepted that this trend will also determine the future development of the EU dairy sector at the farm and the processor levels (Maack et al. 2005). Many farmers leave the business for economic reasons, but in a growing number of cases, problems to find young farmers who are willing to take over existing farming business have become the decisive reason why dairy farms go out of business. All in all, massive investments into dairy farming are necessary to replace capacities of large number of farmers leaving the sector. All in all, it is quite unlikely that under current price and cost conditions, European farmers will heavily invest into new production facilities and strongly overcompensate the output which is lost due to farmers quitting their businesses.
- Finally, in some EU Member States, especially Germany, legislation on renewable energies has provided dairy farmers with more attractive investment opportunities. As a consequence, even many growth-oriented and cost- competitive dairy farmers have refrained from new investments into milk production but have instead built new biogas plants which promise much higher returns on

investments. Thus, the number of biogas plants in Germany has strongly increased since 2004 when the Renewable Energies Act in Germany established attractive conditions for investing into this type of renewable energy production. As a consequence, many dairy farmers have postponed investments into new production capacities; in some cases, they have even decided to quit dairy farming and become “energy farmers” (so-called squeezing-out effect of renewable energies; Emmann and Theuvsen 2012). Figure 8 shows the rising number of biogas plants in Germany between 2000 and 2013; the vast majority of these plants are operated by farmers. Owing to the large amounts of slurry available on large dairy farms, the latter have been amongst the most active investors into biogas plants. More generally speaking, the growth of dairy farming is restricted whenever there are more attractive business opportunities for farmers. Farms in touristically attractive regions, for instance, find it often more profitable to develop their off-farm tourism business and, thus, refrain from expanding milk production. Farms located close to metropolitan areas often face attractive direct marketing opportunities and expand into processing and direct sales instead of increasing their milk production volume. Many other examples could be added. In all these cases, attractive investment opportunities beyond dairy farming restrict farmers’ willingness to increase their dairy herd size.

**Figure 7: Average annual changes in the number of dairy farms 1995 to 2005 (Source: Zimmermann and Heckelei 2012 based on FADN data)**

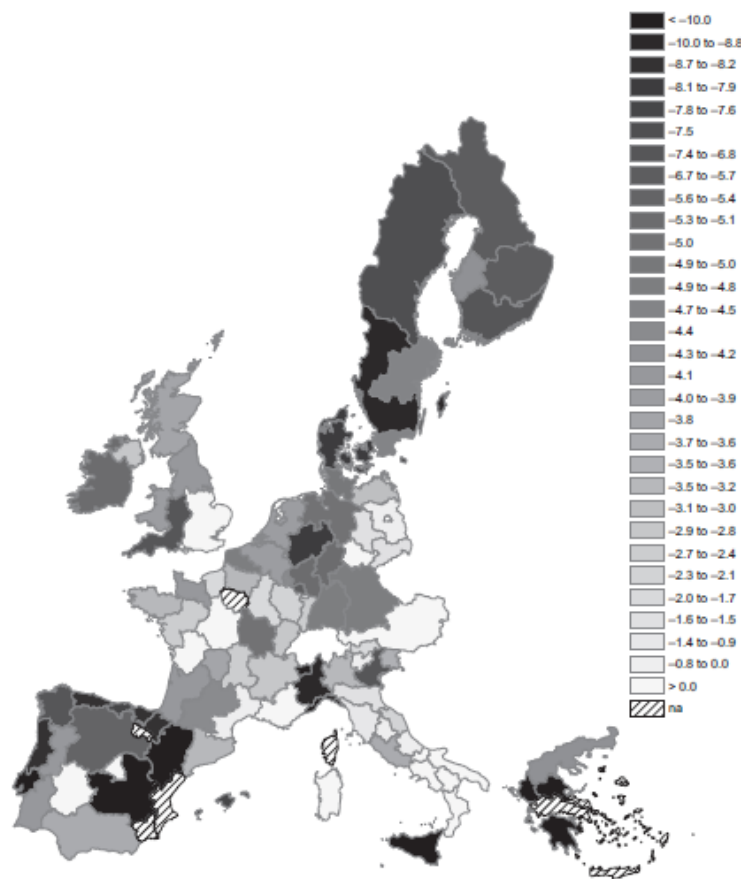
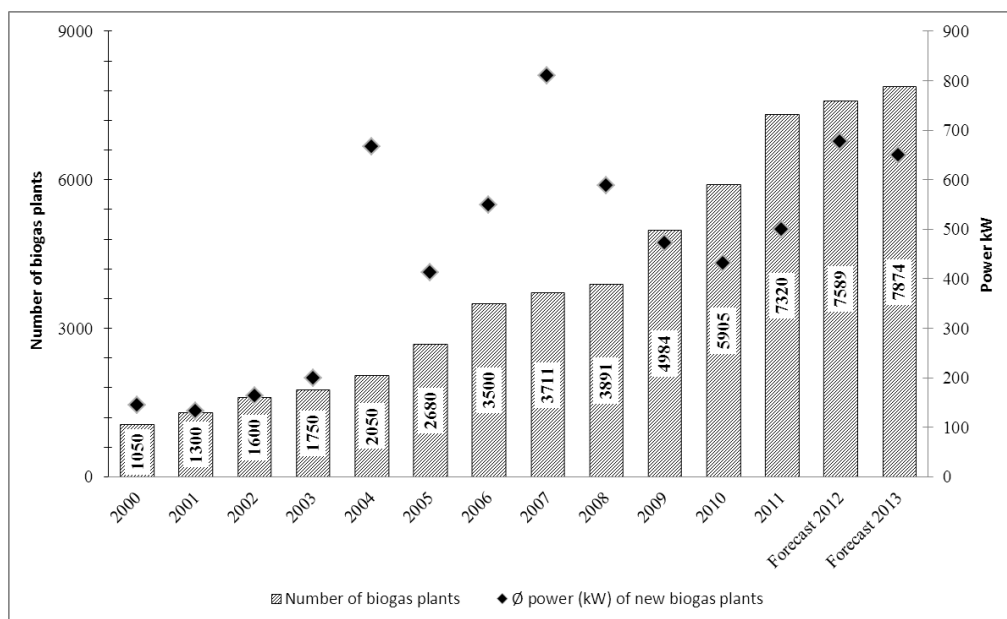




Figure 8: Biogas plants in Germany (Source: FvB 2012)



### **Conclusion: Market forces and the balance between supply and demand in a non-quota regulatory framework**

The balance between supply and demand is strongly determined by the tight integration of the European dairy sector into world markets for dairy products. This will also strongly influence the dairy sector after the expiry of the milk quota system. Whereas domestic demand will more or less stagnate in the future due to the demographic situation in most parts of Europe, third-country markets will steadily grow and provide interesting opportunities for the European dairy industry to sell their products in emerging economies with increasing demand. Owing to the integration into world markets, EU prices for raw milk are determined by world markets. Against this background, it is increasingly important that European dairy farmers and dairy companies are competitive on world markets.

Taking into account the cost competitiveness and the production potential of leading net exporters of dairy products, it is very likely that the marginal supplier to the world market will be a European dairy farmer. The lower the production costs in Europe, the larger the market potential European dairy farmers can serve. The dependency on world market prices for milk and milk products (with regard to price level and price volatility) will make it very difficult for EU farmers in disadvantaged regions to stay in business. As a consequence, the trend towards shifting production to the most competitive regions and farms (with regard to location, size, production technology, etc.) will accelerate.

Besides costs, product differentiation is an additional way to sell dairy products – in this case in the middle-price or even premium segment – to international markets. This will create additional opportunities for the European dairy industry, especially for less cost competitive regions, producers and processors.

Regardless of whether the European dairy sector competes on low prices or through product differentiation, it is always the combination of producers and processors, which is decisive for future market success. Therefore, a supply chain perspective is paramount for forecasting future developments of the dairy sector.

Recent years have witnessed strong structural changes in European dairy farming and very moderate investments into new production capacities. Even under the quota regime, farmers have largely refrained from taking all opportunities to invest into dairy farming and have under-delivered milk quotas in many European countries. There is hardly any reason to believe that this situation will dramatically change after the end of the milk quota regime. While the trend towards shifts of production to the most competitive regions and farms will

prevail, major market disturbances due to an uncontrolled increase of production volumes are very unlikely. This is mainly due to a lack of profitability of dairy farming and the existence of more attractive investment opportunities in countries, such as Germany.

All in all, a slow but steady further development of the EU dairy sector is the most likely scenario which should guide political decisions on setting the framework for milk production in Europe. It is neither very likely that the EU net export position will dramatically change or even end nor that major structural disturbances will leave the European milk market in a mess. Despite remarkable structural differences between the national dairy sectors throughout the EU-27, this can be considered common ground for the whole sector.

#### 2.4.2 Organisational systems

##### ***H. 5: Contracts are (and will be) the most important measure for organising relationships between farmers and processors.***

Along food supply chains characterised by intensive division of labour, there are several buyer-supplier relationships which have to be organised, for instance relationships between farmers and processors, processors and wholesalers or processors and retailers (Theuvsen 2003). With regard to the future development of European milk production after the end of the milk quota system, the relationships between farmers and dairy companies is crucial since all other relationships along the supply are, if at all, only indirectly influenced. Therefore, it makes sense to focus on this specific relationship.

In the EU, supply of raw milk by farmers to dairy companies is in most cases based on contracts (Vavra 2009). In Germany (and presumably in many other European countries), these contracts typically reveal – despite some regional and sector-internal variances as well as some differences between private and cooperative dairy companies – the following characteristics (Schlecht et al. 2013):

- **Duration of the contract:** Most contracts currently stipulate a longer-term relationship between dairy farmers and processors. In many cooperatives, members are allowed to recall their memberships with a two-year cancellation period, typically starting at the end of the current year. Most private dairy companies prefer contract periods between 1 and 10 years.
- **Pricing:** There are mainly three pricing models which are applied by German dairy companies. Most cooperatives calculate prices for raw milk as a function of prices received for dairy products sold to retailers and other customers. This “reverse” pricing model transfers the price risk to dairy farmers and reduces the risk of insolvency of dairy companies. Nonetheless, where regional competition for raw milk is high, dairy companies may have to pay a price premium in order to get the required raw milk quantities. Private dairy companies often prefer a reference price system which takes into account a limited number (for instance, 10) prices paid by other dairy companies. Finally, some dairy companies prefer to contract prices with their farmers without reference to competing dairy companies or prices for dairy products and then repeatedly renegotiate their raw milk prices according to current market developments.
- **Quantities delivered:** In the past, the quantities delivered by dairy farmers were strongly influenced by the milk quota system. Despite this political framework, cooperatives often guarantee to process all milk supplied by their members; at the same time, they require members to exclusively sell raw milk to the cooperative. This system has provided high planning dependability for farmers as well as processors. Private dairy companies often prefer to contract fixed quantities delivered by their suppliers.
- **Completeness of the contract:** The intensity of regulations is not very high in most contracts. With regard to quality, for instance, most contracts just refer to regulations laid down in EU and national legislation and certification systems prevalent in the dairy sector.

Besides contract-based supplier-customer relationships, there are also small spot markets for raw milk and some raw milk traders buying and selling quantities. All in all, these distribution channels have only a very limited relevance for EU dairy farmers. Furthermore, especially spot markets for milk have turned out to be very volatile and, therefore, extremely risky for farmers.

The foreseeable end of the milk quota system has put the traditional contract design in the (cooperative) dairy sector under pressure to adapt to the changing political framework. Since farmers will not be restrained by the quota system anymore, it will become more difficult for dairy cooperatives to forecast exact milk volumes delivered to their production sites. Therefore, several cooperatives have already started to implement internal forecast systems. Through these systems, they survey member farmers and try to forecast the development of supply quantities over the next couple of months. Several major dairy companies are currently in the phase of fine-tuning these systems and validating forecasts against actual developments of milk quantities.

In recent years, there has sometimes been a tendency by farmers to question the dominant contract design in the dairy sector (Schlecht et al. 2013). Some attempts to stipulate more flexible contracts and to find new pricing models could be observed. Furthermore, some farmers tried to get better prices by changing their processors; this was most prevalent in times of low milk prices when farmers were under high economic pressure. Despite these developments that could be observed in recent years, it is very unlikely that there will be a fundamental transformation of supplier-customer relationships in the dairy sector. There are several reasons for this assumption: First, dairy farmers make long-term, very specific investments and, thus, become very inflexible and strongly dependent on assured opportunities for selling their raw milk to a (more or less) nearby processor. Second, transport distances for raw milk have increased over the years but are still limited. This further reduces dairy farmers' flexibility to rely on open markets. Farmers experimenting with spot-market transactions in recent years often had to face the extreme volatility of milk prices and high risks of this small market segment. In times of extremely low spot-market prices, these farmers lost much money or even went bankrupt. This has strongly reduced farmers' enthusiasm about short-term contracts and spot markets. Finally, dairy companies are characterised by high fixed costs due to necessary investments into highly automated, efficient processing equipment. Under these circumstances, economies of scale and continuously high utilisation ratios of costly equipment become very important success factors. Therefore, large food processors characterised by considerable economies of scale often prefer longer-term contracts over spot-market relationship to assure continued supply of input factors (see Lawrence et al. 2001, with reference to the slaughterhouse industry). As a consequence, the predominance of contract-based relationships will remain an important characteristic of the European dairy sector. However, two important developments are likely to gain further relevance:

- Dairy companies currently adjust their contracts to the needs of the post-quota era. This will result in more complete contracts that will include more regulations concerning important aspects, such as quantities delivered by farmers or obligations to timely communicate remarkable changes in production volumes to their processors.
- Farmers try to magnify their countervailing power vis-à-vis a more and more concentrating processing industry. This stimulates the foundation of producer groups or similar types of organisations to which farmers delegate contract, especially price negotiations.

Despite these two recent developments in the milk sector, the fundamental design of supplier-customer relationships will hardly be changed.

***H. 5a: Joint production agreements play an important in the organisation of the EU dairy sector – and will also do so in the future.***

Joint production agreements involve two or more parties who “agree to produce certain products jointly or to carry out certain processing activities jointly” (European Commission 2010b: 14). In dairy farming, these agreements can have very different forms, ranging from joint collection of milk to joint processing of milk and marketing of dairy products (European Commission 2010b). Dairy cooperatives are the most important occurrence of joint production agreements in the milk sector.

Cooperatives have a long tradition and play a pivotal role in European agriculture (Hendrikse 2006). This is also the case in the dairy sector in several important milk producing countries including, but not restricted to, Sweden, Denmark, the Netherlands, Germany and Austria. Some of the cooperatives from these countries belong to the largest processors of milk in Europe. This clearly indicates that farmers have already realised the advantages stemming from joint production agreements.

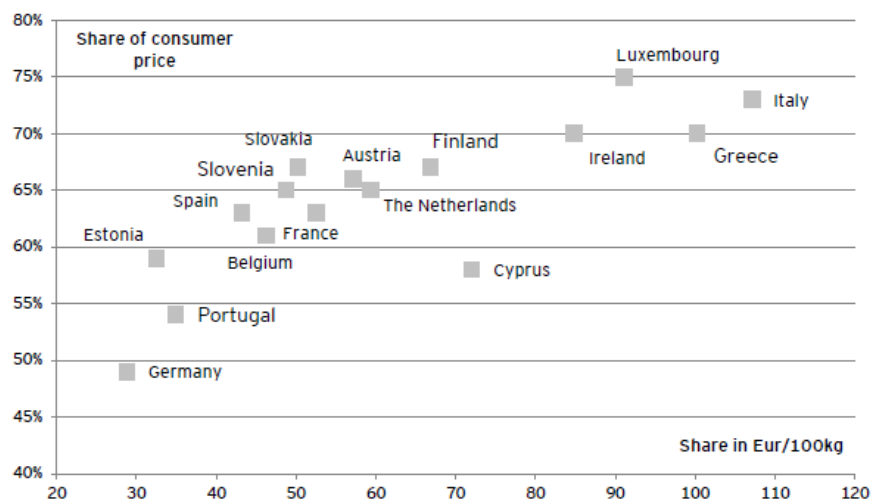
Owing to peculiarities of their corporate governance, cooperatives face quite a number of challenges (Cook 1995). Especially, many large cooperatives have reacted to these challenges and increased their managerial capabilities and attractiveness for large, future-oriented dairy farmers. Therefore, they have been able to defend their market shares in the European dairy sector. Thus, it can be assumed that cooperatives, representing the most relevant form of joint production agreements in the dairy sector, will still have major relevance in the European dairy sector. Empirical research on farmer cooperations has repeatedly revealed that farmers are highly willing to join cooperative agreements (Landwirtschaftliche Rentenbank 2001). As a consequence, it is not necessary to create additional incentives for dairy farmers to enter into joint production agreements as long as cooperatives are well managed and offer attractive prices and services to EU dairy farmers.

***H. 6: The influence of POs on the future development of the dairy sector will be limited. Nonetheless, they can be a valuable instrument for sharing information and guaranteeing the compliance with above-average production or process standards.***

Producer organisations (POs) are a core element of the EU “Milk Package”. This package has introduced the possibility to collectively negotiate contract terms via producer organisations and, thus, has created an exemption from the prohibition of pool selling. Such organisations had already existed before in the dairy sector in some EU Member States, for instance Germany; some of the existing POs were founded during the milk market crisis in 2008/09 in order to provide farmers with a stronger bargaining position in price and other negotiations. In this case, POs help farmers to pool product quantities; subsequently, they act as instruments of providing farmers with countervailing power in more and more concentrated food supply chains. Other producer organisations have very different tasks; they mainly support the definition of and compliance with above-average product or process quality standards, for instance with regard to the production and marketing of PDOs and PGIs in the dairy sector. This function helps to differentiate dairy products and add more value to raw milk. If this strategy is successful, higher prices do not stem from more bargaining power of farmers but from the willingness of European consumers to pay higher prices for differentiated products.

Empirical analyses have revealed that the share farmers get from consumer prices for dairy products has been declining over the last decade. Similar developments can be observed in other agribusiness sub-sectors, for instance the meat industry (Spiller et al. 2005). This development can be interpreted as an indicator for the existence of market power on the processors’ side and an imperfect price transmission along food chains. Furthermore, the shares processors and retailers get from consumer prices vary considerably between Member States. In this regard, Italy, Luxemburg, Greece and Ireland are much ahead of other EU Member States since farmers get above-average shares of consumer prices and high shares in Euro per 100 kilogram (Figure 9). These observations support the idea that strengthening the position of farmers in European dairy chains could help to assure them a fair share of the pie. The question is: Can POs be an effective and efficient way to reach this goal?

Figure 9: Share of processors and retailers for ECM milk in 2011 (Source: EY 2013 based on IFCN data)



There have been similar attempts in the meat sector where, for instance in Germany, livestock farmers have formed a considerable number of POs. These organisations play important roles in the meat sector, for instance with regard to bargaining with slaughterhouses, organising and carrying out animal transports, supervision of slaughtering and billing by slaughterhouses, supporting the introduction of quality assurance schemes, developing new marketing channels, providing recommendations for improving the profitability of farms, and organising piglet and calf purchases (Theuvsen and Franz 2007). The POs in the German meat sector are also engaged in determining market prices for slaughter animals, mainly by providing price information to a central price agency. These are important tasks with regard to the organisation of meat supply chains; therefore, POs have turned out to outperform many competing organisations, for instance private livestock traders (Voss et al. 2010). But the POs have widely failed with regard to negotiating better prices for slaughter animals for farmers. The POs' role in meat supply chains is more an organisational one: They reduce transaction costs for individual farmers and serve as an information and logistics platform supporting interactions between processors and farmers (and vice versa). This helps to improve the definition of and compliance with higher meat quality standards and increases the flexibility of the whole food chain. But strategies of creating more countervailing power on the farmers' side have widely failed. The reasons for this result are quite simple: The concentration ratio on the processors' side is still much higher and will develop much faster in the future than the degree of horizontal organisation farmers can reach through implementing POs or other types of horizontal marketing cooperations. Furthermore, large POs also lose flexibility since there is only a very limited number of processors they can sell their products to. This clearly limits their ability to negotiate higher prices with processors. POs, thus, can play important roles in dairy chains, for instance as information platforms or service providers. They can also engage in price negotiations with processors. But this is a question of reducing transaction costs for individual farmers (and sometimes processors), but it is not an effective strategy for getting a larger slice of the pie.

#### ***H. 7: The influence of IBOs on the future development of the dairy sector will be limited.***

Interbranch Organisations (IBOs) can be recognised by Member States on the basis of national law. They have quite a long tradition in some other food sectors, such as fruit and vegetables, wine, olive oil or tobacco. There are also several IBOs in the dairy chain recognised in some EU Member States, for instance Hungary (HAD), Spain (INLAC) and France (CNIEL). IBOs can help to bring together farmers, processors and other organisations (for instance, wholesalers, industry associations) to carry out joint activities in the fields of production, trade and processing. But IBOs are not allowed to fix prices, share markets or limit production volumes. But nonetheless, there are still other important tasks IBOs can perform: standardisation of contracts, ensuring market transparency, coordination of research, support or even conduct of product development, improvement of knowledge exchange between supply chain actors, or delivery of wider CAP goals, such as environmentally friendly or, more generally, more sustainable production of milk and dairy products.

For most EU Member States, IBOs in the dairy sector are new instruments and there is only very limited evidence on their attractiveness and effects so far. Nonetheless, prior (although limited) experience and existing research on the internal functioning of (industry) associations (e.g., Becker 2006; Czada 1995) have repeatedly highlighted the tricky issues around industry-wide collaborations with regard to joint marketing or product development. One major reason is a lack of harmonised interests which often limits the effectiveness of these organisations. Similar results have been obtained through empirical research on cooperations between companies or between companies and research institutions which are also jeopardised by conflicts of interests. Therefore, it is hypothesised that IBOs will have only a limited influence on the future development of the dairy sector. Furthermore, it can be assumed that only a rather limited number of IBOs will be established in EU Member States where these organisations do not already exist.

***Conclusion: Organisational systems and the balance between supply and demand in a non-quota regulatory framework***

Contracts are and will be core elements of governance systems implemented for coordinating the relationships between farmers and dairy companies. This situation will hardly change after the end of the milk quota system. Processors are currently fine-tuning their contract designs to take into account the peculiarities of the non-quota era. This includes, but is not restricted to, the implementation of more complete contracts with regard to quality requirements and forecast systems, which help dairy companies to cope with the more liberalised market situation after the expiry of the quota system.

Other organisational measures – including spot-markets, POs and IBOs – will play complementary roles in the dairy sector. It can be assumed that these additional organisational measures will only have marginal effects on the balance between supply and demand. But, nonetheless, especially POs and IBOs can turn out to become important information platforms and transaction-cost saving institutional designs in the relationships between dairy farmers and processors. Mainly IBOs can also help to create and diffuse product innovations which can help to add more value to raw milk and will, thus, improve the conditions for paying higher prices to farmers. But, with regard to value added, POs and IBOs will be most helpful in market niches where above-average product or process qualities are relevant. In the wider market, they mainly serve as information platforms and transaction-cost saving institutional arrangements.

### 2.4.3 Policy measures

***H. 8: Policy measures stabilise incomes and reduce risks for dairy farmers. This positively contributes to the future development of the EU dairy sector.***

Recent research on risk management in agriculture has revealed various factors which farmers consider most challenging for the future development and success of their farming businesses. Table 9 presents results from a recent empirical study on agricultural risk management in Eastern Germany. It shows that farmers feel most threatened by risks whose sources they cannot control: political risks, price volatility on input as well as output markets and changes (especially with regard to land prices and availability of farm land) on land markets.

**Table 9: Most important risks as perceived by farmers (Source: Schaper et al. 2012)**

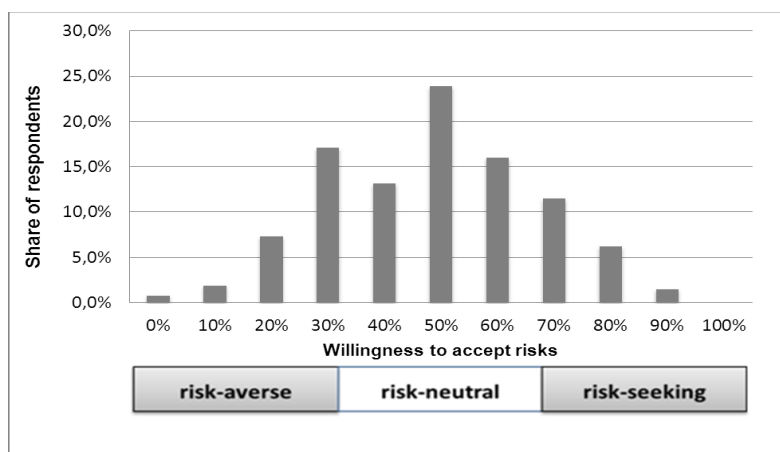
Rank	Risk	Incidence rate (I) <sup>1)</sup>	Potential loss (L) <sup>1)</sup>	Total risk (=I x L)
1	Increasing land prices	4.43 (0.794)	3.80 (0.902)	16.83
2	Decreasing direct payments by the EU	4.54 (0.766)	3.65 (1.003)	16.57
3	Increasing volatility on markets of agricultural	4.21	3.32	13.97

Rank	Risk	Incidence rate (I) <sup>1)</sup>	Potential loss (L) <sup>1)</sup>	Total risk (=I x L)
	products	(0.870)	(0.872)	
4	Increasing volatility on input markets	4.22 (0.856)	3.28 (0.830)	13.84
5	Tightening of cross-compliance regulations	4.15 (0.921)	3.14 (0.994)	13.03
6	Reduced availability of farm land	3.73 (1.150)	3.4 (1.072)	12.66

<sup>1)</sup> Likert scales from 1=very low to 5=very high; columns show mean values and, in brackets, standard deviations)

Empirical studies have also frequently revealed a great diversity with regard to farmers' willingness to accept risks. Figure 10 shows that there are extremely risk-averse and highly risk-seeking farmers as well as a broad midfield of risk-conscious farmers who are willing to accept some risks but at the same time avoid others. Similar results were also obtained through empirical research in the dairy farming sector (Schaper et al. 2010). These studies show that the most risk-averse farmers are also the biggest supporters of the EU milk quota system and market interventions, such as export subsidies and stock-keeping. On the other side, risk-seeking farmers often reject EU interventions on the milk market and prefer a more laissez-faire approach to the management of the milk market.

**Figure 10: Risk attitudes of farmers (Source: Theuvsen 2013 based on Schaper et al. 2012; n=546)**



Under liberalised market conditions and due to the tight integration of the EU dairy sector into world markets, dairy farmers face higher risks, mainly with regard to the price paid for raw milk. In recent years, milk price volatility has emerged as a major challenge mainly for large, growth-oriented farms which are able to produce at low variable and full costs. But these – in most cases larger – farms often heavily rely on non-family labour, rented land and debt capital. These farm characteristics result in high fixed payments. Thus, although highly competitive with regard to their cost positions, these farms have turned out to be most vulnerable during times of (very) low milk prices. These farms face an even more challenging situation when low milk prices are accompanied by high prices for input factors, such as feed. Since prices of both input and output factors have become highly volatile but are only imperfectly correlated, these highly threatening situations have emerged in the past and will likely occur in the future. The farm type characterised above can hardly stand these situations due to its reduced risk-bearing potential, which stems from the heavy reliance of these farms on external production factors which trigger continuous fixed payments to external stakeholders (for instance, banks and employees) and, thus, increase the risk of insolvency (Theuvsen 2013). For this type of farm, a safety net against extreme market situations (mainly very low prices over a longer period of time) contributes to dairy farmers' future prospects and their willingness to stay in dairy farming. Only policy measures, such as intervention prices, regulations on (private) stock-keeping and export subsidies can provide this safety net. Their implementation as policy measures of last resort will help to avoid deep and irrepealable structural distortions in a liberalised European milk sector.

**Conclusion: Policy measures and the balance between supply and demand in a non-quota regulatory framework**

Dairy farmers perceive (milk price) volatility as a major threat to the stability and future success of their farming businesses. Especially, risk-averse farmers strongly appreciate political interventions into markets to protect their farms from the market forces and imponderabilities characterising open (world) markets. Recent developments in EU agriculture have revealed that the entrance of major risks, for instance longer periods of very low prices, pose major threats especially to the most competitive farms which have pursued pronounced growth strategies which have improved their cost positions due to the realisation of economies of scale but, at the same time, have also reduced their risk-bearing potential. Against this background, policy measures should be considered as measures of last resort which help to avoid fundamental disturbances and major upheavals of the EU dairy sector in times of severe crises. Whereas in business-as-usual times policy measures should not influence the balance between supply and demand on markets for raw milk and dairy products, they can be of decisive relevance during crises to avoid uncontrolled structural changes in the European dairy sector.

**2.5 Conclusions and policy recommendations drawn directly from the analysis****Conclusions**

- Owing to the under-delivery of milk quotas in the majority of Member States, the EU dairy sector has already experienced a *de facto* non-quota regime for several years. Producers and processors have widely adapted to the new situation and have taken into account the end of the quota system as well as alternative investment opportunities in their decisions on, for instance, future (dis-)investments. Therefore, it is highly unlikely that the upcoming end of the milk quota system will trigger major upheavals of the European milk market. Instead, recent trends in the dairy sector, for instance the gradual shift of production from less-favoured areas to more competitive regions, will presumably continue in the future.
- The international competitiveness of the EU dairy sector depends on production costs of farmers and the corporate and competitive strategies of dairy companies. In the past, quota costs have contributed to increasing costs of dairy farming in the EU and reduced the international competitiveness of EU producers and processors.
- EU prices for dairy products and raw milk are determined on world markets. This exposes European farmers to the peculiarities of price movements (i.e., price levels and price volatility) on international markets for dairy products. Compared to the pre-liberalisation era of the CAP, this means lower prices and higher milk price volatility for European farmers.
- Liberalised market conditions have triggered a gradual shift of milk production to the most competitive regions and farms. Under these circumstances, dairy farmers in the least-favoured regions, for instance alpine areas, are more and more challenged by more cost-competitive producers in other European regions.
- POs and IBOs can play important roles as platforms for distributing information and transaction-cost saving institutional arrangements. They can also support the development of new products and niche markets and, thus, contribute to implementing differentiation and niche strategies that help to escape pure price competition in the dairy sector.



**Policy recommendations**

- **Do not change the decision to abolish the milk quota system:**  
The quota system currently does not play a major role in the European milk market anymore. Its end will reduce costs for dairy farmers and contribute to an increase in international cost competitiveness. Therefore, it is advised to adhere to the CAP Health Check, which included the decision to abolish the milk quota system in April 2015 (see Regulation (EC) No 1234/2007 and Regulation (EC) No 73/2009).
- **Refrain from introducing a new regulatory framework into the milk market:**  
There will be no upheaval of the EU dairy sector and the sector will not be in a great mess after the end of the quota system. There will be neither fundamental changes of the milk quantities delivered, nor sharp regional production shifts which will go far beyond the dynamics of change which could already be observed in the near past. Therefore, the framework defined by the current Single CMO Policy is considered sufficient in the dairy sector.
- **Retain and, where necessary, strengthen the safety net for extraordinary crisis situations:**  
The dependence on world market prices can result in extreme milk price volatility and longer periods of very low prices for EU dairy farmers. Such situations are most dangerous for growth-oriented, basically competitive farms with low variable and full costs but, at the same time, often high shares of debt capital and paid labour. This type of farm is important for the future development and competitiveness of the EU dairy sector but at the same time most vulnerable in case of serious imbalances in the market. To avoid major distortions and irreversible structural breaks in the European dairy sector, this safety net is (and will be) necessary since it helps competitive farms to avoid bankruptcy during times of extremely unfavourable market conditions. Therefore, prevailing rules on intervention as laid down in Chapter 1 of Regulation (EC) No 1234/2007 and Regulation (EC) No 361/2008 should remain a central pillar of EU policies concerning the dairy sector. Future studies should analyse in more detail whether it is necessary to strengthen the safety net. This analysis should critically review whether the existing policies allow reactions which are flexible enough to quickly react to sudden market distortions. The analysis should also thoroughly review whether the existing databases are sufficient to provide early warning signals in case of an upcoming milk market crisis and whether existing data are sufficient to clearly determine when a crisis in the milk market has occurred. Finally, the analysis should consider whether existing regulations – including intervention prices and intervention quantities – are still sufficient with regard to the further liberalisation of the dairy sector and the changing price levels and volatilities on global agricultural markets not only for dairy markets but also for feeding stuffs.
- **If necessary, strengthen instruments that help to keep (dairy) farming in less-favoured regions:**  
Already under the milk quota system, dairy farmers in less-favoured regions have come under severe economic pressure. This has fuelled a regional specialisation of dairy farming and production shifts from less competitive to more competitive regions. This puts the future of dairy farming (and farming in general) at risk in less-favoured regions, especially in alpine and similar landscapes. Differentiation strategies and other sector-specific measures may not be enough to stop this development. Therefore, the EU has already implemented various policies to support dairy farming in less-favoured areas (see, for instance, Regulation (EC) No 1782/2003 and Regulation (EC) No 73/2009). This policy may need reinforcement if it turns out that regional shifts in production strongly accelerate after the abolition of the milk quota system. But besides additional instruments for strengthening dairy farming in less-favoured regions, future agricultural policies should also critically review whether dairy farming is the most suitable farming practice for the least-favoured, alpine regions. Less intensive farming practices, such as (extensive) beef production or keeping of suckler cows could be more effective (and less costly) in meeting society's goals with regard to these areas (such as preserving traditional cultural landscapes and heritages and rural development).
- **Continue the policies regarding POs and IBOs:**  
POs and IBOs will hardly help to get better prices for farmers in concentrated food supply chains. But they can be valuable instruments for disseminating information, saving transaction costs in negotiations between producers and processors, developing market niches with higher value added, and supporting the development of new products. Therefore, the EU should continue its policies

concerning POs and IBOs as introduced through the so-called “Milk Package” (see, for instance, Regulation (EC) No 511/2012 and Regulation (EC) No 880/2012).

### **3. How will those elements affect the sector’s competitiveness in terms of added value and portfolio of products, ability to react to changes in demand, competitive position of the EU in the world market, and need of investments in the production and processing industry?**

#### **3.1 Interpretation and comprehension of the key terms of the evaluation question**

##### Competitiveness

Competitiveness is the sustained ability to profitably gain and maintain market shares in liberalised markets (Martin et al. 1991).

##### Added value

Added value refers to the difference between sales prices and production costs.

##### Portfolio of products

The portfolio of products refers to the breadth and the depth of the product spectrum offered by a company or the industry.

##### Ability to react to changes in demand

Demand refers to the quantity and quality of products demanded by customers. In a free market economy, supply and demand determine product prices. Changes in demand can occur with regard to the quantities and the qualities demanded by customers. They are communicated to suppliers through price changes – with decreasing prices indicating weak demand (in relation to quantities supplied) and increasing prices indicating strong demand (in relation to quantities supplied). The ability of suppliers to react to changes in demand influences depends on their capacity to forecast or sense changes in demand and their flexibility to adjust their portfolio of products and product prices to changes in demand.

##### Competitive position

The competitive position describes the place in the market a provider (in this case: the EU dairy sector) has. The competitive position determines whether the provider is able to successfully compete with other providers (in this case: other net exporters of dairy products).

##### Need of investments:

Investments refer to the use of financial resources in order to acquire tangible or intangible assets.

#### **3.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used**

The at hand study of the European dairy sector refers to the following analysis criteria:

- **Competitiveness:** The development of market shares and – if available – profitability, both at the farm and the industry levels, are proxies for assessing the competitiveness of the EU dairy sector.
- **Added value:** Added value refers to the gross margins of producers and processors, i.e., the differences between sales prices and production costs. If farmers or dairy companies are able to

successfully implement differentiation strategies, added value often increases (although in most cases at the expense of higher marketing or production costs). Added value can be measured, for instance, by analysing the share of differentiated products or the turnover of a dairy company per kg of milk.

- **Portfolio of products:** The breadth of the portfolio of products describes the number of different product categories a producer offers, whereas the depth of the portfolio refers to the number of products within a specific product category. An important distinction is the differentiation between traditional bulk commodity products such as butter, whole milk powder or skimmed milk powder and more differentiated products. Differentiation can be based on branding, product innovation, region-of-origin, production methods (for instance, artisan production, above-average animal welfare standards, use of GMO-free feeding stuff or regional production), etc.
- **Ability to react to changes in demand:** The analysis of the ability of producers and processors to react to changes in the quantity and quality of products demanded by customers first has to take into account the capability of supply chain actors to forecast changes in demand. This capability determines the time span the actors along a supply chain have to plan and implement required changes. Second, the analysis has to take into account the flexibility of producers and processors to adjust their portfolio of products and prices to changes in demand. This flexibility can be measured on a continuum. The extrema of the continuum are defined by (a) a situation in which adaptations can be implemented very quickly to adapt to changes in demand and (b) a situation in which successful adaptation is not possible at all. This can be the case is, for instance, market prices fall permanently below the minimum costs of efficient producers and processors in a specific region. In this case, exiting the business is the only feasible adaptation strategy.
- **Competitive position:** The competitive position describes whether a producer or processor is able to successfully compete with other providers. The competitive position is very much determined by a successful competitive strategy which is well matched with the external opportunities and threats a company faces and its internal resources and capabilities. The developments of market shares and profitability over time reflect the competitive position of a provider.
- **Need of investments:** Investments are triggered if firm or farm managers see an opportunity to profitably invest into tangible or intangible assets. Therefore, the amount of money invested by farmers and dairy companies reflects the need of investments as well as the farmers and managers willingness to actually invest this money into dairy farming or milk processing.

The analysis is based on secondary data as well as the results of qualitative and quantitative empirical studies on the EU dairy sector. The validity of the available information on the dairy sector is generally good. Exceptions to the rule are data on firm profitability as well as firm strategies which are not systematically collected and stored.

### 3.3 Description of the method(s) used and an indication of its (their) limitations

As already outlined in Section 2.3, the analysis combines supply chain management and strategic management thinking. This means that the organisation of the dairy chain and the interactions between supply chain partners are focused during the analysis. Furthermore, a micro-perspective is chosen which treats market and sector developments as the outcomes of farmers' and firm managers' decisions, for instance their decisions to invest or disinvest.

The subsequent analysis refers to scientific publications, official statistics and other publicly available sources of secondary data. The validity and reliability of data on dairy farming and the dairy industry is sufficient. Some caveats apply to data on strategies and profitability in the dairy industry due to a lack of official statistics. Furthermore, it is only limitedly possible to find data on new organisational systems along the dairy chain, such as POs and IBOs, which are hardly known or do not have a long tradition in quite a number of EU Member States.

### 3.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

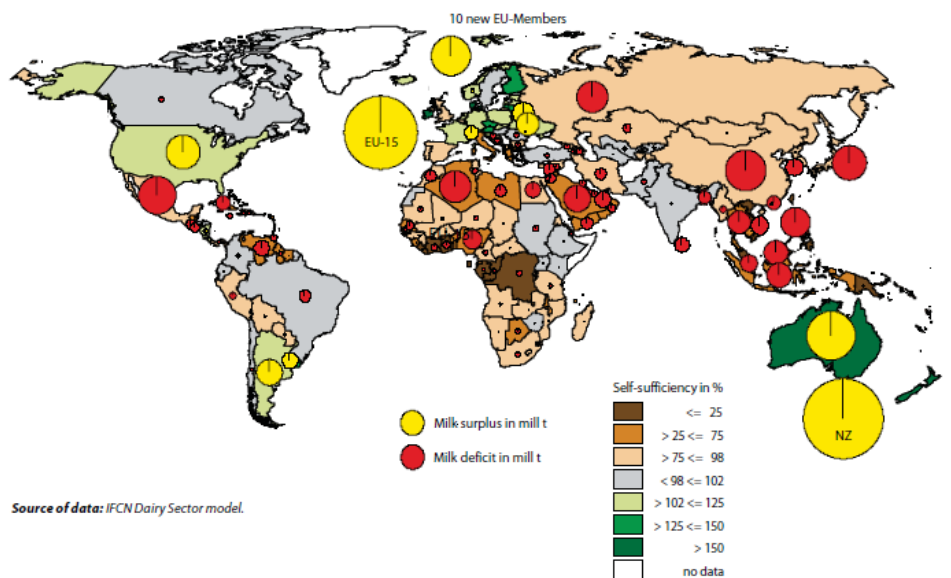
#### ***H. 9: The upcoming liberalisation of the milk market will hardly influence added value in the dairy sector, the portfolio of products and the strategic positioning of dairy companies.***

The value added along the dairy supply chain mainly depends on market characteristics (bulk commodity for standard dairy products vs. specialty markets for differentiated dairy products) as well as dairy companies' innovativeness and their willingness and ability to invest into product innovations, well-known brands and other value-adding activities. Furthermore, national and regional traditions play an important role for how milk is processed and how much value is added. Mediterranean countries, for instance, have a stronger tradition in high-value food products than Northwestern or many Central and Eastern European countries. Regional differences with regard to the income of consumers can also strongly influence the potential for adding value to raw milk. This argument is most relevant with regard to some Central and Eastern European countries where incomes are still considerably below EU average, but also applies to lower income groups in other EU Member States.

In the 1980s and 1990s, there were strong incentives for dairy companies to produce intervention products such as SMP, WMP or butter. After the reduction of intervention prices in 2003 and the definition of maximum quantities of intervention butter in 2004, dairy companies which had specialised in the production of intervention products had to reformulate their corporate and competitive strategies and change to more market-oriented product portfolios providing – at least in many cases – higher added value. Thus, prior liberalisations of the milk market have already abolished most of the incentives to produce intervention products without taking market needs into account and motivated dairy companies to redefine their product portfolios and invest into more differentiated dairy products. Therefore, the final termination of the quota system in the near future will hardly change the situation and will have only very little influence on additional attempts to introduce new products and create more added value. Under the current as well as the future regulatory framework of the EU milk market, added value is strongly determined by dairy companies' strategies but only very limitedly by political decisions. Thus, decisions about the breadth and the depth of the product spectrum and attempts to differentiate dairy products are mainly dependent on dairy company managers' decisions. The political decision to terminate the quota system is only of minor relevance with regard to these issues. Therefore, the strategic positioning of EU dairy companies, i.e., their choices of cost leadership, differentiation or focus strategies, will be widely unaffected by the end of the milk quota system.

#### ***H. 10: The upcoming liberalisation of the milk market will improve the international competitiveness of the EU dairy sector.***

Besides New Zealand, Australia, Argentina, the United States and some smaller exporters such as Ukraine, the EU is one of the very few important net exporters of dairy products in the world; the net exporters are painted in light and dark green in Figure 11. Despite a continuous decline of herd sizes in Europe due to the quota system (and, at the same time, increasing milk yields per cow), the EU has all in all successfully defended its net export position over the years. Future projections also see an important role of the EU on world markets for dairy products although its market shares on world markets for dairy products will decline moderately (FAPRI 2009). Since competitiveness denotes the ability to profitably gain and maintain market shares on liberalised markets (Martin et al. 1991), this indicates that the competitiveness of the EU dairy sector may need some improvement in order to be able to maintain market shares. Cost competitiveness is a major determinant of the international competitiveness in the majority of global dairy markets (see also H. 3 above).

**Figure 11: Net exporters and net importers of dairy products (Source: FAO 2010 based on IFCN Dairy data)**

Over the years, quota costs have become an important cost factor for European dairy farmers. The study by Dusseldorf (2008) revealed quota costs of 1.1 to 4.9 cents per kg milk and an EDF (European Dairy Farmers) average of 1.8 cent per kg of milk. Taking into account that efficient dairy farms in the EU have production costs (without quota costs) of about 35 cents per kg milk, the quota system has increased production costs by about 5 percent. As a consequence of the decision to abolish the quota system, this politically determined cost disadvantage will disappear. Wille et al. (2009) showed that the share of EDF who are able to cover their full production costs at certain price levels will strongly increase (for instance, from 45 percent with quota costs to 58 percent without quota costs if the milk price is 35 cents).

Since raw milk is the most important cost factor for dairy companies, a more cost efficient milk production helps processors to offer dairy products on international markets at more cost competitive prices, regardless of whether the companies sell bulk commodity or differentiated dairy products.

#### ***H. 11: POs can support the generation of added value through their positive effects on product differentiation.***

Producer organisations (POs) can fulfill various tasks in dairy chains: marketing, pooling of product quantities from a larger number of farmers, price negotiations with processors, logistics, supervision of processors, development of new marketing channels, introduction of quality assurance schemes, guaranteeing compliance with higher product or process quality standards, etc. POs, thus, often serve as information platforms between producers and processors and help to save transaction costs (see H. 6 above).

Empirical studies in the meat industry have shown that certain types of product differentiation – which is a prerequisite for added value in food supply chains – are fostered by closer collaboration between supply chain partners along the food supply chain (den Ouden et al. 1996). This is predominantly the case where product differentiation requires the transfer of information between supply chain partners (for instance, from consumers via retailers and processors to farmers) or compliance with specific quality standards defined (and often brought to the market) by one member of the supply chain, in most cases processors, but delivered by another member of the food chain, in the vast majority of cases farmers. Den Ouden et al. (1996) refer to the example of higher animal welfare standards demanded by some consumer segments. This is a typical example where POs can contribute to successful product differentiation in order to serve these more demanding market segments. First, the demand for higher animal welfare standards are a new development and, thus, this change of consumer preferences has to be communicated along the meat supply chain in order to develop this specific market segment. Since POs function as information platforms, they can support this crucial exchange of

information along the food chain. Second, one party, for instance a slaughterhouse or a retailer, defines higher animal welfare standards and then farmers have to comply with these above-average standards for keeping livestock. In this case, both parties make specific investments and require longer-term relationships with their supply chain partners (Williamson 1985). POs can negotiate these contracts and, thus, make it easier and less costly for both sides to invest specifically. Third, this type of product innovation requires a high degree of cooperative adaptiveness. Cooperative adaptiveness refers to a situation in which only changes strictly coordinated between supply chain partners allow to bring a new value-added food product to the market. In this case, autonomous adaptations would completely fail due to a lack of joint efforts needed for aligning the actions of all partners to meet market demands (Williamson 1991). In the meat sector and some other agribusiness subsectors, POs support this type of cooperatively managed adaptations in order to meet specific market demands and, thus, product differentiation and the creation of added value. They can play similar roles in the dairy sector.

PDOs, PGIs and TSGs are illustrative examples for the important role POs can play for generating added value. In this case, it is legally determined that a group of producers defines the product according to precise specifications (see Regulations (EC) 509/2006 and 510/2006). EU legislation in the field of PDOs, PGIs and TSGs aims at fostering the production of high-quality products which are different from standard mass market offerings and, thus, provide the opportunity for added value in the market. A study carried out in 2008 showed that PDOs and PGIs at that time represented an annual turnover of 14.2 billion Euros. Thirty percent of the PDOs and PGIs had established export relationships with third-country markets; the export volume was about 700 million Euros in 2007. And exports increased remarkably both in terms of volume and value between 2007 and 2008 ([http://ec.europa.eu/agriculture/quality/schemes/newsletter-2010\\_en.pdf](http://ec.europa.eu/agriculture/quality/schemes/newsletter-2010_en.pdf)). This example underlines the crucial role POs can play for successfully bringing value-added food products to domestic as well as international markets.

#### ***H. 12: IBOs can support the development of innovative high-value dairy products.***

Interbranch organisations (IBOs) have quite a long tradition in the European agricultural and fishery policies. Nonetheless, in the fisheries and aquaculture sector, for instance, there were only four recognised IBOs in 2007: one in France, one in Italy and two in Spain. Although the reasons for the low number of IBOs were not clear at that point in time, the Commission concluded that “the introduction of interbranch organisations was no success” (Churchill and Owen 2010: 431). In the fruits and vegetables sector, currently 11 IBOs are recognised (France: 3; Greece: 1; Hungary: 1; Italy: 1; Spain: 5) ([http://ec.europa.eu/agriculture/fruit-and-vegetables/producer-organisations/interbranch-organisations\\_en.pdf](http://ec.europa.eu/agriculture/fruit-and-vegetables/producer-organisations/interbranch-organisations_en.pdf)). The regional distribution of IBOs reflects not only the important role the Mediterranean countries play in the fruits and vegetables sector but also the higher prevalence of such organisations in Southern EU Member States.

Despite the somewhat sobering results of prior attempts to establish IBOs in European food supply chains, these organisations generally have the potential to support the development of innovative and, thus, value-added dairy products. EU legislation allows quite a broad spectrum of activities of IBOs (see for the fruits and vegetables sector [http://ec.europa.eu/agriculture/fruit-and-vegetables/producer-organisations/ibo\\_en.pdf](http://ec.europa.eu/agriculture/fruit-and-vegetables/producer-organisations/ibo_en.pdf)). In order to support the development of value-added products, IBOs must have a strong focus on the support of product and process innovations, for instance through defining production standards which allow to address more demanding premium market segments or bringing together various actors to jointly develop new products. IBOs could also help to bring high-value dairy products to new markets by identifying so far overlooked market opportunities, especially in non-EU countries, and supporting market access and penetration.

In the dairy sector, most basic product innovations emerge in the business-to-business sector. Milk turned out to be a highly valuable source for a large spectrum of innovative solutions for the food industry, for instance whey protein concentrates and isolates, casein concentrates, or lactose-based food ingredients. Additional research supported through IBOs can accelerate the speed of innovation and help to find new market opportunities beyond low-price mass market segments for dairy products.

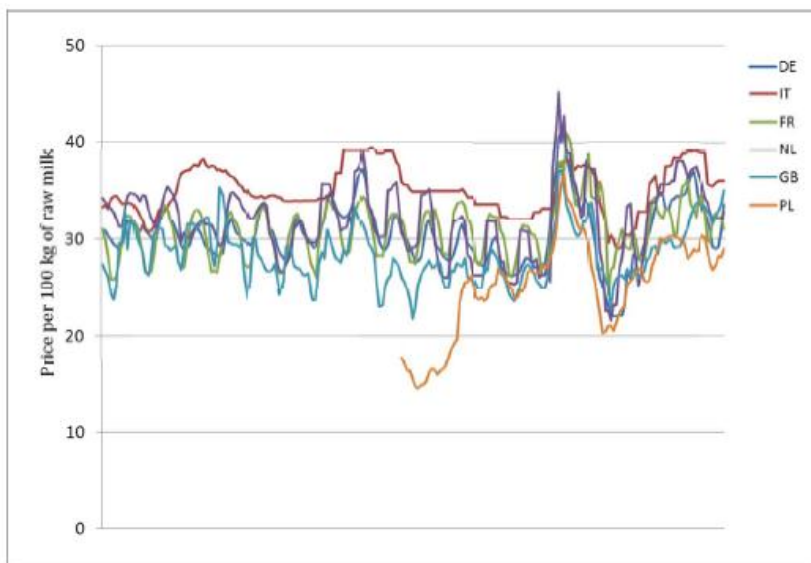
### ***H. 13: POs and IBOs can help to improve the ability to react to changes in demand.***

In recent years, the European dairy sector has been characterised by increasing degrees of uncertainty due to market liberalisations and its growing integration into world markets. This has subsequently increased the necessity to adapt to market changes such as changes in demand. The latter can occur in two forms:

- Changes in the quantities demanded by customers, for instance due to economic downturns in important net importing countries or changing consumer habits which may increase the demand for some products and result in a decrease in demand of other dairy products.
- Changes in demand with regard to preferred quality attributes, for instance a demand for more organically produced dairy products in some Northern European countries.

Changes in demand (and supply) are communicated to producers and processors through price movements; therefore, milk price volatility is closely related to the development of supply and demand on world markets (Fahlbusch 2010). Decreasing prices indicate weak demand (in relation to quantities supplied) and signal to supplies to reduce the output of these products. Increasing prices indicate strong demand (in relation to quantities supplied) and motivate producers and processors to increase their output. Mainly due to liberalisations of the EU milk market and a growing dependence on world markets, price volatility in the European dairy market has increased remarkably over the last decade (Figure 12). In empirical studies, dairy farmers have revealed that they perceive sharp milk price decreases as the risk with the highest loss potential (Schaper et al. 2010). High volatility of milk prices poses major challenges for dairy farmers (and processors) and creates a need for reduced reaction times in order to adapt to changing external conditions.

**Figure 12: Price volatility in the dairy market in selected EU Member States (Source: [www.milchtrends.de](http://www.milchtrends.de))**



Changes in demand require the ability of producers and processors to react to these changes. In particular, two competences are required to cope with changes in demand:

- The ability to forecast changes in demand. The better the forecast capabilities are, the longer is the time span producers and processors have to plan and implement required changes.
- The ability to adjust prices and product portfolios to changes in demand. The capability to adjust to market changes can be measured on a continuum. In some cases, adjustments are very easy, for instance if a diversified large dairy companies is able to redirect raw milk from less profitable to more profitable uses. In other cases, adjustments to changes in demand are very low due to physiological, technical or managerial restrictions. Dairy farmers, for instance, can hardly adjust their output quantities to changes in demand. Specialised dairy companies are less flexible than diversified

companies. In some cases, no successful adaptation is possible at all, for instance if market prices fall permanently below the minimum costs of efficient producers and processors in a specific region.

Changes in the external environment of dairy farmers and dairy companies (so-called parametric uncertainty; Williamson 1985) require the ability to adapt to the new situations. In some cases, autonomous adaptations by single farms or firms are sufficient, whereas in other situations only coordinated actions of various supply chain partners promise the required adjustment to changes in demand (cooperative adaptations; Williamson 1991). A typical example where the latter type of adaptation is required is the introduction of more animal-welfare friendly products (for instance, dairy products from more extensive farming systems). In this case, only joint actions of suppliers, processors and retailers promise a successful introduction of new products into the market as a reaction of changing consumer demands (den Ouden et al. 1996).

POs and IBOs can help to provide this type of cooperative adaptations to qualitative or quantitative changes in demand. Successful examples exist in the meat sector where POs have recently contributed to the introduction of more animal welfare-friendly meat products into the German market. With regard to changes in quantities demanded, it is currently heavily debated to what extent coordinated actions of dairy companies and producers can improve market balance and stabilise milk prices during times of excess supply (Weber 2013). So far this discussion has not produced final results. But again this discussion indicates that there is a need for joint actions in times of increasing milk price volatility which require successful adjustments to changes in demand and that POs and IBOs can contribute to meeting this demand for cooperative adaptations. One important role of POs and IBOs is that they have the potential to function as information platforms in food supply chains. Therefore, they can support the duly dissemination of information between supply chain partners and trigger adaptations to changing market developments at an early time.

***H. 14: Neither market forces nor organisational or policy measures will create a need for major investments in the dairy sector in the near future.***

In recent years, (dis-)investments in the European dairy sector have strongly been driven by regional shifts of production from less competitive to more competitive regions. This trend has triggered disinvestments by dairy farmers and processors in regions where milk production has decreased; and it was accompanied by the establishment of new production and processing capacities in regions where milk production has expanded. Shifts in the product portfolio had similar effects; cheese dairies, for instance, have increased production capacities whereas shrinking, often unprofitable market segments such as UHT milk have repeatedly faced major disinvestments. Finally the growing relevance of non-EU export markets has triggered new investments by companies with strong international business activities. The latter have also made foreign direct investments in order to acquire new production capacities in important milk production regions or in emerging markets for dairy products. This has triggered foreign direct investments in Central and Eastern European EU and non-EU countries as well as emerging markets outside Europe, for instance China.

The further liberalisation of the milk market will (slightly) reinforce some of those trends that have already characterised the dairy sector in recent years, for instance the increase of market shares of the more competitive regions and growing degrees of internationalisations of major processors and some medium-sized product specialists (Heyder et al. 2011). These developments will be reflected in future (dis-)investments in the European dairy sector. But all in all, this is going to be a trend development, not a structural upheaval. It is all in all very unlikely that the end of the quota regime will have strong influences on the decisions of dairy farmers and processors to invest or to disinvest.

### 3.5 Conclusion and policy recommendations drawn directly from the analysis

#### **Conclusions**

- The opportunity to create added value depends on firm strategies and capabilities as well as product and market characteristics. The end of the milk quota system will hardly have any major effects on the creation of value added, product portfolios or the need for major investments and only limited effects on the competitive position of the EU on world markets.



- POs and IBOs can help to disseminate information between supply chain partners, trigger timely adaptations to changes in demand, identify market opportunities, especially in non-EU countries, support the development and production of value-added dairy products and support market access and penetration.

### ***Policy recommendations***

- **Refrain from introducing a new regulatory framework into the milk market:**  
There is no obvious need for political interventions with regard to the sector's competitiveness in terms of added value and portfolio of products, ability to react to changes in demand, competitive position of the EU in the world market, and need of investments in the production and processing industry. The framework defined by the current Single CMO Policy is considered sufficient with regard to the future development of the EU dairy sector. With regard to additional measures regarding a safety net for extraordinary crisis situations and (dairy) farming in less-favoured areas, see the policy recommendations based on the analysis in Section 2.
- **Continue the policies regarding POs and IBOs:**  
POs and IBOs can contribute to more flexible adaptations to changing external conditions and value-added through their contributions to developing market niches with higher value added, product development and access to new markets. The EU, thus, should adhere to its policies concerning POs and IBOs (see, for instance, Regulation (EC) No 511/2012 and Regulation (EC) No 880/2012).

## **4. How could a possible buy-out scheme be operated in a workable and effective way?**

### **4.1 Interpretation and comprehension of the key terms of the evaluation question**

#### Buy-out scheme

A buy-out scheme is a scheme which offers milk producers to reduce their deliveries against compensation.

#### Workability

A buy-out scheme is workable if its management is easy and transaction-cost efficient.

#### Effectiveness

A buy-out scheme is effective if it allows effective adaptations of milk deliveries to actual demand.

### **4.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used**

The assessment of the workability and effectiveness of a possible buy-out scheme is assessed with regard to the following criteria:

- Does the scheme allow quick reactions to unforeseen market developments (responsiveness)?
- Does the implementation of the buy-out scheme allow effective adaptations of milk deliveries to actual demand for milk?

- Is the buy-out scheme managed at the right level (centralised or decentralised)?
- Does the scheme address the least competitive milk producers and, thus, does it not hamper further structural changes which will increase the overall competitiveness of the sector?
- Is it possible to operate the scheme at low transaction costs?

The analysis is mainly based on scientific studies on the EU dairy sector, mainly on studies on the costs and effects of possible buy-out schemes. The validity of the information is generally good. Some limitations stem from the difficulty to forecast the effects of a newly introduced scheme.

#### 4.3 Description of the method(s) used and an indication of its (their) limitations

The analysis is done from an organisation theory perspective. Organisation theorists see organisational structures as the result of horizontal and vertical division of labour and the subsequent implementation of coordination mechanisms. Furthermore, organisational structures are assessed with regard to their cost efficiency and effects on the behaviour of supply chain actors (Frese et al. 2012). With regard to the vertical division of labour, the main research question is where a certain decision should be made in a vertically differentiated system. This is highly relevant for the implementation of a buy-out scheme since it refers to the question whether such a system should be designed as a centralised (at the EU level) or a decentralised (at a regional level) system. Behavioural analyses take into account the effects organisational structures (in this case: the buy-out scheme) have on supply chain actors' behaviour, for instance their forecasts of future prices or the future behaviour of a public authority which manages the buy-out scheme.

Owing to the high complexity of organisational decisions, organisational design is a qualitative research approach. Qualitative efficiency criteria are applied to assess the efficiency and behavioural effects of alternative structural solutions. Assumptions on the effects of structures on efficiency and behaviour are backed by empirical studies but, all in all, empirical insights into the efficiency of organisational structures are still limited. Existing research gaps, thus, have to be filled with plausibility arguments which in some cases reflect practical experiences with alternative organisational structures. Organisation design, thus, is a well-established but still somewhat imprecise theoretical basis for solving design questions.

#### 4.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

***H. 15: Regional disparities between supply and demand should be handled by individual dairy companies in collaboration with their suppliers.***

In volatile and dynamic markets, regional disparities between supply and demand may occur frequently. One reason can be, for instance, that a dairy company loses a major framework contract with a large customer, for instance a retailer. This can result in a massive over-supply of raw milk in the region where this processor is located. In this situation, two alternative situations can occur. Either the dairy company has guaranteed its supplier the processing of all raw milk quantities delivered (purchase guarantee). In this case, the processor will have to accept less profitable marketing opportunities and, according to the widely applied reverse pricing model (see H. 5), milk prices for the suppliers to this dairy company will decline. Or the contracts between the suppliers and their processor allow the latter to cut delivery quantities. In this case, the processor avoids serving unattractive market segments so that prices paid to dairy farmers can remain stable but quantities are reduced. Regardless of how the regional market distortion is handled, it will finally be abolished through regional adaptations of prices and quantities.

***H. 16: There might be a need for an EU-wide buy-out scheme in times of severe market turbulence. This scheme must be operated by the EU. It can be run as a voluntary or a compulsory scheme.***

In case of a serious, EU-wide market imbalance, there can be a need for exceptional measures such as the implementation of a comprehensive buy-out scheme to reduce quantities delivered to dairy companies and adapt supply to actual demand. In such a case, regional measures implemented by individual dairy companies and their suppliers will not work since each region does not have an incentive to reduce quantities but will hope for the decisions of other regions to reduce their quantities of supply. From a transaction cost theory perspective, this is a situation where a high degree of cooperative adaptiveness is needed which can only be guaranteed by a central planning institution (Williamson 1991). In this crisis situation the EU Commission can adopt the role of the central decision-maker who has enough oversight to design and implement an effective system and avoids incentive problems.

In general, the Commission has two options to manage a central buy-out scheme in the milk market. First, it could try to use financial incentives to motivate farmers to voluntarily reduce the quantities delivered to their processors. Second, it could implement a compulsory buy-out scheme which determines where and to what extent to cut deliveries; such a scheme can (but must not inevitably) include financial compensation for farmers who have to reduce their quantities delivered.

It is very likely that a compulsory buy-out scheme would not be accepted by European farmers and farmer associations. Furthermore, a buy-out scheme has to take into account obligations to supply due, for instance, to longer-term contracts with retailers and other customers dairy companies have signed. Therefore, there will be a lack of political support to implement a compulsory scheme; furthermore, such a system would create considerable practical challenges due to existing contracts which have to be fulfilled. So, although a compulsory system may allow somewhat quicker adaptations to changes in demand, the further analysis can focus on a voluntary buy-out scheme which uses financial incentives to motivate farmers to reduce milk production and, thus, contribute to a better balance between demand and supply. A voluntary system based on Article 186 of the single CMO (“disturbance clause”) was also suggested in the first soft landing report (European Commission 2010).

***H. 17: A voluntary buy-out scheme must focus on the reduction of the number of milk cows in the EU.***

Generally, each voluntary buy-out scheme that aims at reducing the raw milk quantities delivered to processors has two options: Either it reduces the number of milk cows and keeps the milk quantity per cow stable, or it keeps the number of cows stable and reduces the milk quantity per cow. For farmers, it is not easy (although not impossible) to reduce the milk quantity delivered per milk cow in the short run. Changes in feed supply and early drying-off would be farmers’ only chances to reduce the milk quantities per cow. But since milk cows are very sensitive with regard to (drastic) changes in their feed supply (Salamon et al. 2012), this path is somewhat difficult to tread. Therefore, farmers usually do not like to reduce the milk quantity per cow. Nonetheless, EU dairy farmers sometimes choose this option, for instance in times of high feed prices (for instance, 2012). But, all in all, a reduction of the number of milk cows seems to be the more practicable starting point for a buy-out scheme since it enjoys a higher acceptance by EU farmers and, thus, provides a more effective solution to a potential over-supply of milk. Regardless of which solution is implemented, the decision to reduce quantities delivered to dairy companies can easily be revised after some time.

***H. 18: A voluntary buy-out scheme should include auction or bidding mechanisms to determine compensation payments to farmers.***

Each voluntary buy-out scheme depends on financial incentives paid to farmers to motivate them to send their cows to slaughterhouses and, thus, reduce the number of milk cows. One option is to offer a fixed compensation per cow to farmers who are willing to reduce their herd size. Such a fixed payment would be very difficult to determine since the production costs as well as the cost structures – including the shares of fixed and variable costs – of European dairy farmers are very diverse (Table 10). This is mainly due to different

production systems throughout EU Member States which result not only in differing costs per kg of milk but also in very diverse shares of fixed and variable costs. If the EU milk market is under severe pressure and if farmers are still able to cover the variable costs of milk production, farmers have to be compensated at least for the fixed costs of milk production to guarantee the financial attractiveness of the buy-out scheme (Weber 2013). If the EU offers a very low fixed price in this situation, farmers might be reluctant to reduce their herd sizes. Furthermore, the reductions will take place only in a very limited number of EU Member States where a low compensation payment is attractive for farmers due to regional cost structures. If the compensation is higher than the minimum price at which farmers would be willing to slaughter some of their milk cows, considerable windfall profits will occur and the buy-out scheme will be more costly than necessary. So, all in all, the setting of the right compensation payment for farmers reveals a severe information problem. From an agency theory perspective this is a typical hidden information problem since farmers know which payments they will find attractive enough to reduce production capacities but will not inform the central agency, i.e., the EU Commission, about their expectations (Arrow 1985).

**Table 10: Costs of milk production in EU Member States (Source: Weber 2013 based on surveys of EDF farmers)**

EU Member State	Fixed costs	Variable costs	Total costs
	Cent/kg ECM		
Netherlands	24.2	19.5	43.7
Denmark	24.1	24.4	48.5
Italy	21.3	27.0	48.3
Sweden	18.9	31.6	50.5
Belgium	18.8	22.4	41.2
Poland	18.8	21.2	40.0
France	18.2	25.9	44.1
Ireland	16.8	19.5	36.3
Germany	16.4	23.6	40.0
Slovakia	13.8	34.9	44.1
United Kingdom	13.1	20.0	33.1
Portugal	13.0	27.2	40.2
Czech Republic	11.9	27.0	38.9
Spain	11.7	32.2	43.9
EU-14 (mean values)	18.3	24.6	42.9

A bidding auction in which farmers offer prices at which they would be willing to reduce their herd sizes would avoid these hidden information and pricing problems. Instead, it uses the (so far hidden; Arrow 1985; Jost 2001) knowledge of farmers about the right prices that have to be set to motivate them to reduce herd sizes. If enough bids for selling milk cows are placed, the Commission will be able to accept the number of bids required for reducing supply quantities as desired. Even in case of the implementation of a bidding auction, there might be regional disparities with regard to farmers' willingness to reduce the number of milk cows due to regionally diverse cost structures. A broad spectrum of bids offered by farmers would also provide a basis for a regionally balanced reduction of production capacities. All in all, a bidding system would allow managing the buy-out scheme effectively and efficiently since it used the hidden information farmers have and which are crucial for an effective and at the same time transaction-cost efficient reduction of quantities delivered to dairy companies.

***H. 19: A voluntary buy-out scheme is most attractive for dairy farmers with high variable costs.***

In times of severe turbulences on the EU milk market, prices will be very low. In this situation, it will be most attractive for farmers with high variable costs of milk production to participate in the buy-out scheme (for a

similar argument see Weber 2013). When milk prices decrease, these farmers will be the first to come into a situation in which prices do not cover variable costs anymore. Then, they lose the more money the more milk they produce and sell. In the same situation, farmers with lower variable costs may still be able to see positive variable gross margins which will allow them to cover at least some of their fixed costs. For these farmers, it is less attractive to reduce the size of their herds. But, depending on which compensation payments are offered, even the more cost competitive farmers might be willing to join the buy-out program. This can be the case if payments by the EU cover the fixed costs of dairy production so that even slightly positive variable gross margins will not motivate farmers to keep milk production stable.

Taking into account the very diverse variable (and fixed) costs of milk production in Europe (Figure 13), a buy-out scheme which uses auctions for determining compensations to farmers will have very diverse regional consequences. In some regions, hardly any farmer will participate, whereas in other regions the scheme may look much more appealing and a considerable share of farmers might be willing to participate.

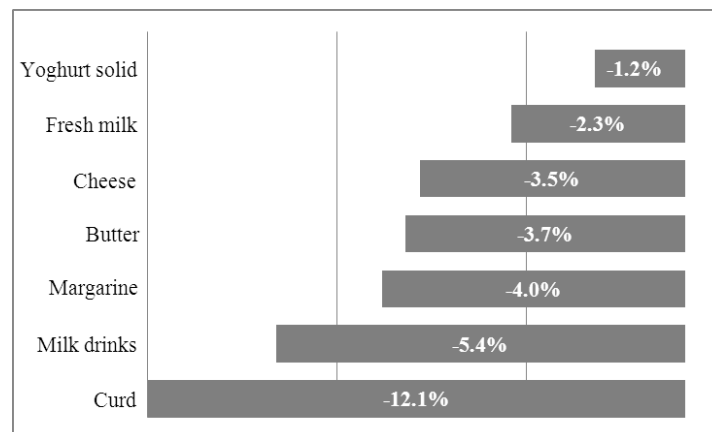
Dairy farms which are competitive in the long run are often characterised by high fixed costs and low variable costs due to investments into latest production technology. Since it makes sense to buy-out the least competitive farmers (often characterised by high variable and comparatively low fixed costs), the higher attractiveness of a buy-out scheme for farmers with high variable costs is an attractive feature of a possible buy-out scheme.

***H. 20: The effectiveness of a voluntary buy-out scheme is highly questionable in the short run.***

According to Weber (2013), the success of a voluntary buy-out scheme, i.e., its ability to effectively contribute to reduced quantities in the market and higher prices, depends on several preconditions:

- The number of participating farmers is large enough to realise a sufficient reduction of quantities delivered. Former crises have shown that minor reductions of quantities of around 1 percent are not sufficient to trigger relevant price reactions.
- Demand remains stable after an increase of prices. Although it is often assumed that demand for food is inelastic, prior experiences after price increases of dairy products have revealed that consumers flexibly change their buying behaviour and demand for some products becomes very weak. Figure 13 shows decreases of sales of selected dairy products in the German consumer market after moderate price increases during the 2008 milk market crisis. The same has been observed for industry customers who often change recipes and replace, for instance, butter by cheaper vegetable fats wherever this is possible.
- Third-country suppliers do not react to higher prices for dairy products in the EU (compared to world markets) and their deliveries do not foil the reduction of quantities delivered by EU farmers. Owing to the protection of the EU milk sector realised through tariffs, this effect will be very much limited and major imports of more cost competitive products from world markets will not occur.
- Export quantities remain stable although prices in the EU are above world market prices. Since at least about 80 percent of EU exports take place in price-sensitive bulk commodity markets, exports will very likely decrease after a buy-out scheme has increased EU milk prices over world market prices. The expectable reduction of exports will at least partly reduce the effects of the buy-out scheme

**Figure 13: Decreases of sales of selected dairy products after a price increase in 2008 (Source: ife Forschungszentrum 2008 based on ZMP data)**



So, all in all, it is very uncertain whether a buy-out scheme can really contribute remarkably to the termination of a milk market crisis. Although farmers might be willing to participate in a possible buy-out scheme, there are reasonable doubts whether the desired adaptation of milk supply to demand will really occur. Since the latter is the major goal of such a programme, its overall effectiveness is highly questionable due to the tight integration of the EU milk market into world markets for dairy products. There is a considerable risk that the money spent by the EU in a milk market crisis is largely wasted due to decreasing exports and the presumably reduced demand of consumers and industry customers due to price increases relative to substitute products.

***H. 21: The effectiveness of a voluntary buy-out scheme is even more questionable in the long run.***

Weber (2013) convincingly argues that the effectiveness of a buy-out scheme is even lower in the long run because market participants will adapt their reactions (including investment decisions) to such a programme. After the buy-out scheme has been applied repeatedly, producers will take possible EU compensation payments into account when planning their production quantities. Therefore, the total volume of milk production in the EU as well as the probability that supply exceeds actual demand will increase. This will further decrease the effectiveness of such a scheme in the long run since the EU would have to buy-out quantities which are only in the market because producers have learned that these quantities will be bought by the EU Commission.

***H. 22: The efficiency of a voluntary buy-out scheme is low.***

In the case of a buy-out scheme, efficiency describes the relationship between the costs and benefits of the programme. The benefits are described by the effects the buy-out scheme will probably have on quantities delivered and raw milk prices in the EU (see H. 20 and H. 21). These benefits seem to be rather low; therefore, a possible buy-out scheme has to be very cost-efficient to justify its implementation. With regard to a buy-out scheme, the following cost categories are relevant (Weber 2013):

- **Compensation payments to farmers:** The buy-out scheme is only attractive for a sufficient number of farmers if it pays at least the fixed costs of milk production to farmers who participate in the programme. Weber (2013) has calculated the EU-wide costs of a reduction of milk by supply by 1 percent, 2 percent or 5 percent (Table 11). The results show that the costs of a remarkable reduction of quantities delivered are high; they amount to payments between 400 million Euros (2 percent reduction) and more than one billion Euros (5 percent reduction). Since reductions of EU production will be partly compensated by higher imports, the costs per kg of milk will be considerable.
- **Administrative costs:** The EU has to administer the buy-out scheme. These costs will be very high since reductions of quantities delivered will occur in several or, depending on the compensation payments, even nearly all EU Member States on a large number of farms. Outputs of participating farms have to be controlled continuously in order to avoid fraud. Besides deliveries to dairy companies, direct sales to consumers which still play an important role in some EU Member States have to be captured by the

control procedures. This will require a very dense inspection system which presumably does not exist so far in the vast majority of Member States.

- Hidden costs: There are more costs of a possible buy-out scheme due to higher prices for dairy products consumers have to pay and windfall profits of farmers who would quit production anyway and now get parts of the costs of their exit decision paid by an EU buy-out programme. More hidden costs occur if the buy-out scheme impedes the future development of growth-oriented, efficient dairy farms due, for instance, to fees these farms have to pay.

**Table 11: Compensation payments to farmers (source: Weber 2013)**

EU Member State	Reduction of milk quantity by 1% of the total EU production	Reduction of milk quantity by 2% of the total EU production	Reduction of milk quantity by 5% of the total EU production
	Million €		
Germany	48.59	97.2	243,0
France	43.56	87.1	217.8
Netherlands	28.91	57.8	144.6
Italy	24.23	48.5	121.1
Poland	23.37	46.7	116.8
United Kingdom	18.28	36.6	91.4
Denmark	11.83	23.7	59.2
Ireland	9.13	18.3	45.6
Spain	7.44	14.9	37.2
Belgium	5.85	11.7	29.2
Sweden	5.41	10.8	27.0
Czech Republic	3.19	6.4	16.0
Portugal	2.29	4.6	11.4
Slovakia	1.23	2.5	6.1
<b>Total costs EU-27</b>	<b>237.6</b>	<b>475.2</b>	<b>1,188.1</b>

***H. 23: The implementation of a buy-out scheme creates difficult design problems and nearly insolvable administrative and control problems.***

The implementation of a buy-out scheme at the EU level (see H. 16) requires (a) an adequate system design, (b) the set-up of the required administrative infrastructure and (c) effective control procedures. With regard to *system design*, the following questions have to be answered:

a) Which indicator is used to determine whether the milk market is actually in a crisis situation which justifies the application of an exceptional measure such as the activation of a buy-out scheme?

At first sight, it seems plausible to link the diagnosis of a crisis situation to the prices dairy farmers get for raw milk. But in times of volatile output *and* input prices, it could be more reasonable to look at farmers' gross margins or liquidity situation in order to determine whether the milk market is in a crisis situation or not. Even if milk prices are above a certain threshold level, rising prices for feedingstuff, energy, fertilizer, land or other input factors can put dairy farmers under severe pressure.

b) What is the threshold level which is used to diagnose a crisis and activate the buy-out scheme?

A minimum threshold level of the relevant indicator has to be defined which activates the buy-out scheme. Furthermore, it has to be decided whether there is a minimum time span for which the threshold level of the

relevant indicator has to be missed before the buy-out scheme is activated (for instance, a milk price below XY Euro-Cents per kg for at least YZ days).

c) Should the system be activated in all EU member states or should there be an opportunity to activate it only in selected regions or member states?

A regional activation of the buy-out scheme could help to adequately react to regional market imbalances. Nonetheless, in a single European market it seems unlikely that regional crisis management will be effective, i.e. able to contribute to higher prices for dairy farmers in that region.

d) Which quantities will be taken out of the market?

The quantities can be defined in absolute numbers or in percentage of production. Furthermore, it is also conceivable to determine (maximum) quantities indirectly by defining a budget available for compensating farmers and the compensation farmers are paid per kg of milk which they do not produce.

e) How long will the system remain active after it has once been activated?

Is this period of time defined by the availability of budgets? Or does the duration of the activation period depend on exceeding a minimum threshold level of the relevant indicator? If a minimum threshold level has to be exceeded, for how many days should this happen before the buy-out scheme is de-activated again? And what will happen in case of a long-term downward trend, for instance of milk prices or the profitability of dairy farming?

f) Which compensation is paid to farmers? And will this compensation be uniform throughout the EU or should there be a differentiation between regions, member states, or farm types (for instance, small, medium-sized and large farms; family farms and farms relying on hired labour)?

At first sight, it seems plausible that compensation payments take into account the profits farmers forego by reducing their production volume. This requires the knowledge of the profitability of dairy production, i.e. prices (which are usually known quite well) and (variable) costs. The latter vary considerably throughout the EU (see H. 18) which makes it difficult to determine adequate (uniform) compensation payments. A uniform compensation payment, thus, will very likely be attractive only for certain farm types or regions. On the other hand, differentiated payments could raise fairness issues or have unwanted side-effects on structural developments or the regional distribution of dairy farming.

It has also to be determined what compensation should be paid to farmers who do not forego any profits by reducing their production volume because their variable costs already exceed milk prices when the buy-out scheme is activated.

Finally, it has also to be decided how to determine and treat natural fluctuations in milk production due, for instance, to changing weather conditions or feedingstuff qualities. Will these fluctuations somehow be taken into account when determining farmers' production volumes in the current and the reference periods?

After designing the system by answering the questions raised above, an adequate *administrative infrastructure* has to be established. It needs at least the following information to effectively run the system:

a) Information on the quantities delivered by farmers who participate in the buy-out scheme in the reference period.

b) Information on the quantities participating farmers delivered before the activation of the buy-out scheme.

c) Information on the actual reduction of production volumes by farmers who participate in the buy-out scheme.



d) Information which is necessary for determining the compensation payments to farmers. If the buy-out scheme is designed in order to compensate farmers for the profits which they forego due to the reduction of production volumes, this will require information on the costs and/or profitability of each single farm participating in the buy-out scheme.

After establishing the administrative infrastructure for running a buy-out scheme, adequate *control procedures* have to be implemented. The system operator has to be able to determine whether the reduction of production volumes for which farmers want to be compensated has actually taken place. This is the more difficult, the higher the share of milk is which is not sold to dairy companies but marketed through other distribution channels (see H. 22).

All in all, it seems next to impossible to set up an effective buy-out scheme and run it efficiently. We consider it very unlikely that it will be possible to solve the enormous management challenges which such a buy-out scheme creates.

#### 4.5 Conclusion and policy recommendations drawn directly from the analysis

##### **Conclusion:**

- The effectiveness of a buy-out scheme is rather low in the short run due to the tight world market integration of the EU dairy sector. It is even lower in the long run due to learning effects on the side of dairy farmers who will anticipate the effects of a buy-out scheme in their investment decisions. Furthermore, the efficiency of a buy-out scheme is low. It will cause considerable costs for compensating farmers and administering the system. Furthermore, there are hidden costs due to higher prices consumers have to pay, some windfall profits which accrue to farmers and potential detrimental effects on growth-oriented, efficient farms. So, all in all, the cost-benefit ratio of a buy-out scheme is very low. Furthermore, it creates extremely difficult management problems and requires extensive controls of dairy farms.

##### **Policy recommendation:**

- **Refrain from implementing a buy-out scheme in the dairy sector:**  
Owing to the low effectiveness and efficiency of a buy-out scheme and the management and control problems it is expected to create, it is not advised to implement such a mechanism in the dairy sector. This expert opinion does not share the optimistic view of the first soft landing report regarding the possibility to stabilise the milk market in times of serious disturbances by taking 1 or 2 percent of milk production out of the market.

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***Theme 2: Sustainable milk  
production including its territorial  
dimension***





**AGRI-2012-C4-04 - Analysis on future developments in the milk sector**

Prepared for European Commission - DG Agriculture and Rural Development

Opinion Report

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**Theme 2: Sustainable milk production including its territorial dimension**

## 1. Introduction

### Major trends in international dairy production and consumption

The global milk production is projected to increase by 2 percent per year during the next 10 years (OECD/FAO, 2012). This increase is strongly driven by increased consumption in the emerging markets. In Asia/Pacific and Latin America, the per capita consumption will rise by 22 percent and 13 percent, respectively. At the same time, the consumption of dairy products in the developed countries will grow modestly by about 5 percent. The strong rise of dairy consumption in the developing countries is driven by the increasing population and income per capita, combined with the growing popularity of dairy products.

The OECD-FAO Outlook also forecasts that the majority of the global milk production gains will come from emerging countries that develop their dairy sector, particularly India and China. The projections show that from 2013 onward, the developing countries will have a greater share in world milk production than the developed countries do. This shift in production makes clearer that the demand for dairy products from the emerging countries has changed the world dairy market drastically. In the past, this market was strongly influenced by intervention buying and export measures of the EU. In recent years and even more in the next decade, the market becomes more and more mature with increasing volumes and more countries participating in import and export. These increased world market volumes combined with a projected modest increase of exports from the EU will lead to a decline in world market share of EU dairy products. Where the EU used to have a share of about 50 percent in the supply of the world dairy market in the 80s of the last century, the projections show that this share will fall to about 20 percent at the end of the next decade. With the highest EU world market share for cheese (about 25 percent in 2021), it is expected that the EU will not only dominate the world cheese market, but also will be the biggest producer with 44 percent of the global cheese production. In the developed countries, cheese is the fastest growing dairy product, whereas the consumption of other dairy products in these countries is quite stable.

### Driving factors for future development of dairy sector

As mentioned before, the growing consumption of dairy products in emerging countries is the major reason for the increase in world dairy production of about 2 percent per year. Besides the increase in population and income, the positive image of dairy products in these countries also plays an important role. Dairy products are associated with healthy and nutritious food and the variety of innovative and attractive dairy products supplied by retail chains and multinational companies encourages consumers to add more dairy in their daily meals.

The production side of dairy is strongly driven by dairy development programs in developing countries and to a lesser extent by expansion of dairy farms and the dairy processing sector in developed countries. We consider access to international markets, strong brands, product innovation, value-added products and low production costs as important factors to be competitive on international dairy markets. As far as dairy farm production systems is concerned, the Organisation for Economic Co-operation and Development (OECD) foresees the most positive prospects for pasture-based milk producing farms because of the expected higher prices for energy and feed. In the long run, the driving factors for the growth of world milk production will be mainly milk-feed price ratio, competition for feed, land and water and environmental constraints that limit further expansion of cow numbers.

The smaller share of the EU on the world dairy market mentioned in 1.1. is caused by the increase in world milk production and milk quota that prevented the EU countries from producing more milk and the changes in the Common Agricultural Policy (CAP) since 2003. The EU export subsidies and intervention support declined and the result was an increase of EU unsubsidised exports of dairy products (Jongeneel et al., 2011) and higher world market prices. Especially, the export of PDO<sup>41</sup>-cheeses to outside the EU increased significantly, which made Jongeneel et al. conclude that these high value and high quality products are not very sensitive to competition from other dairy products because of their unique character. The future projections of OECD (OECD/FAO, 2012) support this conclusion by emphasizing the dominant role of the EU in cheese production and export. In line with this, Tacken (2009) concluded that the EU dairy sector is strong because of its role as an innovative global player. This role is strongly demonstrated in the development and marketing of cheeses and other value-added products.

### Goal: expert opinion on consequences of quota abolition

The main goal of this paper is to give an expert opinion about the perspectives and challenges for the dairy sector resulting from the abolition of the milk quota system. We focus on the development of the EU dairy sector in the period until 2020. In addition to the abolition of quota, we also take all the other expected changes for the dairy sector into account. As most striking changes, we consider the changes in the global dairy sector and dairy markets as outlined in 1.1. Other important changes will be the intended reform of the Single Payment System<sup>42</sup> and the introduction of the Milk Package<sup>43</sup>. Based on the present knowledge of these reforms (situation April, 2013), we estimate that it will only have a minor influence on the differences in competitiveness among various dairy regions considered in this report.

In the last five years, several studies have forecasted the consequences of quota abolition for total milk production, price of raw milk and number of cows per herd in 2020. The increase in total EU milk production is expected to be between 0 (Binfield, 2009) and 5 percent (Réquillart et al., 2008), with four more references

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<sup>41</sup> PDO = Protected designation of origin

<sup>42</sup> MEMO/13/324, Q&A: next steps for the Common Agricultural Policy (CAP) reform, 11.04.2013

<sup>43</sup> Regulation (EU) No 261/2012 of the European Parliament and of the Council, OJ L 94, 30.3.2012, p. 38.

within this range (listed in EY, 2013<sup>44</sup>). These studies also predicted price drops because of the abolition ranging between 2 percent (Binfield, 2009) and 10 percent (Réquillart et al., 2008). In 2012, the European Commission DG Agriculture and Rural Development (DG AGRI, 2012a) projected a milk production that will be 159 million tons (147 million tons delivered to dairies) in 2022, accounting for an increase of 5 percent compared to 2011. OECD/FAO forecasted an increase of the EU milk production of 4.4 percent in 2021 compared to the production in 2009-2011. Both studies show the same direction: a rounded 5 percent increase in the EU milk production in the decade between 2010 and 2020.

These figures are averages for the EU as a whole but can differ greatly between regions, depending on regional differences in e.g., profitability of milk production, market conditions and other production circumstances. This is why we try to get a more insight into the regional milk productions and income development in 2020. The next question is to assess the contribution of the dairy sector to the total agricultural product value as well as its role in maintaining vibrant rural communities, especially in the most fragile areas. In our analysis, we will identify regions where the dairy sector is at risk as well as dairy farming systems that are at risk because of either the abolition of milk quota or other changes affecting the dairy sector. We will also describe elements that may underpin the sustainable development of the sector in these regions including its economic and territorial dimensions. Finally, we suggest appropriate actions to improve the future outlook for the dairy regions and dairy farm production systems at risk.

### Interpretation of questions and reading guide

Our expert opinion is presented in the form of answers on the four questions mentioned by DG AGRI. The questions showed some overlap. This is why we have chosen for an interpretation that focuses on one or two central themes per question. These themes are deducted from the question itself and from the overall theme “sustainable milk production including its territorial dimension”. This will benefit the structure of the entire expert opinion report and minimises overlap and repeating answers. But the reader should be aware of the extra focus we have placed on the central themes. The four questions of DG AGRI and the focus themes we have added are:

1. *What will be the contribution of the milk sector to maintaining vibrant rural communities, especially in the most fragile areas?*  
Our expert opinion including the answer to this question is described in Chapter 2. Our focus theme of Chapter 2 is: “Consequences for regional milk production and income.”
2. *How will evolve over time the balance between the territorial and economic dimension of milk production?*  
Our expert opinion including the answer to this question is described in Chapter 3. Our focus theme of Chapter 3 is “Consequences of the abolition of milk quota for the territorial dimension.”
3. *What are the regions and production systems which could endeavour difficulties?*  
Our expert opinion including the answer to this question is described in Chapter 4. Our focus theme of Chapter 4 is “Regions and production systems at risk.”
4. *What actions could be envisaged with the view to secure that a sustainable balance between the economic and territorial dimension of the milk sector?*  
Our expert opinion including the answer to this question is described in Chapter 5. Our focus theme of Chapter 5 is “Perspectives for regions and production systems at risk.”

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<sup>44</sup> Table 6: Possible scenarios for prices and supplied quantities of milk following the removal of quotas in 2015

## 2. What will be the contribution of the milk sector to maintaining vibrant rural communities, especially in the most fragile areas?

### 2.1. Interpretation and comprehension of the key terms of the evaluation question

This question is of major relevance for regions where the dairy sector plays an important role because of its contributions in the fields of economy (dairy farms and dairy processors) and/or landscape and natural habitats. Since the word 'vibrant' is added to this question, we conclude that besides the economic value of the sector, the broader contribution to the regional community should also be considered.

The influence of the sector on landscape and natural habitats including its cultural value mainly depends on the production system. In regions with intensive systems, this influence usually is of minor importance. In regions with extensive dairy production systems, the farms usually have a large impact on this. In many countries, grassland and grazing cows are an essential part of the landscape and the attractive landscape creates opportunities for tourism and other types of diversification. The consequences of dairy farming systems for the regions are discussed in Chapter 4.

The next key element in this question is the future role of the dairy sector in a region. We consider the change in milk volume produced in the region as the best indicator for the future role of the sector in a region. The way the question is posed evokes the question whether the dairy sector in a region is crucial in maintaining a vibrant rural community. We consider a vibrant rural community as a community with the ability to adapt to changing external circumstances in such a way that at least a satisfactory standard of living is maintained. This also includes the capacity to recover from negative developments that could be the result of market circumstances or government policy. It would be useful to consider new markets and industry branches that are coming up in the regions that are facing a decrease in milk production. When workers in agriculture leave this sector and change to another industry branch, the contribution of these workers to the regional economy might be even greater than their contribution when they stay on the farm. In our expert opinion, we do not go into this subject, but knowledge about this effect should be considered when evaluating the consequences of the developments in the dairy sector for the prosperity of the region. Based on this conviction, we made a list of proposals (in Paragraph 5.5) to improve the overall employment situation in regions where employment in the dairy sector is declining.

In this chapter, we focus on the contribution of the dairy sector on the economy of the region. And we consider the regional change in milk volume in 2010-2020 as the main indicator for the change in the contribution to the regional economy.

We will take a closer look at the most fragile area in Chapter 4.

## 2.2. Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

Based on the interpretation of the question described in 2.1., we use these analysis criteria to make projections for the future of milk production in 15 European regions:

- Expected development of the volume of milk production within regions  
The expected development will be based on multi-criteria expert judgment. The expert judgment is made by authors with about 25 years of experience in research, advisory services and management with regard to the dairy sector. Additional experts have contributed by reviewing the results.
- Economic importance of the dairy sector within regions  
This economic importance is estimated from (1) share of agriculture in gross domestic product (GDP) and (2) the share of milk in agricultural revenues.

## 2.3. Description of the method(s) used and an indication of its (their) limitations

### 2.3.1. Method to forecast regional change in milk production 2010-2020

Many studies in the last five years were aiming at forecasting the consequences of the envisaged abolition of quota in 2015. A recent summary of the results is made by EY (2013)<sup>45</sup>. This literature review shows that most of the studies forecast an increase in EU milk production in between 0 and 5 percent between 2015 and 2020. Although a general increase in milk production is foreseen for the EU as a whole, the consequences for regions will differ strongly. Within the studies mentioned here, quota rent<sup>46</sup> is used as an important predictor for the future milk production in the Member States. We consider dairy farm expansion as a strategic decision of farmers in which many opportunities and conditions play a role. Therefore, we developed a multi-criteria approach (Zijlstra et al., 2008) that is applied to EU-regions to make projections that take into account many aspects that we consider as relevant for farm continuation and expansion. A panel with experts is organised to make the scores quantitative. In our approach, we have chosen to divide the EU into 15 regions that share many general characteristics like economic conditions, climate, dairy farm size and government policies. In order to predict the milk production in 2020, we assessed the regions for these nine criteria:

1. Percent change milk production in the last decade  
This change is based on data about milk production in EU-regions from Eurostat<sup>47</sup> over the years 2000, 2001, 2010 and 2011. The average production of 2010 and 2011 was compared to the average of 2000 and 2001. When data were missing, the nearest years were used to replace. These changes in milk production for the regions are shown in Table 1 (in percentage from production in 2000; for some regions with missing data for this year other reference years)
2. Expected change in milk production after abolition of quota, based on literature  
This assessment is based on the projections from IPTS (2009)<sup>48</sup> made by model calculations with the CAPRI model.
3. Entrepreneurship of dairy farmers  
The score for entrepreneurship is based on expert judgment. Entrepreneurship includes ambition, risk

<sup>45</sup> Table 6: Possible scenarios for prices and supplied quantities of milk following the removal of quotas in 2015

<sup>46</sup> Quota rent is defined as the difference between the farm milk price and the marginal cost of production (IPTS, 2009). Quota rent is supposed to be an important indicator for the extra profit per extra kilogram of milk the farmer produces.

<sup>47</sup> Milk production in NUTS2-regions. The basis data came from Eurostat and were made available to us by Ernst & Young and regrouped by us.

<sup>48</sup> Data from Table 17 in IPTS (2009) about the change in milk production in 2020 caused by the abolition of milk quota.

attitude, expertise with farm expansion, financial situation and regional or national fiscal climate. This is one of the most subjective scores used in this evaluation. It is strongly based on our long time experience with the ambition to increase milk production within EU-regions. Other than point 4 hereafter, this criterion is solely focusing on ambition, attitude and the strength to make expansion ambitions come true. Dairy farmers in certain areas will increase production both at a high and at a low milk price. Their attitude is that the higher will be the milk price, the more money will be earned. However at a low milk price, increasing production will cut down cost, is their reasoning. In other areas, a high milk price sometimes comes with a high price for cereals as well. Farmers in certain areas would rather prefer to produce cereals than milk. Hence, attitude and entrepreneurship really make a difference.

#### 4. Profitability of dairy farms

This score is also based on expert judgment. For this judgment, different data sources are used as indicators:

- a. Farm Net Value Added per Annual Working Unit on milk specialised farms in 2009 from FADN EU Dairy farms report 2011(EY, 2013)<sup>49</sup>
- b. Gross margin over operating cost for specialised EU dairy farms (Jongeneel et al., 2011)<sup>50</sup>
- c. Cost of milk production as shown for typical farms in EU-countries in Hemme (2012)<sup>51</sup>

These data sources were combined with expert knowledge based on earlier studies and presentations with data of FADN and EDF (European Dairy Farmers).

#### 5. Competitiveness of the dairy processing industry

Expert judgment was among others based on Jongeneel (2011) and Tacken (2009).

#### 6. Natural conditions

The conditions that will influence soil fertility and the growth of grass and fodder crops: soil fertility, climate (temperature and rainfall), hilly terrain and mountain areas.

#### 7. Environmental regulations

Regulations and legislation to protect soil, air and water can limit the possibilities for dairy farm expansion. The same is true for regulation on spatial planning.

#### 8. Land prices and urban pressure

In urban regions, land prices are usually high and farm expansion might have to compete with alternative destinations for land with higher profitability's.

#### 9. Growth of the local market for dairy

An increase of the regional or domestic market might be an incentive for dairy farmers and processors to expand.

All regions are assessed for the above criteria are rated with numbers ranging from 1 (low potential for increase of milk production) to 5 (high potential for increase of milk production). The criteria are not completely independent of each other. Especially, the criteria with weighing factor 2 have strong mutual relationships.

The results of the assessment are shown in Table 1. The summation of the nine scores leads to the total score that is the basis for the rank of the regions. The summation is calculated by weighing the different criteria on the basis of their assumed importance for predicting the future expansion of the regional milk production. The weighing factors are shown in the top of the table. The criteria 1, 3, 4 and 5 have a weighing factor of 2. We consider these criteria as the main determinants for the increase in regional milk production. For Criteria 8 and 9, this factor is 0.5 and for the remaining criteria, the factor is 1.

<sup>49</sup> Tables 38 and 39

<sup>50</sup> Table 7.9

<sup>51</sup> Page 34: Cost of milk production of typical farms analyzed

The total score is the basis for the calculation of the expected milk production in 2020. This calculation is made by combining the milk production in recent years with the regional total score and the expected increase in EU milk production by OECD/FAO (2012) between 2009-2011 and 2021. This expected increase is 4.4 percent.

The changes in regional milk production are calculated with the formula:

$$= \text{average milk prod 2010 and 2011} \times \frac{\text{regional score}}{\text{weighed average score}} \times \text{outlook OECD increase EU milk production}$$

Some of the nine criteria mentioned in this paragraph may be positively correlated, e.g., criteria 2 and 4, both of which focus on the profitability of additional milk, but are calculated by different methods. Both are taken into account because we consider this characteristic as very decisive. Moreover, it was not the intention to select criteria that are independent from each other.

### **2.3.2. Method to estimate share of dairy sector in GDP**

Changes in milk production in regions will have consequences for the income of farms and the number of farms, resulting in a change in the contribution of the dairy sector to the regional income. To take a closer look at these consequences, we first evaluate the contribution of the agriculture sector to the regional income (expressed in gross domestic product, GDP) in the present and in 2010-2020. The next step is to multiply this share of agriculture in GDP by the share of milk production in the total agriculture production. This results in the share of milk production in GDP. This share is presented in combination with the expected change in milk production between 2010 and 2020 to give an impression of the change in income from the dairy sector in this period.

## **2.4. Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits**

### **2.4.1. Future milk production in regions**

The results of the expert approach are shown in Table 1. The results refer to the change in milk production between 2010 and 2020. Half of this period is still under the quota regime, the other half is after abolition. The combined period of 10 years makes it easy to compare the projected change in milk production with the realised change in the past. Therefore, this change in the past (decade 2000-2010) is also shown in the table. Like mentioned before, this change is one of the criteria used to forecast the expected future change.

Table 1. Regional data on milk production changes in past and future, including the results of expert judgement for criteria determining the expected change in milk production

Region*	Average annual production 2010+2011	% change production 2000-2010	% change production past	Projections in literature	Entrepreneur-ship	Profitability production	Competitiveness process. industry	Natural conditions	Environmental restrictions	Land price /Urban pressure	Growth local market	Total score	Rank	Milk production 2020	% change production 2010/11-2020
	weghing factor		2.0	1.0	2.0	2.0	2.0	1.0	1.0	0.5	0.5				
Scandinavia	5,175	-11%	1	2	3	3	5	3	3	4	3	35.5	14	4,330	-16%
United Kingdom	13,974	-4%	3	1	4	3	3	5	4	4	3	39.5	10	13,009	-7%
Ireland	5,453	3%	4	5	4	5	3	5	4	4	3	49.5	3	6,362	17%
North Sea region	29,242	9%	5	5	5	4	5	5	2	2	3	52.5	1	36,185	24%
Western France	12,527	1%	4	4	4	4	5	5	3	3	3	49.0	4	14,468	15%
Central France	9,301	-4%	3	2	3	3	4	3	4	4	3	38.5	11	8,440	-9%
Central Germany	12,536	4%	4	5	4	4	4	4	3	3	3	47.0	5	13,887	11%
Eastern Germany (former DDR)	6,383	2%	4	5	3	4	3	5	4	4	3	45.5	6	6,845	7%
Alps region	10,030	0%	4	4	4	3	4	3	3	3	3	43.0	8	10,165	1%
Poland	12,347	4%	4	4	3	4	2	4	5	5	4	43.5	7	12,659	3%
Baltic countries	3,262	2%	4	3	3	3	2	4	5	5	4	40.5	9	3,114	-5%
Eastern Central Europe (C/S/H/S)	5,934	-7%	2	4	3	4	2	3	5	5	4	38.5	11	5,385	-9%

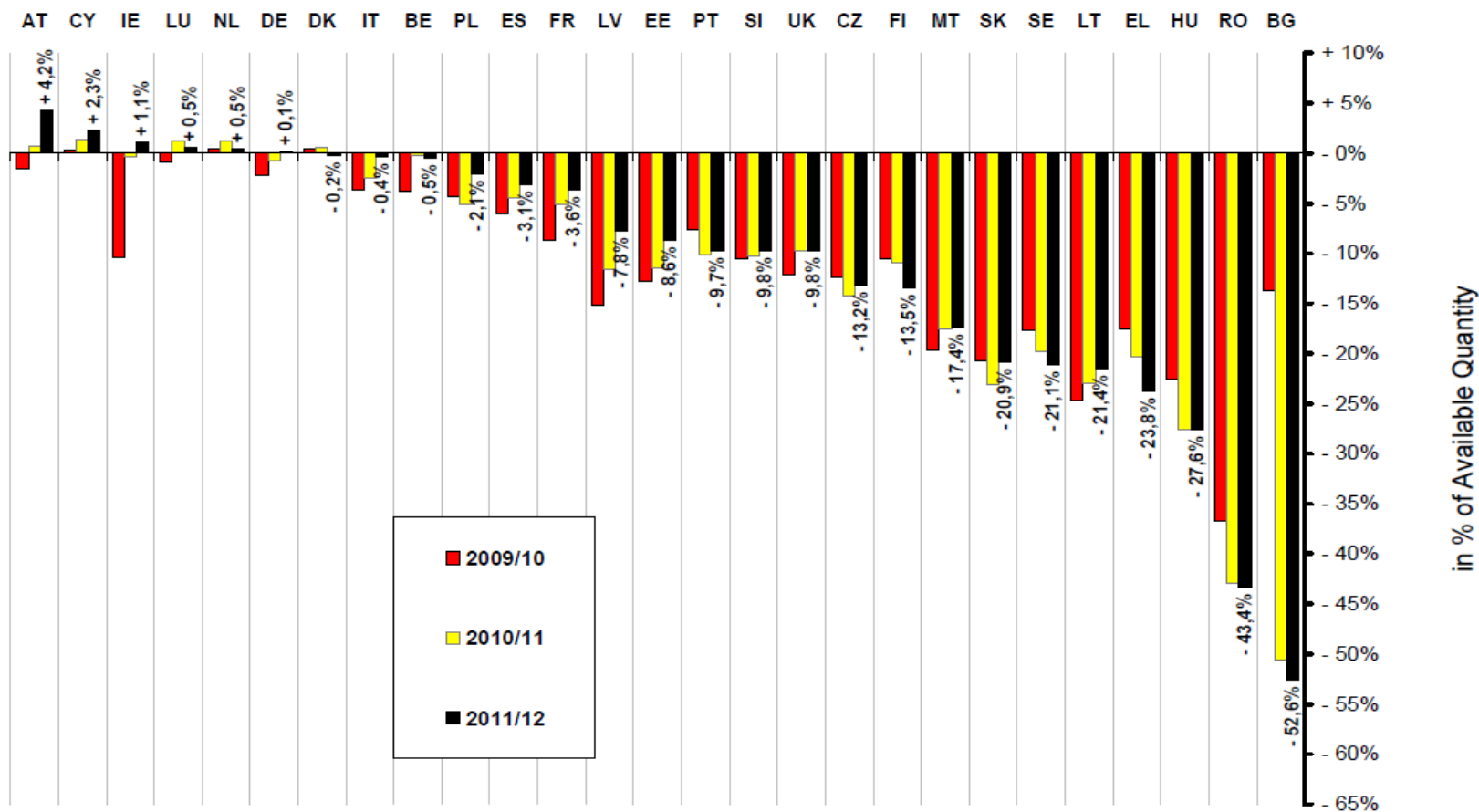


Region*	Average annual production 2010+2011	% change production 2000-2010	% change production past	Projections in literature	Entrepreneur-ship	Profitability production	Competitiveness process. industry	Natural conditions	Environmental restrictions	Land price /Urban pressure	Growth local market	Total score	Rank	Milk productionn 2020	% change production 2010/11-2020
weghing factor			2.0	1.0	2.0	2.0	2.0	1.0	1.0	0.5	0.5				
Romania and Bulgaria	5,109	-19%	1	4	2	3	2	4	5	5	4	33.5	15	4,034	-21%
Po Valley	7,831	5%	4	4	5	5	5	4	3	2	3	51.5	2	9,505	21%
Southern Europe	11,231	-1%	4	3	2	3	3	2	4	5	3	37.0	13	9,795	-13%
<b>Total/weighttd average</b>	<b>150,335</b>	<b>101%</b>										<b>44.3</b>		<b>158,183</b>	<b>5%</b>

\*See Appendix 1 for a detailed description of regions

Figure 1. Milk production compared to quota in three recent years (Source: DG AGRI, 2012b)

### EU Deliveries Overshoot/Under use (in % of quota)



The results in Table 1 show strong increases (more than 10 percent) in milk production in the North Sea region, Po Valley, Ireland, Western France and Central Germany. The first reason for the expected expansion of milk production in these regions is the increase these regions already have shown in the last 10 years with quota. This is forecasted based on the criteria in Table 1. But it can also be deducted from Figure 1 where the milk production in the Member States is compared with the national quota for three recent years. Austria, Cyprus, Ireland, Luxemburg, The Netherlands, Germany, Italy and Belgium are usually filling or overshooting their quota.

Because of the gradual increase of milk quota since 2008 and because of the possibility of quota transfers within the Member States, these regions had the possibility to expand their production. The entrepreneurship of farmers in these regions is strongly moving into the direction of further dairy farm expansion. The French situation where quota are more tied to regions, makes that Western France till so far has not shown an increase in regional milk production. Another reason for the strong rise in milk production in these regions is the profitability of milk production. In most of these countries, the high profitability of the farms is mainly caused by their size and/or by the level of the milk price. Italy has both. In Denmark, Northern-Germany and the Benelux, the average herd size is large compared to the rest of Europe and milk prices usually are also above average. The positive prospects of the Irish milk production have mainly to do with its low cost grass-based production system. In the case of Western France, the positive prospects have to do with favourably natural constraints and a competitive processing industry. This strong position of processors is also present in the North Sea region and in the Po Valley.

Strong decreases in milk production are expected in Romania, Bulgaria, Southern Europe and Scandinavia. The reasons for this are the contrary of those for the regions that gain in production. Romania, Bulgaria and Scandinavia have shown strong drops in milk production in the last 10 years and they underutilised their quota in recent years: Romania -43 percent, Bulgaria -53 percent, Sweden -21 percent and Finland -14 percent compared to the national quota. In the regions Southern Europe and Romania and Bulgaria entrepreneurship, profitability of milk production and competitiveness of the dairy processing industry are evaluated as below European average. This restricts further development of the sector.

Another four regions are estimated to decrease production in the period between 2010 and 2020 by 4 to 8 percent: Baltic countries, United Kingdom, Central France and four countries grouped as Eastern Central Europe. The Baltic countries have reasonable opportunities from the point of view of natural constraints and possibilities to expand production, but processing and entrepreneurship are not enough developed to expand. The same is true for the Eastern Central European countries. In the United Kingdom, milk production in the last three years has been about 10 percent under its quota. Although the natural constraints are as positive as they are for Ireland, British dairymen have problems to make a good family income. About the same is true for Central France although the natural constraints for grass production are less favourable in this area.

#### Validity of the conclusions

The results shown in table 1 are the result of a subjective approach based on the development of regional milk production (data from the past) and our subjective assessment of eight other criteria. The nine criteria may not all be independent from each other, e.g., one could argue that entrepreneurship and profitability of production might be depending on each other since they both are based on the same fundamental characteristics of farmers. To check for this, we calculated the correlations between some of the criteria. The scores for entrepreneurship and competitiveness of the dairy industry in table 1 show a correlation of 0.64. Between entrepreneurship and profitability of production this correlation is 0.57. Between the change of production in 2000-2011 and competitiveness of the dairy industry the correlation is quite low: 0.21. These correlations give a more insight look in the results we have generated by our approach, but it was not our intention to analyse

the results this way. The sole objective was to formulate criteria, add weighing factors for the criteria and score regions for these criteria and estimate on the basis of the total score the change in production in the next 10 years: a so called multi criteria approach.

The results in table 1 are quite robust since they depend on nine criteria. To test the robustness of the results of our approach, we have made additional calculations for a number of situations, based on the weighing factors that caused most of the discussion within expert-groups. The results with alternative weighing factors are shown in table 1a:

- A higher weighing factor for the competitiveness of the processing industry  
In table 1a, we increased this weighing factor to 3 and 4 instead of 2 in table 1. This will result in a stronger influence of this competitiveness on the change in production. The regions with high and low scores for this criterion experience the highest changes with more and less milk in 2020, respectively. The first is true for Scandinavia, North Sea region, Western France and Po Valley. The latter is true for the four Eastern-European regions in the table.
- A higher weighing factor for the profitability of production  
If we increase this weighing factor to 3, it will only result in small changes compared to table 1. The regions Ireland, Eastern Central Europe and Po Valley show an increase of more than 1 percent in production compared to table 1. Not any of the countries show a decline in production with more than 1 percent.

Table 1a. Percentage change in milk production in 2020 compared to the average of 2010 and 2011

Region*	Results table 1	Competitiveness process. industry	Competitiveness process. industry	Profitability production	
	weighing factor		3.0	4.0	3.0
Scandinavia	-16%	-12%	-8%	-16%	
United Kingdom	-7%	-8%	-8%	-7%	
Ireland	17%	14%	12%	19%	
North Sea region	24%	25%	26%	23%	
Western France	15%	17%	19%	15%	
Central France	-9%	-8%	-6%	-10%	
Central Germany	11%	11%	11%	11%	
Eastern Germany (former DDR)	7%	5%	4%	8%	
Alps region	1%	2%	3%	0%	
Poland	3%	-1%	-4%	3%	
Baltic countries	-5%	-8%	-10%	-5%	
Eastern Central Europe (C/S/H/S)	-9%	-12%	-14%	-7%	
Romania and Bulgaria	-21%	-23%	-24%	-21%	
Po Valley	21%	23%	24%	23%	
Southern Europe	-13%	-13%	-13%	-13%	

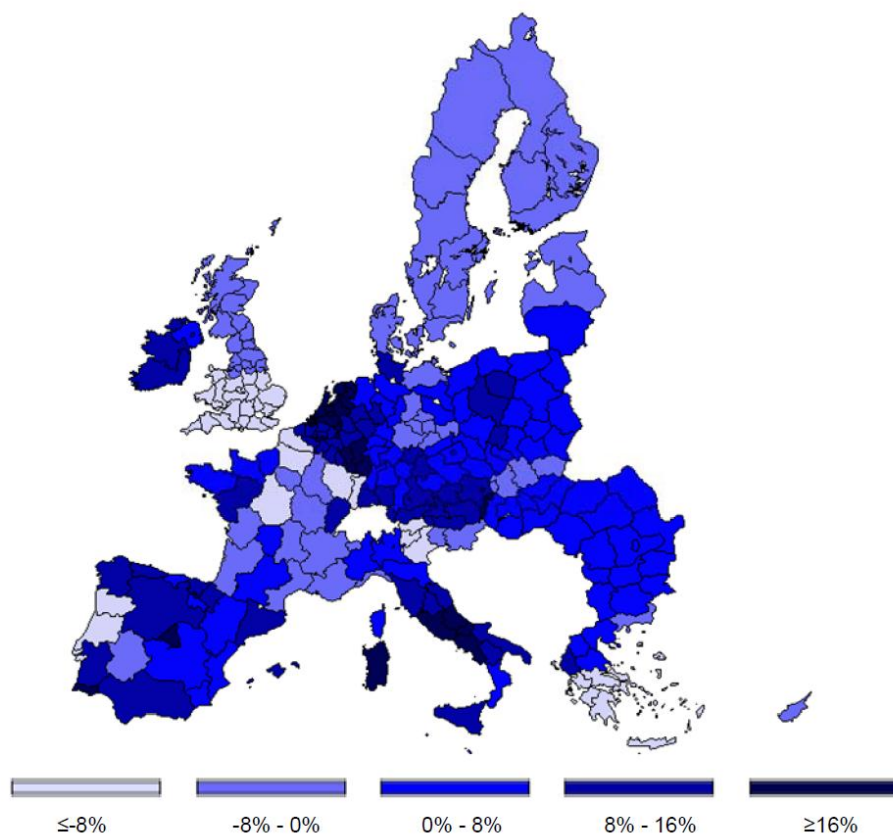
The changes in milk production expected in the next 10 years show more variation and in general more increase in production than they did in the last 10 years (table 1).

The question arose whether changes in milk price would influence the changes or the magnitude of the changes. Our opinion is that the projected changes are quite robust since they are largely influenced by entrepreneurship and competitiveness of the dairy industry and there is little reason to think that they both will slow down expansion plans in case of lower milk prices. In addition to this, the positive relationship between milk prices and feed prices shown in the last five years reduces the effect of increases and decreases of milk prices on farmers' income. One might expect that this also softens the reaction of milk price fluctuations on farm expansion strategy and changes in production volumes. However, a significant fall of milk price might cause a bigger decrease in milk production in regions at risk than predicted. But the consulted experts did not expect a big decrease in milk price in the coming years.

#### **2.4.2. Comparison results with literature**

The results shown in Table 1 can be compared with the most detailed recent forecast for the development of milk production in regions made with the CAPRI model in 2009 (IPTS, 2009) shown in Figure 2.

Figure 2. Percentage of change in milk production after quota abolition, based on CAPRI model calculations (IPTS, 2009)



These results in general show similar trends in milk production as in Table 1 with some exceptions. The regions with the greatest differences are:

- **Southern Europe**  
Figure 2 shows increases in milk production in most Spanish regions as well as in southern parts of Italy and the north of Greece. This means that they are more optimistic about Southern Europe than we are on the basis of our nine criteria. The CAPRI model emphasizes the positive profitability of additional milk (based on quota rent) as a reason for expansion whereas in our methodology, entrepreneurship and natural constraints will hinder expansion. Although we must admit that our region, Southern Europe, is quite heterogeneous and there surely will be sub-regions within this region that will increase in milk production. Based on our criteria, Galicia and Castilla-La Mancha (Spain), Azores (Portugal), Isole, Sicilia and Sardegna (Italy) and Anatoliki Makedonia, Thraki (Greece) are regions in Southern Europe where we expect further growth in milk production until 2020, based on our approach of the projected milk production.
- **Eastern Central Europe and Romania and Bulgaria**  
In most of these countries, the CAPRI-model expects increases between 0 and 5 percent and a slight decrease of less than 2 percent for Slovakia and Slovenia. In our opinion, the decrease in production in these regions in the last 10 years and the modest scores for the competitiveness of the dairy processing industry and entrepreneurship of the dairy farmers are the main indicators for a further decline in milk production in the next 10 years. Only for the Czech Republic, we expect a small increase in production, based on the increase in the past 10 years.
- **Alps region**  
Figure 2 shows a quite strong increase for milk production in parts of Austria, the southern parts of Bavaria and Baden-Württemberg and Franche-Comté, whereas we estimated only a small increase for the Alpine region as a whole. We agree with these conclusions. Our modest growth is based on the average increase for the whole region. We also expect increases in the regions mentioned, but these increases will be combined by decreases in milk production in other French (mainly Rhône-Alp) and in Italian regions (mainly Trentina, Veneto and Aoste). The development in the Alpine region as a whole will be quite heterogeneous.

Since we have chosen to divide the EU in a limited number of regions, heterogeneity plays a role in many regions. It is the strongest in the Southern Europe and Alp region. To a smaller extent, it is also present in the regions, the UK and Eastern Germany. In the UK, we expect an increase in milk production mainly in South Western Scotland, Northern Ireland, Cumbria, Devon and Cornwall and decreases in other parts of the country. In Eastern Germany, we expect increases mainly in Mecklenburg-Vorpommern and Sachsen.

### **2.4.3. Expected change in regional income**

#### **2.4.3.1. Share of dairy sector in regional GDP**

The first part of Table 2 shows the importance of agriculture and the dairy farm sector for the GDP for the 15 regions analysed in this report. In all regions, the contribution of the dairy farm sector to GDP is estimated to be less than 1 percent. The average share of dairy in the EU GDP is 0.32 percent, with differences ranging from 0.89 percent for the Baltic countries to 0.17 percent for the United Kingdom. Four of the five regions with the biggest milk volumes in recent years have shares between 0.17 percent and 0.36 percent. The fifth big region

(Poland) has a much higher share of 0.60 percent. Milk production has a dominant place in agricultural production in Ireland, Scandinavia, the Baltic countries and Western France with a share of 20 percent or higher. The results about the expected change in milk production in the right part of Table 2 show that in two of these regions, milk production is expected to increase (Ireland and Western France) whereas in the other two regions (Scandinavia and Baltic countries), a decrease is expected. Southern Europe, and Romania and Bulgaria are the regions with the lowest share of milk in agricultural production and for both regions; the projections are showing a decline in milk production.

Table 2. Share of agriculture and milk production in gross domestic product (GDP in 2012)

Region	Share of agriculture in GDP 2008-2012	Share of milk in agricultural production 2011*	Estimated share of milk in GDP 2012	Average annual production 2010+2011	Milk production 2020	% change production 2010/11-2020
<b>Scandinavia</b>	2.4%	25%	0.62%	5 175	4 330	-16%
<b>United Kingdom</b>	1.0%	17%	0.17%	13 974	13 009	-7%
<b>Ireland</b>	1.0%	27%	0.27%	5 453	6 362	17%
<b>North Sea region</b>	1.6%	18%	0.29%	29 242	36 185	24%
<b>Western France</b>	1.8%	20%	0.36%	12 527	14 468	15%
<b>Central France</b>	2.0%	13%	0.26%	9 301	8 440	-9%
<b>Central Germany</b>	2.0%	13%	0.26%	12 536	13 887	11%
<b>Eastern Germany (former DDR)</b>	1.4%	15%	0.22%	6 383	6 845	7%
<b>Alps region</b>	1.6%	16%	0.25%	10 030	10 165	1%
<b>Poland</b>	4.0%	15%	0.60%	12 347	12 659	3%
<b>Baltic countries</b>	4.0%	22%	0.89%	3 262	3 114	-5%
<b>Eastern Central Europe (C/S/H/S)</b>	2.9%	14%	0.35%	5 934	5 385	-9%
<b>Romania and Bulgaria</b>	6.8%	8%	0.54%	5 109	4 034	-21%
<b>Po Valley</b>	2.0%	11%	0.22%	7 831	9 505	21%
<b>Southern Europe</b>	2.6%	8%	0.21%	11 231	9 795	-13%
<b>Total/weighted average</b>	<b>2.2%</b>	<b>16%</b>	<b>0.32%</b>	<b>150 335</b>	<b>158 183</b>	<b>5%</b>

Source: Own calculations based on World Bank and Eurostat (share of agriculture in GDP) and EY, 2013<sup>52</sup> and expert approach for assigning values to regions.

\*Based on turnover.

<sup>52</sup> Figure 6: Share of milk in the Member States' agricultural production (by values) in 2011 and 2000.

The estimated share of milk production in GDP is based on the contribution of the dairy farm sector. However, this sector is also the basis for suppliers, processors and distributors within the regional agro and food complex. This means that the importance of the dairy sector as a whole is greater than just the share of dairy farms. Research for the Dutch situation (Van Leeuwen et al., 2012) showed that the contribution in terms of workers is 2.5 times the number of workers in dairy farming. This factor will vary between regions, mainly because regions differ in the added value by milk processors. But in general, we assume that the contribution of the dairy chain as a whole will be two to three times higher than the percentages shown solely for the dairy farm sector.

Another comment on these figures is that they refer to the region as a whole. If the figures would be calculated for the countryside areas within regions, the share of the dairy sector in these areas will also be higher. We did not find any literature to demonstrate this but this point is important to consider when we further evaluate regions in the next chapters.

#### **2.4.3.2. Change in regional income 2015-2020**

The change in milk production in a region will most likely have an impact on its agricultural income. This means that regions with a negative change in the last column of Table 1 might expect a decrease in GDP from milk and regions with a positive change can expect an increase. However, not only the amount of milk produced but also the profitability of the milk production plays an important role in the added economic value of the dairy sector in a region. Milk price and feed costs are the most important determinants of this profitability. This was the reason to study the consequences of quota abolition on the expected change in milk price. The general conclusions from this literature (seven studies reviewed by EY, 2013) are that the abolition will lead to a drop in milk price that varies between 7 and 10%, with one exception of a study that forecasted a drop of only 2 percent. Most of the studies were carried out in 2008 and 2009 and the drop in milk price was the result of model calculations assuming that the increase in EU milk production after abolition will result in a drop in price. When we assess the dairy market development of the last five years, we conclude that the constant growth in annual world milk consumption of about 2 percent per year creates good opportunities for a growing export from the EU. The annual increase in milk production that the EU has realised in the last five years can easily be absorbed by the growing world demand without disturbing the world market for dairy products. To illustrate this, we compare the extra milk production of New Zealand in the last five years with our projection of the increase in EU milk production in the next 10 years. The growth in milk volume brought to the world market by New-Zealand in the last five years was about 4 million tons (Dairy NZ, 2012). When we divide our projection of the extra EU production in the next 10 years by two to make an estimate for the increase in production in the next five years, the result is also an increase of 4 million tons. When the dairy demand keeps growing with the pace of the last five years, the result is also an increase of 4million tons. When dairy demand keeps growing with the pace of the last five years, absorbing extra EU milk will most likely not lead to a drop in milk price. However, if the world GDP growth in emerging countries will slow down, this will probably lead to a delay in the growth of dairy consumption, since the countries consume the extra milk shipped to the world market by (mainly) New Zealand, US and EU.

To get a better picture of the income of dairy farms in 2020, we first take a look at the projections of IPTS (2009), one of the seven studies that have projected the consequences of quota abolition mentioned before. IPTS made model calculations to determine the consequences of quota abolition for the overall agricultural income. Their estimate from 2009 is that the projected 4.4 percent increase in milk production and the 9.8 percent decrease in milk price in 2020 will result in an average loss of 2 percent agricultural income for the EU 27. The average income loss for the dairy farms in EU 27 will be bigger: -14 percent, due to the lower milk price



and higher feed costs assumed in this study. The assumptions about the possibilities for extra exports of dairy products to outside EU play an important role in calculating the income loss. The price-supply elasticity's used in the CAPRI model (based on data up to 2005) and the income for the dairy farmers might be underestimated in the view of the functioning of the current world market. Given the present market situation and the outlooks of OECD/FAO (2012), we do not expect a downward trend in the average world market price for raw milk after 2015. The OECD/FAO projections for future milk prices estimate an increase of 2 percent annually in nominal terms. This corresponds with average milk prices in the next 10 years that are equal (in real terms, corrected for inflation) to the average milk price in the last four years. These price assumptions will lead to better prospects for future dairy farm incomes when used in economic models like CAPRI.

These future projections mentioned above bring us to the assumption that there is little reason to expect a drop in the long term average milk price after 2015. The change in the contribution of the regional dairy sector to the regional GDP can be based on two factors. The first one is the change in regional milk production that was shown in Table 1 and repeated in the last column of Table 2. This factor is a good predictor of the increase in contribution to GDP in regions where an increase in milk production is expected. The second factor is the alternative income for workers that leave the dairy sector in regions where we expect a decrease in milk production. The effect on GDP will be less than the decrease in milk volume when workers who leave the dairy farm sector realise a higher added value in the sector where they move to. We expect this phenomenon in countries with an expected positive growth in GDP in the period until 2020. If this growth is absent or small combined with a negative change in milk volume, this might tend to a decrease in GDP that is similar to the decrease in milk production.

## 2.5. Conclusions and policy recommendations drawn directly from the analysis

### 2.5.1. Conclusions

1. Regions that are expected to increase their milk production with more than 10 percent between 2010 and 2020 are North Sea region, Po Valley, Ireland, Western France and Central Germany. These increases are expected mainly because of the combination of high evaluations for the criteria: change in production in 2000-2010, entrepreneurship<sup>53</sup>, profitability of milk production on the farm, competitiveness of the processing industry and natural conditions.
2. Regions that are expected to decrease their milk production by more than 10 percent between 2010 and 2020 are Romania/Bulgaria, Scandinavia (here: Sweden/Finland) and Southern Europe. The reasons for this expected drop in milk production are low evaluations for the criteria: change in production in 2000-2010, entrepreneurship and profitability of milk production on the farm and competitiveness. For Romania/Bulgaria and Southern Europe also, the competitiveness of the processing industry is evaluated as low.
3. The share of dairy farming in GDP is estimated to be less than 1 percent in all regions considered. The average for the EU is 0.32 percent. This share is the highest in Baltic countries, Scandinavia, Poland and Romania/Bulgaria (all between 0.50 and 0.90 percent) and lowest in the United Kingdom, Southern Europe, Po Valley and Eastern Germany (between 0.15 and 0.25 percent). The contribution of the dairy chain as a whole is estimated to be two to three times higher than the percentages solely for the dairy farm sector. In rural regions with a great dairy sector and little other industry branches, the share of the dairy sector may be higher.

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<sup>53</sup> Entrepreneurship is defined as an attitude toward farm development based on ambition, risk attitude, expertise with expansion, financial situation and fiscal climate.

4. The expected change in regional income (GDP terms) will be related to the change in milk volume for the regions that increase milk production. So the regions with the highest projected expansion in milk volume mentioned in conclusions 1 will gain most in GDP. The negative effect on GDP for regions that drop in milk volume, will be (partly) offset by a gain in GDP when workers that leave the dairy sector and enter an other industry branch add more to GDP than they did before.
5. The regional economies of Scandinavia and Romania/Bulgaria are facing the most negative impacts because both regions combine a relative high share of milk production in GDP with a strong drop in milk production in 2010-2020. Here again: workers who leave the dairy sector might cause more added value outside this sector.
6. Western France is the only region where a higher than average share of milk in GDP (0,36 percent) is combined with an expected strong increase of the milk production in 2010-2020.

### **2.5.2. Policy recommendations**

#### **1. Combine EU funds for regional development to create regional economic development rather than maintaining sectors**

The effects of projected increases or decreases in regional milk production cannot be assessed in isolation of the development in the regional economy as a whole. In regions with emerging industry branches outside dairy, a decrease in employment in the dairy sector might cause a growth in regional GDP. Whereas in regions with a high unemployment rate a decrease might lead to a loss in GDP. Therefore regional economic and social development policies should be based on a broader view than just dairy or agriculture. Therefore CAP funds aiming at regional development should be addressed within the framework of the EU Structural Funds. The easiest way is to combine both types of funds. An alternative could be to have a special Agri-fund within the framework of Structural Funds and the Cohesion Fund.

#### **2. Create more targeted EU policy instruments to stimulate competitiveness of EU dairy producers**

The goal of the EU policy to remove the milk quota is to create extra incentives to improve the competitiveness of European dairy producers, making production more reactive to demand impulses. The Single Payment System with basic payments and green payments has no added value to achieve that goal. Both are based on land area and have no relation with demand and supply. The results of successful dairy regions in the past and the projections for the development of dairy regions in the future show that entrepreneurship and competitiveness are key elements for further growth of regional dairy sectors. Future policy instruments to support the dairy sector should therefore stimulate these two characteristics.

### **3. How will evolve over time the balance between the territorial and economic dimension of milk production?**

#### **3.1. Interpretation and comprehension of the key terms of the evaluation question**

This question is dealing with the territorial and the economic dimension of milk production. The economic dimension is an important part of the territorial dimension because it offers income for part of the inhabitants of the region. The economic dimension is extensively discussed in chapter 2. This is why we focus on the consequences of the quota abolition on the territorial dimension in this chapter.

Based on previously mentioned studies that show a decrease in income for dairy farmers after 2015 (summarised by EY, 2013<sup>54</sup>) and political worries about great differences in competitiveness of dairy farmers and dairy processors within the EU, one of the main questions when changing the CAP rules is: what will it mean for the development and the competitiveness of dairy farms in various EU regions? More in detail: policy makers and politicians have questions about the future prospects for dairy farms in many regions. Questions like:

- Will the abolition lead to lower milk prices?
- Will farmers stop producing milk after quota abolition?
- Will farmers in regions with less favourable conditions for dairy farming stop producing milk?
- Will this lead to unemployment and land abandonment in these regions?

These types of questions receive extra weight because of the present positive value of the dairy farm sector for:

1. Maintaining landscape and nature

In many European regions, especially those with grass based dairy farms, dairy farms play an important role in maintaining the landscape. Many dairy farms in areas with natural restrictions play a role in preserving valued habitats and biodiversity. Loss of income or farmers that stop their dairy farm might damage landscape, habitats and biodiversity.

2. Keeping agriculture in Less Favoured Areas (LFA)

LFA can be describes as areas where agriculture is hampered by slopes or altitude (mountainous areas), by unfavourable production circumstances or by environmental restrictions. In the scope of the second pillar of CAP farmers can be compensated for these difficult production circumstances by means of Compensatory Allowances per ha. With the aim to ensure continued agricultural land and thereby contributing to the maintenance of viable rural communities (Terluin et. al., 2010).

3. Avoiding farmland abandonment

A low farm income, small farm size, small parcel size, lack of investment, poor soils and areas with extensive and traditional grazing systems with rough grasslands are indicators of farmland that is at risk for farmland abandonment. If quota abolition would lead to these situations, it might result in higher risk of farmland abandonment. Regions considered at risk are mainly located in Southern Europe, Baltic countries and some Eastern European countries (Pointereau et al., 2008).

4. Regional employment

In regions with high production costs for milk, farmers might quit dairying, resulting in less employment in the region. High production costs can be the result of poor soil, small-scale farming, poor logistics and lack of knowledge of efficient production.

5. Environmental sustainability

Small-scale dairy farms are often considered to be equal to little environmental problems. If quota abolition will lead to large-scale farms with a high intensity of production per hectare, this could lead negative effects on environment: pollution to air, soil and water and reduction of biodiversity (cited in EY, 2013<sup>55</sup>).

<sup>54</sup> Table 6: Possible scenarios for prices and supplied quantities of milk following the removal of quotas in 2015

<sup>55</sup> Figure 2: Linkages between milk production and the environment

### 3.2. Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

Considering all the factors mentioned in 3.1, we conclude that there is a large impact of dairy farming and dairy farming systems on the environmental and socioeconomic condition of a region. From Table 2, we conclude that the direct economic impact (low estimated share of milk in GDP) is relatively small but the influence on the look and image of the region can be great because of the above aspects. To deal with questions and subjects mentioned, we focus on three central aspects in the territorial development of regions:

- The autonomic development of the dairy sector
- The socioeconomic impact of changes in the dairy sector
- The sustainability impact of changes in the dairy sector

### 3.3. Description of the method(s) used and an indication of its (their) limitations

The method in this chapter is to provide qualitative analyses of the developments in the dairy sector. Doing so, we create a clearer picture of the developments in the sector and the positive and negative aspects thereof. These aspects will be further elaborated in Chapter 4, where we focus on regions and production systems that are considered to be at risk.

### 3.4. Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

#### 3.4.1. Autonomic development of the dairy sector

Within all members states, we perceive a strong long-term trend in the development of the dairy farm structure in all dairy regions. It is a process of restructuring the dairy sector that we define as the autonomic development of the dairy sector. The word autonomic emphasizes that this process is largely independent from economic conditions and policy. The autonomic development of the dairy farm sector in almost all EU regions through the years has followed a pattern of:

1. Specialisation in dairying  
In the past, farms often combined dairy with arable farming, pig farming or poultry. Nowadays, in most regions, dairy farms are more and more specialised in dairying. Table 4 in Chapter 4 shows that in Northwest Europe, farms are strongly specialised. In Eastern Europe, mixed farms are still more common.
2. Increase in herd size (number of cows) as well as land area (number of hectares)  
Farm expansion has been an on-going process for many decades in all regions. The most important reasons for expansion were increasing income and new techniques that created possibilities for higher labour efficiency in terms of cows, kilogram milk and hectares per worker. New techniques requiring high investments that can only be made profitable by larger farms are an important driving force behind the combination of specialisation and expansion.
3. A decrease in number of farms  
The process of farm expansion was possible because farmers that exit the dairy business transfer land and quota to farmers who expand. In the quota era, this led to a process of less farmers producing the same amount of milk. In some Member States (Figure 1), milk production dropped under the national quota threshold.

4. A decrease in number of cows per region combined with a higher milk production per cow  
Breeding, feeding and improved management and buildings have increase milk production per cow. The combination with quota and farmers exiting this has led to a steady decrease in cow numbers.
5. Higher farm income on larger farms  
In general, farm incomes in the long run are higher on larger farms (Jongeneel et al., 2011)<sup>56</sup>.
6. An increase in milk per hectare of forage area (Jongeneel et al., 2011)<sup>57</sup>  
In general, dairy farms all over the world tend to move to high input/high output systems with high inputs on roughage and concentrates and high output in milk per cow. This process is extra driven in regions with high prices for land and feed.

We consider these trends as powerful and dominant trends in the dairy sector, driven by a combination of technological progress, economies of scale and the mind-set within international dairy farming sectors. All EU countries show these trends (data about most of these trends are listed in EY, 2013 and Jongeneel et al., 2011<sup>58</sup>). In 4.5.2., we observe the same development for New Zealand and the US. The result is: larger and more efficient farms and a lower share of the dairy farm sector in GDP. Time and again (mostly young) people leave the farm and start working in other industry branches and doing so, they usually increase the regional GDP. This process is not only stimulated by modern techniques and the need for higher income on dairy farms, but also by attractive jobs and good wages in these other branches. So it is a combination of a push from within the dairy sector and a pull from outside the sector. If the pull from outside the dairy sector is not available, the result might be unemployment or young people staying on the farm and accepting a lower income. The latter might happen in times of little alternative opportunities in the regional economy. The general picture is that the above changes are an autonomic development that has been going on for many decades.

In the EU-15, this process has led to a 50 percent reduction in family workers on dairy farms between 1995 and 2008 (Jongeneel et al., 2011)<sup>59</sup>. This development of the EU dairy farm sector is strong and only little influenced by the quota situation. The annual decrease rate in the number of dairy farms is quite constant over the years and was in most Member States hardly influenced by the introduction of the quota in 1984. Only in regions where quota mobility was held back by high quota prices (e.g., The Netherlands) or quota regulations that prevented quota mobility (e.g., France), this process was slowed down during the quota era. In 2013, in most of the EU countries, quotas are no longer a limiting factor for dairy farm expansion, since the majority of the Member States underutilise their quota. Only the countries in the North Sea region, Germany, Italy and Austria are countries that usually fill their quota. Since (1) quota hardly limit production in the present situation and (2) average milk prices in 2010-2020 are not expected to differ much from the average of the past four years, we conclude that the autonomic development of dairy farms within the EU will continue to follow the pattern of specialisation, expansion and intensification mentioned previously. The only difference will be that the regions with a positive change in milk production in Table 1 will increase milk production stronger than they did in the last 10 years, because the quota limit is no longer there. The positive dairy market outlook (OECD/FAO, 2012) will also stimulate this trend, which might be slowed down by environmental and spatial restrictions.

### **3.4.2 Socioeconomic impact**

Like argued before, the territorial impact of the quota abolition is very limited. The reasons that cause regional unemployment, farmland abandonment and loss of landscape and nature values in some regions have to do with a combination of the long term autonomic development of the dairy sector, lack of economic

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<sup>56</sup> Table 7.11

<sup>57</sup> Table 14.9 Milk per hectare of forage area, 2000-2007

<sup>58</sup> Paragraph 5.10 to 5.14

<sup>59</sup> Figure 14.1 Labour on farms with dairy herds, EU-15, 1990-2008

competitiveness of dairy sector and processors and rural resilience<sup>60</sup>. The lack of economic competitiveness might partly be caused by unfavourable natural conditions (soil, rainfall, slopes, etc.) that can lead to the designation of less favoured area (LFA) for agricultural purposes or to farmland abandonment. But many of these areas are highly appreciated for their values on aspects like landscape, biodiversity or tourism. It is the rural resilience that determines whether or not the region is able to adapt to new circumstances. The rural resilience might get damaged by the general economic development of the region and its surrounding regions. In many southern and eastern regions of the EU, the entrance to the EU in the last 20 years has boosted economic growth and offered many new opportunities as an alternative to developing agriculture. The result in some regions is an agriculture sector that has neglected developing viable new farm concepts. New concepts may include alternatives like increase in farm size, changing from dairy to beef, part time farming, tourism, building new cooperatives, etc. In many regions, the pull for labour from outside the sector was so strong that there was no need to restructure the regional agricultural economy. In that case, the desired process of change toward simultaneously balancing the ecosystem and economic and cultural functions has operated moderately or was lacking. This problem will not be solved by keeping milk quota in place, because milk production might not be the best future opportunity for the region. Also, many farmers have already stopped producing milk. The real solution is to increase the resilience of the region: make use of natural conditions, skills, knowledge, opportunities and needs within the region to develop new economic activities. The region needs to capture an appropriate place within the regional, European or even global division of labour.

### **3.4.3. Sustainability impact**

#### **3.4.3.1. Sustainability impact and EU-regulation**

As stated in 3.3, the autonomic trend leads in general to more intensification in terms of livestock units per hectare and grass and fodder production per hectare. This intensification is often combined with a greater environmental impact. Associated with more intensive dairy systems are the risks of negative impacts like (CEAS, 2000 and Steinfeld et al., 2006):

- Increased use of fertilisers
- More concentrated use of manure
- Pollution of ground water and surface water with nitrates and phosphates, resulting in decrease of drinking water quality and eutrophication of surface water
- Use of feed additives with heavy metals that might accumulate in the soil
- Use of pesticides that can damage ground water and fauna
- Erosion
- Air pollution because of methane, nitrous oxide and carbon dioxide (greenhouse gases) and ammonia
- Decline in biodiversity and landscape
- Decline in animal welfare
- Decline in scenic quality of farm buildings

The EU has been aware of the environmental risks of dairy farming and intensification of the dairy sector. Therefore, it has developed a number of directives to ensure that agriculture (including dairy production) will not cause extra pollution or damage the environment<sup>61</sup>. The directives are not only aiming at avoiding but also at improving environmental quality. The EU instruments are legislations about ground water, surface water,

<sup>60</sup> Rural resilience is defined as the capacity of a rural region to adapt to changing external circumstances in such a way that a satisfactory standard of living is maintained in the region (Heijman et al., 2007).

<sup>61</sup> <http://rod.eionet.europa.eu/instruments>

biodiversity, eutrophication, air pollution and acidification. Every Member State has to 'translate' the EU-directives into national legislation. Some important EU directives are:

- Directive 80/68/EEC on groundwater: This Directive is designed to prevent and combat groundwater pollution. Its provisions include: preventing and limiting indirect discharges (after percolation through soil or subsoil) of pollutants into groundwater.
- Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources: This "Nitrates Directive" aims to protect waters in Europe by preventing nitrates from agricultural sources from polluting groundwater and surface waters by encouraging the use of good agricultural practices.
- Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market: The need to regulate the use of plant protection products which could be damaging to human and animal health and/or the environment.
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy: Pollution, promoting sustainable water usage, environmental protection, aquatic ecosystems and the effects of floods and droughts for inland surface waters, groundwater, transitional waters and coastal waters.
- Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants: air pollution responsible for acidification, eutrophication and ground-level ozone pollution.

EU leaders have committed to transform Europe into a highly energy-efficient, low carbon economy. The EU has set itself targets for reducing its greenhouse gas emissions progressively up to 2050 and is working successfully toward meeting them. Under the Kyoto Protocol, the 15 countries that were EU members before 2004 ('EU-15') are committed to reducing their collective emissions to 8 percent below 1990 levels by 2008-2012. Emission monitoring and projections show that the EU-15 is well on track to meet this target. Most Member States who have joined the EU since 2004 also have Kyoto reduction targets of 6 percent or 8 percent, which they are on course to achieve. For 2020, the EU has committed to cutting its emissions to 20 percent below 1990 levels. This commitment is one of the headline targets of the Europe 2020 growth strategy and is being implemented through a package of binding legislation. The EU has offered to increase its emissions reduction to 30 percent by 2020 if other major emitting countries in the developed and developing world commit to undertake their fair share in the global emissions reduction efforts.

### 3.4.3.2. *Methods to live up to the EU directives*

Every Member State is obliged to live up to the EU-directives. So the Member States have developed national legislation and have set up programs to improve the farmer's performances. Instruments for improving are about:

- Research: What measures are effective to reach the goals and the development of new measures?
- Extension services: Show and tell the farmers how to reach sustainability goals.
- Education: Teach students and young farmers about EU directives and the way to live up to them.
- Farmer projects: Learn together with farmers, extension services, research and governments in pilot projects how to improve environmental quality and maintain income. The international Dairyman project<sup>62</sup> is an (international) example of dairy farmers working on improving sustainability. Many countries have developed regional and national projects with the same goals.

## 3.5 Conclusions and policy recommendations drawn directly from the analysis

### 3.5.1 *Conclusions*

1. The quota abolition causes only minor changes in the development of the dairy sector in European regions. The changes that can be expected in regions are in line with the long-term autonomic trend in the European dairy sector. This is underlined by the fact that the change in regional milk production in the last decade broadly is expected to continue in the next decade. It is the autonomic change itself that should lead to a wake-up call for some regions that are lagging behind in economic development and in rural resilience.
2. We conclude that there are two types of regions that need extra attention within the development of the dairy sector:
  - a. Regions with very extensive farming systems where farmers might quit dairy farming because of lack of profitability, scarce labour or better prospects in other industry branches. This might lead to the risk of farmland abandonment.  
The challenge for these regions is to create a profitable dairy farming concepts or other type of sustainable land use to provide a new economic basis and to maintain high valuable landscapes and habitats.
  - b. Regions where dairy farming systems are becoming more and more intensive and this may create the risk of an increase of sustainability problems.  
The challenge for these regions is to develop innovative techniques and farming systems that combine profitable efficient dairy farming systems with high sustainability standards.
3. The capability to respond to changes in markets and agricultural policy should be improved in rural regions at risk. To improve this rural resilience, the awareness of the potential and the opportunities of the region are crucial to create new sources of income.
4. Sustainability of the dairy farm sector can be improved by joined initiatives of farmers, research organisations, advisory services and regional governments. The development of new techniques and practices will improve sustainability of the sector.

In Chapter 4, we take a closer look at the regions and farming systems at risk.

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<sup>62</sup> Dairyman is a project in the INTERREG IVB program co-funded by the European Regional Development Fund. Within this project, 14 partners in 10 regions in Northwest Europe covering seven countries are cooperating. Dairyman aims to strengthen rural communities in the regions of North West Europe (NWE), where dairy farming is a main economic activity and a vital form of land use. Dairyman will lead to a more competitive dairy sector, stronger regional economies and an improved ecological performance with the rural area.  
([www.interregdairyman.eu](http://www.interregdairyman.eu))



### 3.5.2 Policy recommendations

*[The policy recommendations in this paragraph are the same as in Paragraph 4.5.2. Since the Chapters 3 and 4 show overlap and are complimentary, the following recommendations are based on the analyses in Chapters 3 and 4.]*

#### 1. **Connect or merge Structural Funds, Territorial Agenda and CAP to get more targeted policy instruments for regional development**

Regional development is more than stimulating agriculture. It also means stimulating rural resilience to build strong local economies and to ensure global competitiveness of regions.

#### 2. **Introduce regional program to improve the resilience of the region**

- Identify strengths of the region: Professional skills, knowledge and experience, authentic character, touristic attractiveness, potential of alternative agricultural products.
- Stimulate building new networks that develop new commercial activities.
- Funds for this program can come from CAP funds or from Structural Funds and the Cohesion Fund.

#### 3. **Introduce custom-made restructure programs for the dairy sector in countries or regions with predominantly small farms**

In regions with predominantly small farms, an accumulation of difficulties for dairy farming is observed: low income of dairy farms, land abandonment, low competitiveness of the dairy processing industry and a decrease of milk production. Custom-made national or regional restructure programs for the dairy sector or the whole agriculture sector can provide an accelerated restructuring.

#### 4. **Introduce R&D-program sustainability for the dairy sector**

The public opinion wants more sustainable farming systems and markets require more sustainable products. This is in line with the EU policy of greening and the EU directives aiming at improving environmental quality. The future of the sector and its competitiveness will strongly rely on efforts to improve sustainability. Payments to the dairy sector should therefore contribute to the improvement of sustainability. Within the Single Payment System these sustainability incentives play only a minor role. A more stimulating role at reasonable administrative costs is to stimulate R&D-projects of collaborating organisations within the dairy chain like dairy farmers, their suppliers and processors, consultants and research organisations. They should start joined initiatives to develop new techniques and tactics. These R&D-activities should be aiming at long-term improvements of sustainability: animal welfare, efficient use of inputs like fertiliser and herbicides, reducing emissions to soil, water and air, developing high yielding feed protein crops to avoid soybean imports, etc. These steps should be undertaken in 'research laboratories', on experimental farms and in field experiments.

#### 5. **Develop a special policy instrument to avoid farmland abandonment combined with profitable animal production**

Regions where farmland abandonment is a threat deserve special attention. Many of these regions have ecologically valuable habitats. The most obvious way to combine nature and agriculture in these areas are extensive dairy and beef production. Combined with the possibilities to produce PDO/PGI-products, including market regulation under PDO/PGI-rules, the added value of products from these regions should be better valued by consumers on domestic and international markets. Crucial elements in this policy should be market approach and payments for conserving nature.

## 4. What are the regions and production systems which could endeavour difficulties?

### 4.1 Interpretation and comprehension of the key terms of the evaluation question

We define regions as “regions which could endeavour difficulties” if they meet a combination of the criteria listed below:

1. An expected significant drop in milk production in the next 10 years, on the basis of our estimates shown in Table 1.  
We believe that the main reasons for the drop in milk in a region are entrepreneurship, profitability of milk production and the competitiveness of the local dairy processing industry. As mentioned in Chapter 3, the alternative opportunities (outside dairy) will also play an important role when farmers decide about continuing or stopping with milk production.
2. A more than average proportion of milk coming from LFAs (based on Jongeneel, 2011<sup>63</sup>). Although Jongeneel (2011) concluded that results over 1995-2004 underpin that the number of dairy farms declined less steeply inside LFAs, we still consider farms in LFAs as a risk for unemployment or farmland abandonment, since the natural conditions for dairy farming in these regions are poor to modest. In case of lower or no LFA-payments in these regions, dairy farms might endeavour difficulties.
3. Regions that are indicated at risk for farmland abandonment by hypotheses of Pointereau et al. (2008) and an assessment of the likelihood of large-scale agricultural abandonment by Keenleyside and Tucker (2010). Their criteria for farmland abandonment are further elaborated in 4.2.
4. Average herd size of dairy farms is less than 20, both for the specialised and non-specialised dairy farms (based on data in EU, 2010) in combination with one of the above criteria. We have added this criterion since the small size of dairy farms plays an important role in many regions where continuity of dairy farms is a perceived problem.

We define production systems as “production systems that could endeavour difficulties,” if they meet one or more of the next criteria:

1. Production systems that are considered as ecologically valuable, but where the continuity of dairy farming is threatened because farmers are (expected to) quitting their farms.
2. Production systems that are facing sustainability problems. The reasons for these (expected) sustainability problems can be: environmental impact on soil, water or air (often connected to a high number of livestock units per ha) or animal welfare concerns perceived by society. These problems also have been described in 3.5.

In this report, we call regions and production systems that could endeavour difficulties regions and production systems at risk. Regions at risk play an important role in this report since dairy farming is considered to be a sector that can offer income opportunities for these regions combined with maintaining landscape, habitats and biodiversity. Production systems at risk are important to identify because of growing concerns in society about the sustainability of the dairy farming sector, where we use a broad definition of sustainability that includes among others, the environmental impact, animal welfare, nature and incentives to connect regional production and consumption.

### 4.2 Indication of the analysis criteria allowing to answering the question; validity of the quantitative and qualitative information used.

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<sup>63</sup> Table 2.36 Distribution of dairy cows by LFA/non-LFA, 2003 and 2007

The indicators needed to identify regions and production systems at risk are set out in Table 3.

Table 3. Indicators for regions and production systems at risk

Criterion	Quantitative information	Qualitative information
<b>Identification of regions at risk</b>		
<b>Expected drop in milk production between 2010 and 2020</b>	Projected change in milk volume produced per region. Data presented in Tables 1 and 2.	
<b>Proportion of milk coming from LFA</b>	Estimated, based on data of Jongeneel et al. (2011). Data presented in Table 4.	
<b>Risk of farmland abandonment</b>		Regions that are indicated at risk for farmland abandonment by Poitereau et al. (2008) and Keenleyside and Tucker (2010)
<b>Average herd size</b>	Estimated, based on data of EU (2010). Data presented in Table 4.	
<b>Identification of production systems at risk</b>		
<b>Dairy farming systems within regions</b>	Share of milk from dairy farming systems within regions. Shares are based on expert judgment. Data presented in Table 4 for both specialised and non-specialised dairy farms.	Description of dairy farming systems Typology of farming systems partially based on CEAS (2000).
<b>Intensity of dairy farming</b>	Intensity in livestock units (LU) per ha. Data presented in Table 4.	

#### 4.3. Description of the method(s) used and an indication of its (their) limitations

Based on the quantitative data and qualitative information from literature, other experts and our own experiences with regions and farming systems, we will appoint regions and production systems at risk.

#### 4.4. Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

##### 4.4.1. Regions at risk

In Table 2 seven regions show a projected decrease in regional milk production. From this group, only the regions or sub-regions with an average number of dairy cows with less than 20 (see data in Table 4) are considered to face risks of very low income. This results in regions in Spain, Italy, Greece, Slovenia, Romania, Bulgaria and Baltic countries. Although Poland is expected to increase milk production, we will add Poland to this list because of the small size of Polish farms. In Table 4, data of both specialised and non-specialised farms are presented to show a more detailed picture of the dairy farm structure in the regions. In regions where a large part of the milk production is coming from non-specialised farms (e.g., Eastern Central Europe and Alps region), a change in the profitability of dairy production might have other consequences than for specialised farms. Mixed farms in Eastern Central Europe can, for instance, switch from milk production to selling cash crops in times of unfavourable conditions for dairy combined with favourable conditions for arable land.

Poitereau et al. (2008) mentioned criteria like small farms, low farm income, high percentage of permanent grassland and aged farmers as indicators for farm land abandonment. Although data were lacking for good analyses, they suggest that the risk of farmland abandonment is present in regions in Portugal, Spain, Greece, Southern Italy, Slovakia and the Baltic countries. In our further analysis, we have interpreted permanent

grassland as semi-natural pastures with a high ecological value. In Table 5 this is one of the various farming systems.

Keenleyside and Tucker (2010) concluded that the areas most at risk from abandonment will be in Finland and Sweden, the Pyrenees, North-Western Spain, Portugal, the Massif Central (France), Apennines (Italy), Alps, other uplands areas of Germany and the border area of the Czech Republic and, to a lesser extent, the Carpathian Mountains (Poland). We can compare these qualitative assumptions from literature with the indicator data collected in Table 4. If we combine regions with a relative high proportion of milk coming from LFAs with a small average farms size (less than 20 cows) the list of countries consists of: Austria, Finland, Greece, Italy, Portugal, Spain, Bulgaria, Estonia, Lithuania, Poland, Portugal, Romania, Slovenia and Spain.

When we combine all these results, it becomes clear that the regions from Table 4 with the greatest risk of unemployment of agricultural workers and/or risk of farmland abandonment are (in order of risk):

1. Southern Europe: Portugal, Spain, Apennines (Italy) and Greece
2. Romania and Bulgaria
3. Eastern Central Europe: Slovenia and Slovakia
4. Baltic countries: Estonia, Latvia and Lithuania
5. Poland: Mazowieckie, Lubelskie, Podkarpackie and Podlaskie
6. Finland and Sweden: northern regions in Sweden and eastern in Finland
7. Central France: Massif Central

#### 4.5. Production systems at risk

The abolishment of quota combined with the autonomic development of the dairy sector will show diverse effects in regions. The question is whether this will be influenced by dairy farming production systems. This requires first to get a better insight in these systems and second to forecast how future developments within the sector will influence these systems.

##### 4.5.1. Present dairy farming systems

###### **Notes to Table 4: Regional farming systems**

The main characteristics we consider to classify dairy farming systems in EU are herd size (livestock units), area size (hectares), intensity of production (in particular livestock units per ha and crop yield per hectare), ratio grass/fodder crops and organic versus common production system. On the basis of these characteristics, we developed a typology to appoint dairy farming systems. The typology is a simplified version of the one that was used by CEAS (2000). The distinguished farming systems are set out in the right hand part of Table 4. The typology starts with the extensive farm system semi-natural pastures and ends with organic. From left to right, within the table, the percentage of grass decreases and the percentage of fodder crops increases. In general, the same is true for intensity: the number of livestock units per ha generally increases from left to right, although this was not a criterion for assigning percentages. In some references (e.g., CEAS, 2000) the authors describe the farming systems in the left columns as natural systems whereas the systems on the right-hand side tend to industrialised systems (except the organic system). These two trends are not valid for the organic system. The reasons for differences in systems are the result of a long-term development that is caused by many factors, among them climate conditions, soil fertility, land prices and price and availability of concentrates as being the most important. We have also added the projected change in milk production in the second column to create a more complete picture of the regional situation, including its future.

Table 4. Characteristics of dairy farms and dairy farming systems that are indicators for regions and farming systems at risk<sup>e</sup>

Region	% change milk production 2010/11-2020 (from Table 1)	Characteristics of specialised farms <sup>a</sup>			Characteristics of non-specialised farms <sup>a</sup>			Share of milk from LEA (%) <sup>d</sup>	Share of milk production per dairy farming system (% in 2013) <sup>b</sup>					
		Share of milk production	Average herd size (LU) <sup>c</sup>	LU/ha	Share of milk production	Average herd size (LU) <sup>c</sup>	LU/ha		Semi-natural pastures	Grassland	>80% grass + <20% crops	Grassland 50-80% grass + 20-50% crops	Mixed system < 50% grass + >50% crops, < 75 cows	Mixed system < 50% grass + >50% crops, > 75 cows
Scandinavia	-16%	95%	40	0.8	5%	25	0.4	80	-	5	30	45	10	10
United Kingdom	-7%	95%	120	1.2	5%	80	0.6	30	-	50	25	5	10	5
Ireland	17%	95%	55	1.0	5%	20	0.5	55	-	95	5	-	-	-
North Sea region	24%	90%	80	1.5	10%	50	1.1	10	-	20	55	10	10	5
Western France	15%	85%	55	0.8	15%	45	0.7	20	-	20	35	40	-	5
Central France	-9%	65%	40	0.7	35%	30	0.5	50	5	25	25	40	-	5
Central Germany	11%	75%	40	0.8	25%	30	0.6	60	-	-	40	50	5	5
Eastern Germany	7%	95%	150	0.8	5%	75	0.5	10	-	-	30	-	70	-
Alps region	1%	60%	25	0.8	40%	15	0.4	80	10	30	30	20	-	10
Poland	3%	65%	15	1.1	35%	5	0.8	60	10	5	25	45	10	5
Baltic countries	-5%	65%	25	0.4	35%	10	0.3	30	10	5	30	40	10	5
East. Centr. Europe	-9%	35%	90	0.4	65%	115	0.5	60	5	-	10	10	70	5
Romania and Bulgaria	-21%	75%	5	1.4	25%	5	0.8	35	10	-	45	45	-	-

Region	% change milk production 2010/11-2020 (from Table 1)	Characteristics of specialised farms <sup>a</sup>			Characteristics of non-specialised farms <sup>a</sup>			Share of milk from LFA (%) <sup>d</sup>	Share of milk production per dairy farming system (% in 2013) <sup>b</sup>						
		Share of milk production	Average herd size (LU) <sup>c</sup>	LU/ha	Share of milk production	Average herd size (LU) <sup>c</sup>	LU/ha		Semi-natural pastures	Grassland	>80% grass + <20% crops	Grassland 50-80% grass + 20-50% crops	Mixed system < 50% grass + >50% crops, < 75 cows	Mixed system < 50% grass + >50% crops, > 75 cows	Organic
Po Valley	21%	95%	55	1.8	5%	30	0.9	20	-	-	-	-	35	60	5
Southern Europe	-13%	90%	35	2.0	10%	5	0.4	65	5	5	20	55	10	-	

<sup>a</sup> Specialised farms: Criteria used for specialised farms are from EU, 2010. The main criterion for specialised farms is: 50% of the total output and coupled subsidies comes from milk output and subsidies. Data shown are based on data from EU (2010), Jongeneel et al. (2011)<sup>64</sup> and PZ (2013) and are processed by the authors for regions within Member States. <sup>b</sup> Systems are partially based on classification system of CEAS, 2000. Total sum of shares per region is 100%. All data are based on expert judgment. <sup>c</sup> LU = livestock units, 1 milk cow = 1 LU<sup>65</sup>. <sup>d</sup> Own calculation based on data Jongeneel et al. (2011)<sup>66</sup>. <sup>e</sup> Yellow highlighted numbers are explained in the text box at the beginning of Paragraph 4.5.1

<sup>64</sup> Figure 5.12

<sup>65</sup> [http://ec.europa.eu/agriculture/envir/report/en/lex\\_en/report\\_en.htm#Notice](http://ec.europa.eu/agriculture/envir/report/en/lex_en/report_en.htm#Notice).

<sup>66</sup> Table 2.36

The most striking characteristics of regions are highlighted in yellow to emphasize them. For herd size, these are the regions where herd size of either the specialised farms or the non-specialised farms is 20 or smaller. For intensity, the regions with more than 1.5 cows per ha are shaded. The same is true for share of milk production on non-specialised farms if it is higher than 40 percent. The first shaded farming system that gets extra attention in this report is the semi-natural pastures because of its high value for nature and landscape. The next farming systems shaded are the more intensive (all systems in regions with more than 1.5 LU/ha) or large herd size farms (> 75 cows) because of their possible risks for negative impacts on environment, nature and landscape.

In this paragraph, we discuss herd size, intensity and ratio grass/fodder crops and specialisation to draw a more detailed picture of the role these three indicators have on the appearance and performances of dairy farm systems in Europe.

#### **4.5.1.1 Herd size**

Table 1 shows regional data for herd size. Regions with large herds are Eastern Germany, United Kingdom, Eastern Central Europe and the North Sea region. In these regions, about 95 percent of the milk comes from specialised large herds where grassland is combined with more or less maize or other fodder crops, depending on climate conditions. Regions with small herds compared to the rest of EU are Rumania/Bulgaria, Poland, Baltic countries and the Alps region. The data also show that the non-specialised farms generally have smaller herds than the specialised farms. Eastern Central Europe with large mixed farms is an exception. In Southern Europe, the non-specialised dairy farms (estimated to be 10 percent) are also small farms.

EU-reports (EU, 2010) mention that the non-specialised farms receive on average a lower milk price than the specialised farms. It might be linked to a difference in quality of milk produced, maybe due to more or less expertise in milk production. The price difference is particularly high in Portugal (220 €/tonne instead of 306 €/tonne for specialised farms in 2010) and Romania (258 €/tonne instead of 330 €/tonne).

Jongeneel et al. (2011)<sup>67</sup> showed the importance of economies of scale in the dairy sector. From a study in which they combined FADN-data and interviews with farmers in 10 EU Member States, they concluded that the percentage of costs covered by revenues usually increases with the increase in herd size. This is a common sense conviction of dairy farmers in many regions and one of the socioeconomic drivers resulting in farmer strategies aiming at continual expansion.

#### **4.5.1.2. High intensity: Environmental problem**

Cows per ha (LU/ha in Table 4) is a measure of intensity of production. The intensity is the highest on specialised farms in Southern Europe, Po Valley, North Sea region and the United Kingdom. These farms are located in regions with good climate, soil and water conditions. Characteristic of these farms is high input combined with high output: high input of mineral fertilisers, concentrates, manure and pesticides and high output in grass and fodder crop production per hectare and milk production per cow and per hectare. The main dairy farming systems in these regions are “intensive grassland and crops” and “mixed system with over 50 percent crops” (Table 4). About 50 percent of the present EU milk production comes from these regions and

<sup>67</sup> Table 7.11

this is expected to increase in the next decade. These farms might face pollution of surface and ground water, high emissions of methane and ammonia and low biodiversity (CEAS, 200). The negative consequences of the process of intensification were already addressed in the 80s and 90s of the last century and were reason for new regulations on emissions, pesticide use, natural habitats and other environmental issues, as outlined in Chapter 3. The EU Nitrate Directive has played an important role in reducing emissions from nitrate and phosphate to ground and surface water in the North Sea region and the United Kingdom. Initiatives that have focused on reducing emissions with little or no reduction in yield have been quite successful in this region and have created more support of dairy farmers for coping with new environmental regulations. The specialised small farms in Poland and Romania/Bulgaria also show a high intensity. This is caused by a small number of cows managed intensively on small plots.

In regions with a relatively high percentage of mixed farms where milk production is combined with arable cash crops like Scandinavia, Central Germany, Baltic countries, Poland and Eastern Central Europe, the intensity of milk production is relatively low compared to the regions mentioned before. Although these farming systems can also combine high input with high output, excess manure will be rare since it is used on the arable land.

#### **4.5.1.3. Low intensity: High ecologic value**

The farming systems “semi natural pastures” and to a certain extent also the systems “grassland” and “organic” are usually systems with a low intensity, little environmental problems and have good opportunities to contribute to more biodiversity and maintaining natural habitats. For permanent grassland, this is only the case when intensity of livestock units per hectare is low. According to our own calculations and the results of CEAS (2000), we estimate that about 10 percent of the EU milk comes from these ecologically valuable farming systems. This percentage is without the majority of farms with permanent grassland in the United Kingdom, Ireland, North Sea region and Western France, because these farms usually have a high grassland production based on a high input of fertiliser and/or manure.

The long-term trend in the decrease of number of dairy farms that practise ecologically valuable farming systems should be stopped because these farms are contributing largely to maintain socially desired goals.

Above that, dairy farming can be a profitable way to maintain natural habitats at low costs.

Within Europe, the highest share of organic milk in total milk production is in Austria (16 percent), Denmark (10 percent), Sweden (9 percent) and Latvia (7 percent) (Lebensministerium, 2011). The market for organic milk is still expanding. Some new farmer-and-retail concepts are aiming at filling niches between conventional and organic dairy products or develop new organic market concepts.

#### **4.5.1.4. Ratio grassland/fodder crops**

The two farming systems called “mixed systems” in Table 4 use a large proportion of fodder crops in the feed rations for their dairy cows. This is practised mainly because the dry matter or feed energy production per hectare of fodder crops in these regions is higher than the production of grass. In some regions, the dairy farm does not grow its own forage, but achieves it from arable farms inside or outside the region. Within these systems, cows are usually kept inside or in a corral outside.

These mixed farming systems are the most common in Eastern Germany, many Eastern European Member States, Po Valley, Southern Europe, Central Germany and in parts of Scandinavia, North Sea region and the United Kingdom. In the case of specialised dairy farms with their own feed production, the intensity is usually high. These farms can be found in the North Sea Region, Central Germany, Po Valley and Southern Europe. In the case of mixed farms (dairy with arable farming), the intensity per ha is low, but the dairy farm system itself will have high input (forage and concentrates or grain per cow) and high output (high milk per cow)



characteristics. These farms can be found mainly in the Eastern European Member States and in parts of Scandinavia, North Sea region and the United Kingdom.

#### **4.5.1.5. Specialisation**

Table 5 shows that regions differ in the average degree of specialisation. This is partly caused by diversification that is a deliberate strategy for some farmers. It can be carried out within agriculture by combining dairy production with arable farming or pig production. This farm structure is quite common in Denmark, Sweden and many Eastern European countries. It also is a type of spreading business risks, since the farmer's income is only partially depending on dairy.

Dairy farming can also be combined with tourism, recreation or maintaining landscape and natural habitats. The Alp region is a successful example for this type of dairy farm strategy. The success is based on recognizing business opportunities in the region and to convert them into successful business. In general mountain areas, other scenic landscapes and touristic regions offer the best opportunities for these kinds of farms. In these regions, a relative high proportion of the dairy farming systems falls in the categories semi-natural pastures, permanent grassland and organic farms. Many tourists consider these farm types as the most attractive for visiting, staying overnight or buying home-made products.

#### **4.5.2. Future developments of dairy farming systems**

The general trend in dairy farming systems is: specialisation, larger herds and more intensive farming systems (higher yields per hectare and per cow). This trend has been going on for decades and is practised in almost all the European regions. But it is not just a European phenomenon. Farm expansion and intensification of farming systems is a global trend and is mainly driven by economic forces. Major competitors on the world dairy market like New Zealand and the US have a comparable increase in average herd size as EU has (PZ, 2013) but on a much higher level of average herd size. The average dairy herd size in 2011 was 179 for the US and 388 for New Zealand, compared to 30 for the EU average. This low average figure is strongly influenced by the great numbers of small farms (less than 10 cows) in Romania and Poland. Herd expansion in the EU is likely to be limited by milk quota, natural and landscape constraints and environmental regulations. More in general: it is caused by a low level of the scores for criteria mentioned in Table 1.

This continuing process of specialisation, expansion and intensification is expected to result in better incomes for dairy farmers and a more competitive dairy sector in the EU. But these more intensive production systems might also result in pollution of surface and ground water and high emissions of methane, nitrous oxide and ammonia. Also biodiversity, natural habitats and valuable landscape areas can be damaged. Intensification of grassland might lead to more ploughing of permanent grassland and doing so, less carbon will be captured in the soil. In some EU countries, the public opinion (NGOs and consumer organisations) is opposing against large dairy farms, since they are seen as a threat for animal welfare and/or landscape. EFSA (2009) concludes that farming systems and breeding strategies are the major factors causing poor dairy cow welfare leading to udder disorders, leg and locomotion problems and metabolic and reproductive disorders.

The perceived negative impact of the various aspects of the dairy sector has led sustainability programs of governments, dairy organisations and dairy processors and to legislation on EU and national levels. In Chapter 3, we already discussed that some policy measurements taken in the last 20 years have proven that the negative impacts of this process of expansion and intensification can largely be avoided. But this requires policy that focusses on (1) stimulating innovative agricultural practices and techniques that contribute to

sustainability and (2) avoiding the undesirable developments that adversely affect the sustainability of milk production. Improving sustainability of the dairy sector is a key factor in becoming more competitive since markets and public opinion consider this as an important factor.

#### 4.6. Conclusions and policy recommendations drawn directly from the analysis

##### 4.6.1. Conclusions

###### Regions at risk

1. Important indicators for regions at risk for unemployment and land abandonment are: small farms (less than 20 cows), low farm income, high percentage of semi-natural grassland, aged farmers and a projected decrease in milk volume. Regions where many dairy farms meet these criteria are regions at risk.
2. When we combine all these results, it becomes clear that the regions with the greatest risk of unemployment of agricultural workers and/or risk of farmland abandonment are (in order of risk):
  - a. Southern Europe: Portugal, Spain, Apennines (Italy) and Greece
  - b. Romania and Bulgaria
  - c. Eastern Central Europe: Slovenia and Slovakia
  - d. Baltic countries: Estonia, Latvia and Lithuania
  - e. Poland: Mazowieckie, Lubelskie, Podkarpackie and Podlaskie
  - f. Finland and Sweden: Northern regions in Sweden and eastern regions in Finland
  - g. Central France: Massif Central

###### Farming systems at risk

3. Farm expansion and intensive production systems may result in pollution of surface and ground water and high emissions of methane and ammonia. Also biodiversity, natural habitats and valuable landscape areas can be damaged. These production systems are relatively common in Southern Europe, Po Valley and North Sea region. This requires more focus from the CAP on:
  - a. Stimulating innovative agricultural practices and techniques that contribute to sustainability
  - b. Avoiding the undesirable developments that adversely affect the sustainability of milk production.
4. The long-term trend in the decreasing number of dairy farms operating in ecologically valuable regions needs further attention and action, because these farms are contributing largely to maintain socially desired goals. Above that, dairy farming can be a profitable way to maintain natural habitats at low costs.

##### 4.6.2. Policy recommendations

*[The policy recommendations in this paragraph are the same as in Paragraph 3.5.2. Since Chapters 3 and 4 show overlap and are complementary, the following recommendations are based on the analyses in Chapters 3 and 4.]*

1. **Connect or merge Structural Funds, Territorial Agenda and CAP to get more targeted policy instruments for regional development**  
Regional development is more than stimulating agriculture. It also means stimulating rural resilience to build strong local economies and ensure global competitiveness of regions.
2. **Introduce regional program to improve the resilience of the region**
  - Identify strengths of the region: professional skills, knowledge and experience, authentic character, touristic attractiveness, potential of alternative agricultural products.

- Stimulate building new networks that develop new commercial activities.
- Funds for this program can come from CAP funds or from Structural Funds and the Cohesion Fund.

**3. Introduce custom-made restructure programs for the dairy sector in countries or regions with predominantly small farms**

In regions with predominantly small farms, an accumulation of difficulties for dairy farming is observed: low income of dairy farms, land abandonment, low competitiveness of the dairy processing industry and a decrease of milk production. Custom-made national or regional restructure programs for the dairy sector or the whole agriculture sector can provide an accelerated restructuring.

**4. Introduce R&D-program sustainability for the dairy sector**

The public opinion wants more sustainable farming systems and markets require more sustainable products. This is in line with the EU policy of greening and the EU directives aiming at improving environmental quality. The future of the sector and its competitiveness will strongly rely on efforts to improve sustainability. Payments to the dairy sector should therefore contribute to the improvement of sustainability. Within the Single Payment System, these sustainability incentives play only a minor role. A more stimulating role at reasonable administrative costs is to stimulate R&D-projects of collaborating organisations within the dairy chain like dairy farmers, their suppliers and processors, consultants and research organisations. They should start joined initiatives to develop new techniques and tactics. These R&D-activities should be aiming at long-term improvements of sustainability: animal welfare, efficient use of inputs like fertiliser and herbicides, reducing emissions to soil, water and air, developing high yielding feed protein crops to avoid soybean imports, etc. These steps should be undertaken in research laboratories, on experimental farms and in field experiments.

**5. Develop a special policy instrument to avoid farmland abandonment combined with profitable animal production**

Regions where farmland abandonment is a threat, deserve special attention. Many of these regions have ecologically valuable habitats. The most obvious way to combine nature and agriculture in these areas are extensive dairy and beef production. Combined with the possibilities to produce PDO/PGI-products, including market regulation under PDO/PGI-rules, the added value of products from these regions should be better valued by consumers on domestic and international markets. Crucial elements in this policy should be market approach and payments for conserving nature.

## **5. What actions could be envisaged with the view to secure that a sustainable balance between economic and territorial dimension of the milk sector?**

### **5.1. Interpretation and comprehension of the key terms of the evaluation question**

We explain the central desire in this question ‘to secure a sustainable balance between the economic and the territorial dimension’ in two ways:

1. The most remarkable word in this question is the territorial dimension. This is interpreted as special attention for the position of milk producers and processors in regions at risk when asking for actions to improve the situation of the dairy sector.
2. The question as a whole is aiming at improving both long-term profitability and sustainability of the dairy sector. For sustainability, we use the broad definition (also used in 4.1) that includes among others, the environmental impact, animal welfare, maintaining natural habitats and incentives to connect regional production and consumption. We consider economic dimension as the straight forward goal to strive for sufficient income from dairy farms and dairy processors.

Another key element in this question is actions. In the previous chapters, we have described the developments in the last decade and projections for the next decade. These projections do not always correspond with the goals of policy makers. The actions listed in this chapter can help focus on policy goals. This is why the vast majority of the actions are policy recommendations.

This question is the last one in a row of four about the contribution of the milk sector to maintain prosperous regions and sustainable farming systems. This is why the selected actions have the character of integrated solutions for the future of the sector as a whole and for regions and farming systems at risk in particular.

### **5.2. Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used**

The analysis made in the previous chapters to answer the previous questions has served as the basis for the search for actions. An important part of this analysis was to summarise the regions and the farming systems at risk and their characteristics. The basis for this analysis can be found in the previous chapters.

### **5.3. Description of the method(s) used and an indication of its (their) limitations**

Two methods were used to find answers for the central question of this chapter. First, we organized a workshop for a group of four experts of the European dairy sector (including the authors). The participants made a list of possible actions to solve the problems of regions and farming systems at risk. The next step was regrouping the ideas and an additional brainstorm by the authors to focus on solutions that are appropriate to improve the position of regions and farming systems at risk.

#### 5.4. Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

The main elements in the reasoning were the problems and the challenges the dairy sector is facing with emphasize on regions and farming systems at risk. These positive outlooks for the international dairy market challenge the EU to benefit from its position as supplier of high value-added products, in particular quality cheeses. The EU as a whole has a broad dairy product portfolio with great opportunities to supply the world with high-quality dairy products. This is the time to realise a forward looking EU dairy sector to further strengthen the position of the EU as a whole and its dairy regions in particular as competitive players on domestic and international markets. The positive outlooks for the next decade fit very well with the abolition of milk quota and call for more emphasis on responding to markets instead of market regulation. This call is not only meant for the dairy sector as a whole, but also for dairy regions and dairy farming systems. They all have the challenge to adapt to the future market for dairy products.

In the previous chapters, we have discussed central themes for regions at risk: alternative employment outside the dairy sector, land abandonment and unemployment and the risk of semi-natural pastures being left by farmers. In intensive regions, sustainability aspects of the production system are considered as a problem, although farmers and processors in many regions are already working on solutions. But adaptation to the market would be stimulated by speeding up this process of developing a more sustainable dairy sector.

#### 5.5. Conclusions and policy recommendations drawn directly from the analysis

In this chapter, we focus on policy recommendations and actions for regions at risk and for farming systems at risk. We call regions at risk if the share of income from dairy farms and dairy processors is decreasing or where side effects of this decrease in milk production are considered to be detrimental to the economy or the socioeconomic position of the region. When looking for solutions to improve the situation in this category of regions, we discovered that many of the invented solutions have positive effects for all regions; not only for the regions at risk. Since the future of the EU dairy sector and the perspectives and challenges of this sector after 2015 are an important underlying goal of this report, we decided to make a special category of policy recommendations to enhance the long-term competitiveness for the whole EU dairy sector. These recommendations are listed in 5.6 and reflect our opinion about the challenges for the EU dairy sector as a whole. In the next paragraph (5.7) we focus on policies to improve employment in the regions at risk identified in 4.4.1. We added this paragraph since we are convinced that the solutions for regions at risk should not only be expected from the dairy sector, but should be based on the overall potential of the region. Since we are not experts in this field, this paragraph is only short, but its importance is considered great. In the subsequent paragraph (5.8), we focus on policy recommendations and actions that can be taken in the dairy sector to improve the prospects for the dairy sector in regions at risk. In the last paragraph (5.9) we focus more specifically on policy recommendations to improve farming systems at risk. In 4.5, we have concluded that mainly intensive farms and large farms are facing problems that have to do with sustainability. This is why we present solutions for solving these problems in this paragraph. In addition, we also have added solutions to improve the prospects for endangered farming systems from the type semi-natural pastures in this last paragraph.

## 5.6. Main policy recommendations to enhance long-term competitiveness of the EU dairy sector

The main actions that should be taken within EU Member States to improve the long-term competitiveness of the EU dairy sector are:

### 1. Stimulate dairy farmers and dairy processors to become more market oriented.

Important steps within this action are:

- a. To improve entrepreneurship and cooperation within dairy chains.
- b. To enhance market awareness and the skills to react on trends and markets.

The future dairy policy should stimulate dairy farmers and processors to cope with trends and markets and doing so, improve their skills in adapting to changes in markets. In the long run, this is the way to develop a competitive dairy sector.

These policy goals can be achieved by actions like:

- i. Market orientation programs initiated by dairy processors, advisory services or farmer organisations.
- ii. Sustainability programs and market concepts by dairy processors to develop more sustainable dairy products.

Dairy farmers and dairy processors play an important role in these actions. These programs should be initiated by market parties. That is the best guarantee for implementation of market-oriented initiatives. [For regions at risk, a more specific approach of this action is elaborated in 5.8, recommendations and actions 1 to 6.]

### 2. Introduce custom-made restructure programs for the dairy sector in regions with small farms and dairy processors that are lagging behind in competitiveness.

This action is aimed to apply an acceleration in the process of adapting to the market and the establishment of profitable and sustainable dairy farms and processors. This action is mainly meant for regions with small farms (less than 20 cows) with poor prospects. These farms are mainly located in the Baltic countries, Poland, Romania, Bulgaria and Slovenia. Some regions within other Member States are facing the same problem. The goals of this program are: improving profitability of dairy farms, adaptation to market conditions and improving the position of farmers in the dairy chain.

Important elements in the program: entrepreneurship, dairy farm management skills, market orientation, cooperation within the dairy chain and knowledge exchange with dairy farms in other EU regions.

[For regions at risk, a more specific approach of this action is elaborated in 5.8, recommendations and actions 1 to 6.]

### 3. Introduce R&D-program sustainability for the dairy sector

The public opinion wants more sustainable farming systems and markets require more sustainable products. This is in line with the EU policy of greening and the EU directives aiming at improving environmental quality. The future of the sector and its competitiveness will strongly rely on efforts to improve sustainability. Payments to the dairy sector should therefore contribute to the improvement of sustainability. Within the Single Payment System, these sustainability incentives play only a minor role. A more stimulating role at reasonable administrative costs is to stimulate R&D-projects of collaborating organisations within the dairy chain like dairy farmers, their suppliers and processors, consultants and research organisations.

[A more detailed approach of this recommendation is elaborated in 5.9.]

### 4. Reward dairy farmers who make significant contributions to public goods like nature, landscape and carbon capture.

The EU has many areas that are characterised as valuable habitats or landscapes. Farmers with dairy or beef cattle, sheep and goats can play a role in preserving these areas. This can lower the cost of nature conservation and thus the social costs of maintaining the area. Rewards should be used to stimulate this

role in combination with developing higher added value product concepts in these regions with a risk of land abandonment. A more detailed study is needed to evaluate the present policy instruments in this field and to develop more target oriented policy instruments.

### 5.7. Policy recommendations to improve employment in regions at risk

The socioeconomic situation of a region not only depends on the future of dairy, but more in general on the overall competitiveness of the region. This is why we made a list of actions to improve employment in the region at risk. In Chapter 4, we have appointed the characteristics of this category of regions. These regions combine small (dairy) farms (less than 20 cows per herd), low income, high percentage of semi-natural grassland and aged farmers. These regions might run into problems like unemployment, land abandonment and low income of farmers. These risks are greater in combination with an expected decrease in milk production as mentioned in Chapter 1. The next policy recommendations can improve the employment situation in these regions:

#### 1. Regional program to improve the resilience of the region

- Identify strengths of the region: professional skills, knowledge and experience, authentic character, touristic attractiveness, potential of alternative agricultural products.
- Stimulate building new networks that develop new commercial activities.
- Funds for this program can come from CAP funds or from Structural Funds and the Cohesion Fund.

#### 2. Development of new commercial activities in fragile areas

This support can for instance be used to develop new products or new services, implement solar or wind energy or develop touristic activities. This type of stimulation programs fits very well with Structural Funds.

#### 3. Develop and market new crops

In countries with fertile land (e.g., Baltic countries, Poland, Romania and Bulgaria), traditional or new agricultural products can be introduced combined with the introduction of a supply chain concept. Growing high protein crops to supply the European food and feed market or raw materials needed in the bio-based sector can be attractive crops.

#### 4. Stimulate the use of beef cattle in maintaining endangered habitats

If dairy cow milk production is no longer profitable in a region, many regions have opportunities to switch to beef production with suckler cows or dairy production with sheep and goats. Restructuring these sectors to improve market orientation and profitability could be accommodated in the recommendations 1 and 2 mentioned in 5.6.

### 5.8. Policy recommendations and actions for the dairy sector to improve competitiveness in the dairy sector in regions at risk

See 5.6 for the general policy recommendations for regions at risk. In this paragraph, these main recommendations are further elaborated for this type of regions to policy recommendations in 5.8.1. and actions for dairy farmers and dairy processors in 5.8.2.

#### 5.8.1. Policy recommendations

##### 1. Training of dairy farmers in entrepreneurship and craftsmanship

Entrepreneurship and profitability are keystones for successful dairy farming (see policy recommendation

1 in 5.6). Part of this training can be to take a closer look at the specific opportunities of dairy production in the region.

## **2. European Dairy Development Program to stimulate interregional and international cooperation between farmers and dairy processors**

Farmers and processors in regions at risk can learn from experiences in other EU regions. In Northwest-Europe, there is a lot of experience with cooperatives and international marketing. In Austria, France and Southern Germany, farmers and processors have experiences with small diversified farms producing local for local. Italian and French processors have great experiences in producing highly valued cheeses. Farmers in Southern and Eastern Europe have the expertise of producing milk on ecologically valuable habitats. All these experiences can be exchanged with other regions that are looking for opportunities to develop their entrepreneurship and market approach in dairying. It would stimulate new cooperatives in regions at risk if the EU would create an EU-program to promote this in regions that have market potential for developing the dairy sector.

This action can be further elaborated by actions like:

- Exchange program for dairy farmers for exchange of knowledge about dairy farming.
- Interregional partnerships to develop dairy chains.  
Experienced farmers or cooperative employees from other regions can help to support in setting up new cooperatives or to develop sustainable dairy chains.
- Develop dairy support programs for international cooperatives to set up subsidiaries or new cooperatives in other countries.

## **3. Premiums per hectare for the maintenance of habitats and biodiversity in grassland with handicaps.**

If dairy farmers offer valuable services to the society by maintaining nature, they can be paid for that by:

- LFA premiums (second pillar)
- Premium for maintenance of landscape and nature (Second Pillar)
- Special top up (First pillar)

Farmers should be stimulated to build a producer organisation to build a stronger position and to develop additional dairy chain initiatives to collectively market milk from natural habitat areas.

## **4. Stimulation program for foreign investors to invest in developing dairy and beef production in regions at risks**

Create opportunities for foreign investors to establish or take over dairy farms under certain conditions that have to be fulfilled to take care of regional goals concerning habitats and other sustainability requirements.

### ***5.8.2. Actions for dairy farmers and dairy processors***

## **5. Establish cooperatives of dairy farmers to improve bargaining power, develop markets and products and reduce risks**

Farmers can take a greater responsibility for the marketing of their milk by organizing dairy processing and supplying retail. Cooperatives offer good possibilities to earn a higher share of the value added in the food supply chain. They can also help in reducing market risks and strengthen the competitive position of their members. Cooperatives can become important employers in the region and there are many examples of cooperatives that are successful in developing and marketing regional specialities. A large market share for cooperatives in a particular sector and country can increase the price level and reduce the price volatility (Bijman et al., 2013). Among others, more specific actions in this field are:

- Develop new cooperatives to trade in milk
- Develop new cooperatives to process and market milk



## 6. Develop new dairy products and brands based on nature and landscape

Regions at risk often possess scenic landscapes and valuable natural habitats (e.g., LFAs) that attract many tourists and can enhance the natural character of dairy products. A close connection between the region and the product can be made by producing protected designation of origin (PDO) cheeses or other PDO-products. This is true for organic and conventional products. Jongeneel et al. (2011) found that PDO-cheeses showed little price fluctuations and were not influenced by the world market imbalances or by CAP price stabilisation instruments. The production and marketing of (new and existing) PDO-cheeses in Spain, Portugal and Eastern Europe offers opportunities to improve market perspectives for the dairy sector in these regions.

In many regions, a further development of goat and sheep dairy products offers also opportunities for new products combined with maintaining semi-natural grasslands.

## 5.9. Policy recommendations to improve the sustainability of dairy farming systems

### 1. Introduce R&D-program sustainability for the dairy sector

The public opinion wants more sustainable farming systems and markets require more sustainable products. This is in line with the EU policy of greening and the EU directives aiming at improving environmental quality. The future of the sector and its competitiveness will strongly rely on efforts to improve sustainability. Payments to the dairy sector should therefore contribute to the improvement of sustainability. Within the Single Payment System, these sustainability incentives play only a minor role. A more stimulating role at reasonable administrative costs is to stimulate R&D-projects of collaborating organisations within the dairy chain like dairy farmers, their suppliers and processors, consultants and research organisations. They should start joined initiatives to develop new techniques and tactics. These R&D-activities should be aiming at long-term improvements of sustainability: animal welfare, efficient use of inputs like fertiliser and herbicides, reducing emissions to soil, water and air, developing high-yielding feed protein crops to avoid soybean imports, etc. These steps should be undertaken in research laboratories and, on experimental farms and in field experiments.

### 2. Implement sustainable practices on dairy farms

This policy instrument is a logical continuation of the R&D-program mentioned above. Important steps to come to implementation at the dairy farm are:

- Make an inventory of measures that can improve sustainability on the farm level.
- Develop decision support systems, monitoring systems and professional skills to educate and facilitate consultants for supporting decisions on farms in the field of sustainability.

### 3. Stimulate dairy processors to develop sustainability improvement program based on incentives coming from the market

Consumer organisations, NGOs and retail chains require higher sustainability standards. The goal of this action is to stimulate farmers and dairy processors to join forces with these organisations and to start joined efforts to develop more sustainable farming systems and dairy products, including premiums for dairy farmers who meet higher standards.

### 4. International exchange of national programs to improve sustainability on dairy farms

In various Member States, programs have been developed to improve sustainability in the dairy sector. An exchange of these programs can accelerate the dissemination of knowledge, techniques and tactics within the EU. This exchange could start with researchers, later on followed by advisors and farmers.

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**Appendix 1. Detailed description of milk production data about the regions**

Region	includes the regions	Cow milk production			
		2000 <sup>3</sup>	2001 <sup>3</sup>	2010 <sup>4</sup>	2011 <sup>4</sup>
<b>Scandinavia</b>		<b>5 842</b>	<b>5 811</b>	<b>5 198</b>	<b>5 151</b>
	Sweden	3 348	3 339	2 862	2 850
	Finland	2 494	2 472	2 336	2 301
<b>United Kingdom</b>	United Kingdom	<b>14 496</b>	<b>14 709</b>	<b>13 859</b>	<b>14 088</b>
<b>Ireland</b>	Ireland	<b>5 211</b>	<b>5 390</b>	<b>5 350</b>	<b>5 556</b>
<b>North Sea region</b>		<b>27 085</b>	<b>26 805</b>	<b>29 184</b>	<b>29 301</b>
	Danmark	4 719	4 553	4 830	4 800
	Schleswig Holstein	2 352	2 333	2 612	2 664
	Lower Saxony	5 170	5 133	5 800	5 999
	The Netherlands	11 155	10 971	11 791	11 626
	Belgium	3 425	3 545	3 873	3 927
	Luxemburg	265	270	278	284
<b>Western France</b>		<b>12 385</b>	<b>12 350</b>	<b>12 217</b>	<b>12 837</b>
	Brittany	5 115	5 088	5 078	5 338
	Haute-Normandy	862	862	846	896
	Basse-Normandy	2 765	2 724	2 755	2 865
	Pays de la Loire	3 643	3 675	3 537	3 738
<b>Alps region</b>		<b>10 516</b>	<b>10 555</b>	<b>10 528</b>	<b>10 666</b>
	Rhône Alps	1 650	1 660	1 550	1 555
	Franche Comté	1 212	1 181	1 171	1 216
	Baden Württemberg mountain area <sup>1</sup>	569	570	557	572
	Bavaria mountain area <sup>1</sup>	1 913	1 906	1 940	1 983
	Austria	3 233	3 300	3 258	3 307
	Northern Italy mountain area <sup>2</sup>	1 939	1 938	2 052	2 034
<b>Eastern Germany (former DDR)</b>		<b>6 290</b>	<b>6 206</b>	<b>6 343</b>	<b>6 424</b>
	Brandenburg	1 356	1 345	1 347	1 364
	Mecklenburg-Vorpommern	1 350	1 339	1 419	1 465
	Sachsen	1 542	1 522	1 609	1 605
	Sachsen-Anhalt	1 084	1 061	1 027	1 051
	Thüringen	956	940	941	938
	Berlin	1	1	1	1
<b>Central France</b>	rest of France	<b>9 682</b>	<b>9 671</b>	<b>9 094</b>	<b>9 508</b>
<b>Central Germany</b>	rest of Germany	<b>12 039</b>	<b>12 043</b>	<b>12 377</b>	<b>12 695</b>
<b>Poland</b>	Poland	<b>11 889</b>	<b>11 884</b>	<b>12 279</b>	<b>12 414</b>

Region	includes the regions	Cow milk production			
		2000 <sup>3</sup>	2001 <sup>3</sup>	2010 <sup>4</sup>	2011 <sup>4</sup>
<b>Baltic countries</b>		<b>3 166</b>	<b>3 248</b>	<b>3 286</b>	<b>3 239</b>
	Estonia	630	684	671	675
	Lithuania	1 713	1 718	1 787	1 733
	Latvia	823	846	828	831
<b>Eastern Central Europe (C/S/H/S)</b>		<b>6 468</b>	<b>6 229</b>	<b>5 890</b>	<b>5 978</b>
	Czech Republic	2 646	2 602	2 683	2 736
	Slovakia	1 142	1 079	918	928
	Hungary	2 031	1 895	1 685	1 712
	Slovenia	649	653	604	602
<b>Romania and Bulgaria</b>		<b>6 333</b>	<b>6 322</b>	<b>5 017</b>	<b>5 201</b>
	Romania	5 024	4 977	3 944	4 075
	Bulgaria	1 309	1 345	1 073	1 126
<b>Po Valley</b>	Italian plains in Po Valley (69% of total Italian milk production)**	<b>7 434</b>	<b>7 427</b>	<b>7 866</b>	<b>7 796</b>
<b>Southern Europe</b>		<b>11 249</b>	<b>11 396</b>	<b>11 193</b>	<b>11 270</b>
	Portugal	2 060	1 983	1 918	1 919
	Spain	6 290	6 520	6 357	6 488
	rest of Italy (18% of total Italian milk production)**	1 939	1 938	2 052	2 034
	Malta	45	45	41	40
	Greece	768	768	673	639
	Cyprus	147	142	152	151
<b>Data of countries or regions that are divided over regions</b>					
<b>Germany</b>		<b>28 331</b>	<b>28 191</b>	<b>29 629</b>	<b>30 336</b>
<b>France</b>		<b>24 929</b>	<b>24 862</b>	<b>24 032</b>	<b>25 116</b>
<b>Italy</b>		<b>10 774</b>	<b>10 764</b>	<b>11 399</b>	<b>11 299</b>
<b>Baden Württemberg</b>		<b>2 277</b>	<b>2 282</b>	<b>2 230</b>	<b>2 286</b>
<b>Bavaria</b>		<b>7 650</b>	<b>7 623</b>	<b>7 759</b>	<b>7 931</b>

Data source: Eurostat, NUTS2 regions

<sup>1</sup> Based on own estimation that 25 percent of milk production in this state comes from mountain area

<sup>2</sup> Based on calculations and estimates of Alberto Menghi (personal communication in 2008): 18 percent of total Italian milk production comes from the Alps mountain area

<sup>3</sup> When data of these years were missing, the nearest years after 2001 were used to replace

<sup>4</sup> When data of these years were missing, the nearest years before 2011 were used to replace

**AGRI-2012-C4-04 - Analysis on future developments in the milk sector**

Prepared for European Commission - DG Agriculture and Rural Development

Opinion Report

Expert Name: Susanne Clausen

**Theme 2: Sustainable milk production including its territorial dimension**

## 1. What will be the contribution of the milk sector in maintaining vibrant rural communities, especially in the most fragile areas?

### 1.1 Interpretation and comprehension of the key terms of the evaluation question

The key objective of the question is to assess the most likely contribution of the milk sector in maintaining vibrant rural communities after the end of the milk quota system, especially in the most fragile areas.

The term “vibrant rural communities” is assumed to be communities filled with energy and activity and to be linked to economic as well as social and cultural issues. The future contribution of the milk sector in maintaining “vibrant rural communities” is assumed to depend on the future development in milk production.

Fragile areas are assumed to be areas highly dependent on milk production both in terms of employment and economy, and without any obvious alternatives to milk production. The interpretation of fragile areas, as areas which are fragile in economic terms, corresponds with the former Commissioner Mariann Fischer Boel’s view on fragile areas as stated in a speech on 7 February 2008<sup>68</sup>. The question will be answered for the whole of the EU; however, most emphasis will be put on the most fragile areas.

### 1.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

The current impact of dairy farming on employment and economy of rural areas will be assessed at a regional level (Nuts 2 level) for all Member States of the EU. Based on this information and on information about the development in milk production over time in these regions, potentially fragile areas are identified. The future development in milk production in these areas will be assessed based on the current characteristics of dairy farming in the same areas and taking into account the impact of the end of the quota system, the Milk Package and the future developments of the market.

The answer to this question relies on official quantitative statistics from Eurostat and FADN. Data from these sources are of high validity; however, the data of FADN from 2009 do not capture the latest developments. This can impact the final conclusions, if the years not captured deviate from the years covered by the FADN.

Information about the possible impact of the end of the quota system on milk prices is drawn from the descriptive chapter. EY (EY) refers to several studies and shows specific data from one of these studies. The results of this study are used in the answer to this question. The information is assumed to be of high validity. Other studies also predict decrease in milk prices, yet the size of the predicted decline varies among the studies. All of the studies are some years old, which may affect the conclusions made. Information from the descriptive chapter about the implementation of the Milk Package is also used in the answer to the question. Information on future commodity prices is drawn from the latest OECD-FAO report<sup>69</sup>.

<sup>68</sup> Mariann Fischer Boel 2008, “The CAP Health Check – good news for variety in European farming” Brussels 2008.

<sup>69</sup> <http://www.oecd.org/site/oecd-faoagriculturaloutlook/> (17.05.2013)

### 1.3 Description of the method(s) used and an indication of its (their) limitations

An analytical and micro-economic approach will be used when answering the question.

The development in milk production until now and the contribution of dairy farming to the employment and the economy<sup>70</sup> within the agricultural sector is established. Based on the obtained information, potentially fragile areas are identified. These are characterised by having seen either no change or a decrease in milk production over time and by being very dependent on dairy farming in terms of employment and economy. The technical and economic structure of farms in these areas is described by technical key factors, such as structural development over time, farm size, milk yield per cow and by economic key factors, such as farm net income per family work unit (FWU) and farm net value added per annual work unit (FNVA per AWU) net investments. Based on this information, the impact of the end of the quota system as well as the impact of the Milk Package and of the future developments in commodity prices are assessed and discussed. Overall conclusions are drawn and based on these, policy recommendations are made.

The method applied provides information about the impact of dairy farming on the employment and economy within the agricultural sector; however, it does not establish the impact of dairy farming on the overall economy and employment in different areas. Dairy farming may be important for the agricultural sector in an area; however, the agricultural sector may not be very important for the economy and employment of the area. This is generally not captured by the method applied. The impact of dairy farming is measured by milk output as share of the total agricultural goods output. This may not show the full effect of dairy farming on the economy within the agricultural sector, as dairy farms are also characterised by having output from beef. This approach only captures the output side and not the input side, which is another limitation associated with this approach.

The regionalisation of data does in some cases differ between Eurostat and FADN, and therefore the FADN data may either be lagging or cover broader areas than the Eurostat data. Moreover, the data from FADN sometimes refer to farm sizes which are quite different from the average farm size. These differences impede in some cases a consistent description of farm structure and economic structure of farms.

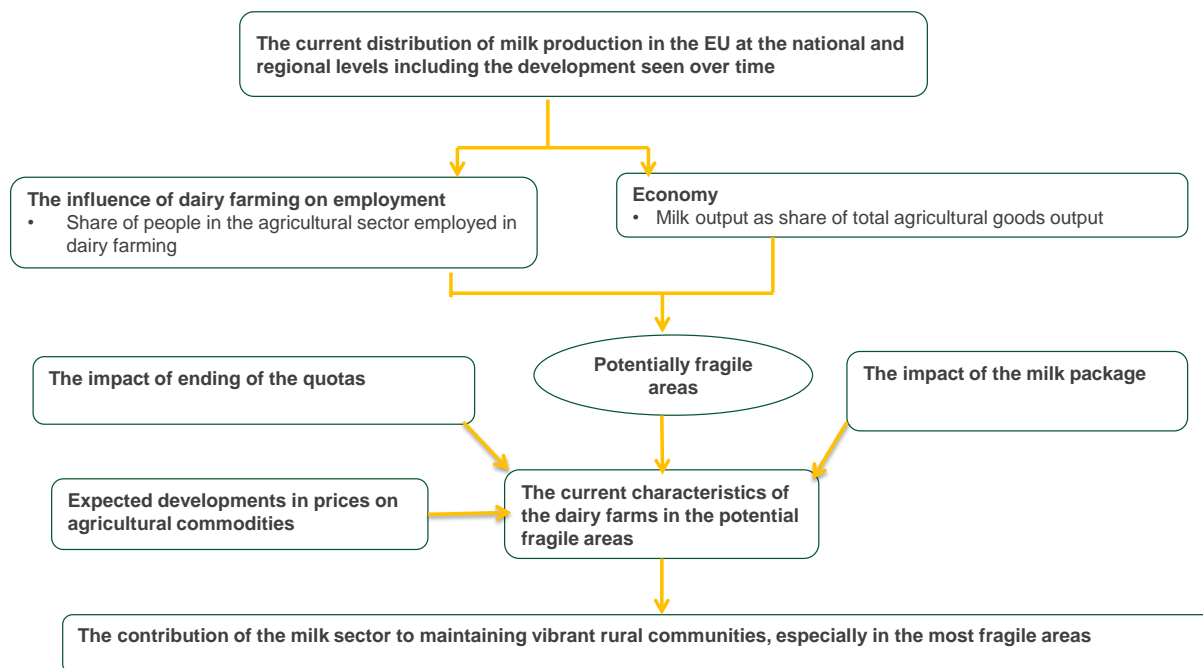
### 1.4. Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

The overall approach to answering the question is shown in Figure 1.1.

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<sup>70</sup> Measured by milk output as share of the total agricultural goods output.

**Figure 1.1:** Overall approach for answering Question 1

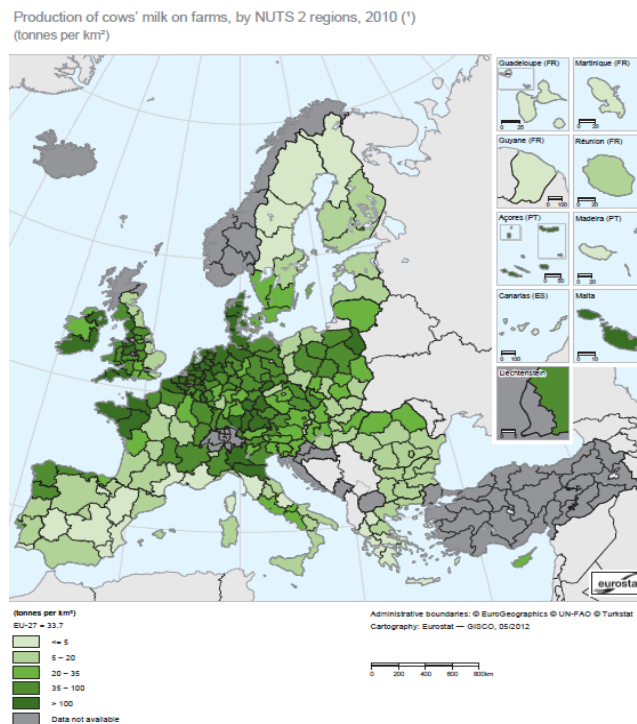


Milk is produced in all Member States of the EU and in all regions within the different Member States of the EU as indicated in Figure 1.2. Milk production is, however, in many cases concentrated within certain Member States and within certain regions of the different Member States.

The high density of milk production in certain areas is most likely a result of favourable conditions for milk production in these areas compared to other types of agricultural production. Yet, it may also be linked to historic and cultural conditions i.e., these areas have a long tradition for milk production.

The milk quota system has protected milk production at a national level and in some cases also at a regional level, because some Member States have tied the milk quota to the individual regions and prevented milk quota from being transferred from one region to another. Despite this, milk production in the different Member States has not been at a standstill as milk production has changed over time both at the national and regional levels as shown in Figure 1.3 and in Figure 1 in Appendix 1.<sup>71</sup> Milk production tended to increase in the Member States with a high density of milk production and decrease in the Member States with a lower density of milk production. Similar to the trend seen at the national level, milk production also tended to increase in the regions, which already accounted for a high share of the overall milk production of the individual Member States.

**Figure 1.2:** Production of cow’s milk, tons per km<sup>2</sup> in 2010.

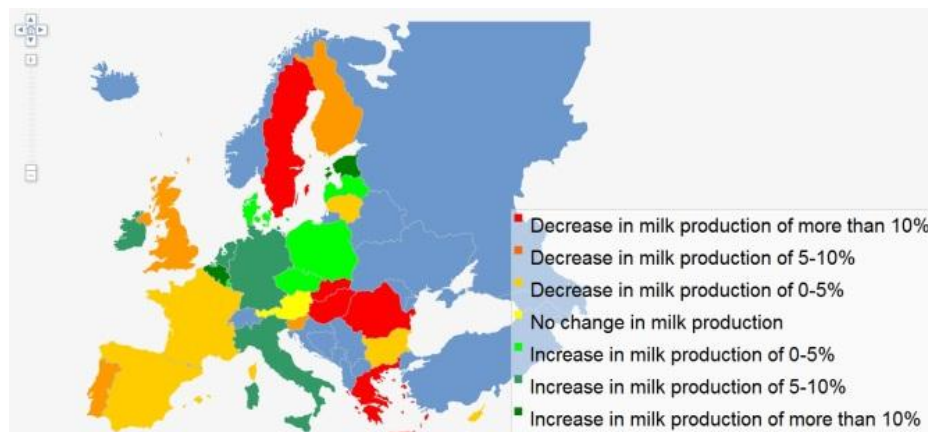


<sup>71</sup> BG: 2006-2011; Czech Republic (2003-2011); Greece (2003-2011); Latvia (2002-2010); Lithuania (2002-2010); Luxembourg (2003-2009); Hungary (2003-2011); Malta (2002-2008); Romania (2004-2011); Slovenia (2007-2011); Finland (2003-2011). Source: Eurostat: Production of cow's milk on farms by NUTS 2 regions (1,000t) [agr\_r\_milkpr].



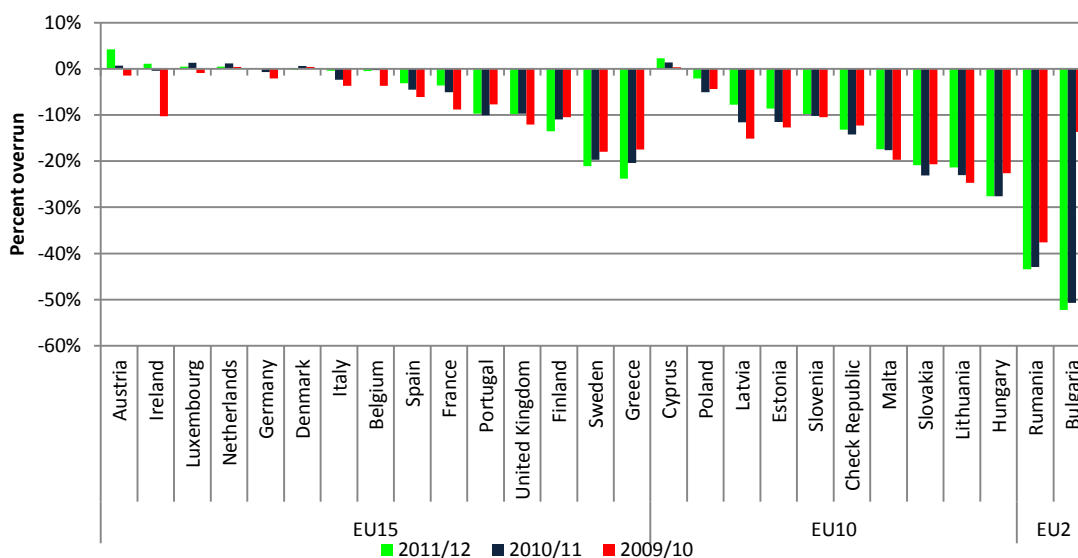
Owing to the changes in milk production, the contribution of the milk sector to the employment and economy is likely to have increased in the areas which have seen an increase in milk production, while the contribution has decreased in the areas which have seen a decline in production. The declines already seen in milk production may be accelerated by the abolition of the quota system and in turn, the employment and economy of these areas may be affected negatively.

**Figure 1.3:** Change in milk production from 2002 to 2011



Currently, many Member States do not produce the milk quota (see Figure 1.4).

**Figure 1.4:** Utilisation of milk quota for 2009/10 to 2011/12<sup>72</sup>

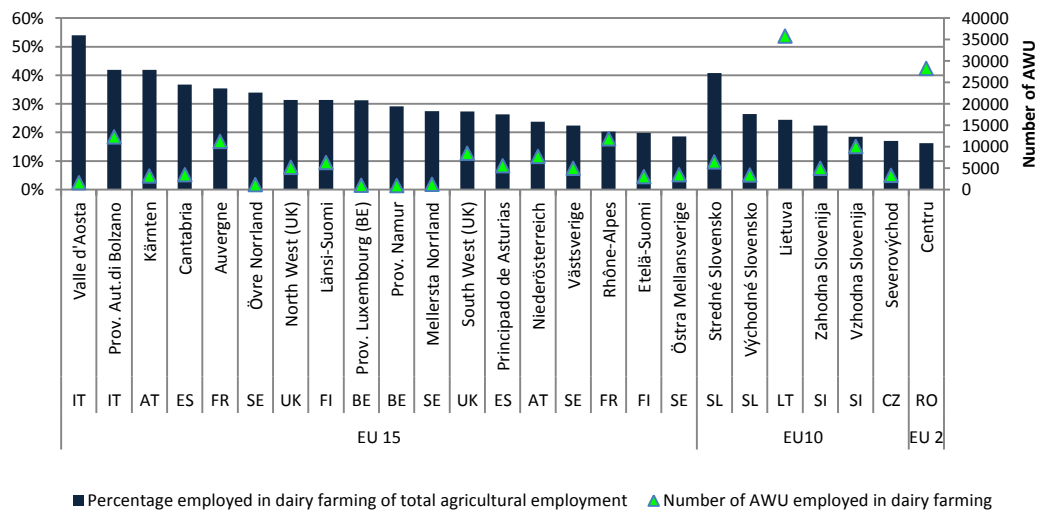


Milk production may increase in those Member States which either produce or are close to producing the milk quota, because it will be easier for dairy farmers to expand and because the expanding costs will be lower. In turn, this may have a positive influence on the employment and economy of these areas. However, even when milk production is likely to increase at the Member State level, some areas may see a decline in production and some of these may currently be relatively dependent on milk production both in terms of employment and economy. The Member States that have already seen declines in milk production are likely to be vulnerable to further decreases.

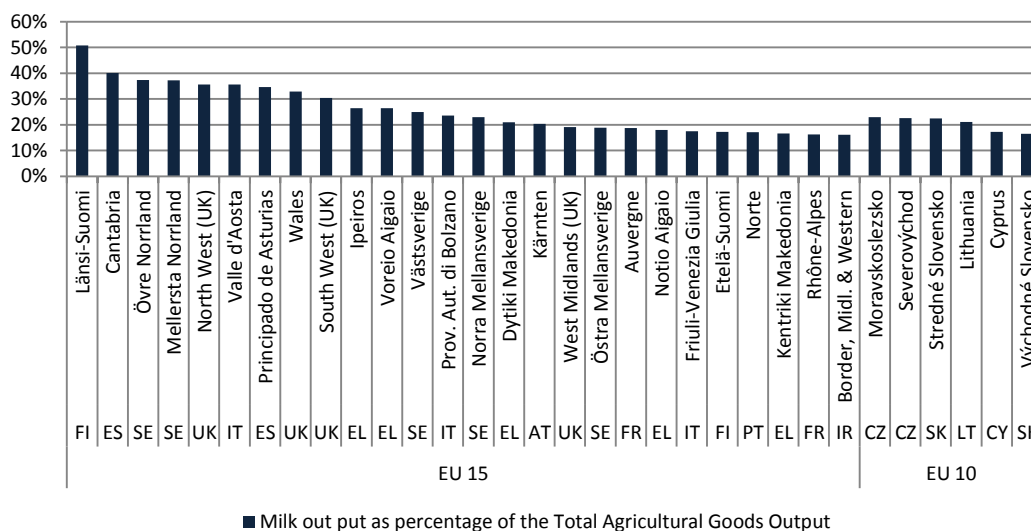
<sup>72</sup> [http://europa.eu/rapid/press-release\\_IP-12-1116\\_en.htm](http://europa.eu/rapid/press-release_IP-12-1116_en.htm)

Figure 1.5 shows the regions that have seen declines in milk production up till now and are highly dependent on dairy farming for the employment within the agricultural sector, while Figure 1.6 shows regions that have seen decreases in milk production up till now and in which milk output represents a large share of the total agricultural goods output, which in turn imply that milk production is an important contributor to the gross value added (GVA) from the agricultural sector.

**Figure 1.5:** The number of annual work units (AWU) employed in dairy farming and the share of AWU employed in dairy farming out of AWU employed in the agriculture in regions that have seen a decline in milk production up till now in 2010.<sup>73</sup>



**Figure 1.6:** Milk output as share of the total agricultural goods output and share of national milk production for those regions that have seen a decrease in milk production over time in 2010.<sup>74</sup>



Milk production is important for employment within the agricultural sector in mountainous regions, Nordic regions and in many of the UK regions as well as in some of the EU12 regions. All of these regions have seen declines in milk production and because milk production declined at the national level in Sweden, Finland and the UK, many regions of these Member States are included in Figure 1.5 and in Figure 1.6.

<sup>73</sup> Eurostat: Key variables: Area, livestock (LSU), labor force and standard output (SO) by type of farming (2-digit) and NUTS 2 regions [ef\_kvftreg] & production of cow's milk on farms by NUTS 2 regions (1 000 t) [agr\_r\_milkpr]

<sup>74</sup> Source: Eurostat agr\_r\_accts and nama\_r\_e3vab95r2

The importance of the dairy sector for the employment in the different regions and areas of the EU, and the contribution of the dairy sector to the economy of the regions are more or less two sides of the same coin, as the regions, highly dependent on dairy farming in terms of employment within the agricultural sector, also tend to depend on the dairy sector in terms of the contribution of this sector to the total agricultural goods output. There are a few exceptions to this as some Greek areas, as well as some areas of Portugal and the Czech Republic, are characterised by being less dependent on dairy farming in terms of employment, but quite dependent on this sector in terms of the total goods output.

No region is completely dependent on dairy farming in terms of employment and economy within the agricultural sector. In all regions, there are other types of agricultural farming. In many cases, these are crop farming and/or cattle farming as is shown in Figures 2, 3, 4 and 5 in Appendix 1.

Some dairy farmers will supplement their income by non-farming activities like for instance, tourism. No statistics exist on the size of this for dairy farms, yet Figure 1.7<sup>75</sup> shows the extent to which farmers in general are engaged in other gainful activities than farming.

According to Figure 1.7, the extent to which farmers have other gainful activities not only varies between the individual Member States, but also between regions within the individual Member States.

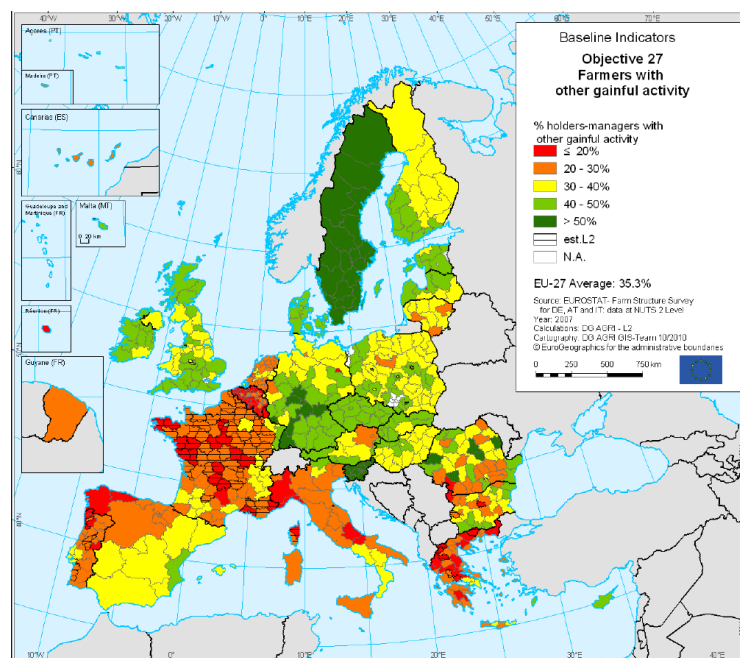
In the southern part of Germany, 40-50 percent of the farmers have other gainful activities. This also applies for some regions of Austria (Vorarlberg, Tyrol and Kärnten) as well as the Provincia Autonoma di Balzano in Italy.

In comparison, less than 30 percent of the farmers have other gainful activities than farming in most parts of France, the north western part of Spain and Portugal as well as in the Valle de Aosta region in Italy. In Finland, between 30-40 percent of the farmers had other gainful activities than farming, whereas in SE, more than 50 percent of the farmers have other gainful activities.

Figure 1.7 does not tell the importance of these activities for the income of the farms. Nonetheless, the more other gainful activities the farmers have, the less reliant they are on the income from the farming activity. Farmers will end farming activities, which year after year provide them with a negative income. However, the existence of other gainful activities makes them less exposed to the fluctuations in income from the farming activity. The existence of other gainful activities could also cause farmers to stay on with the current farming activities for longer than would otherwise be the case.

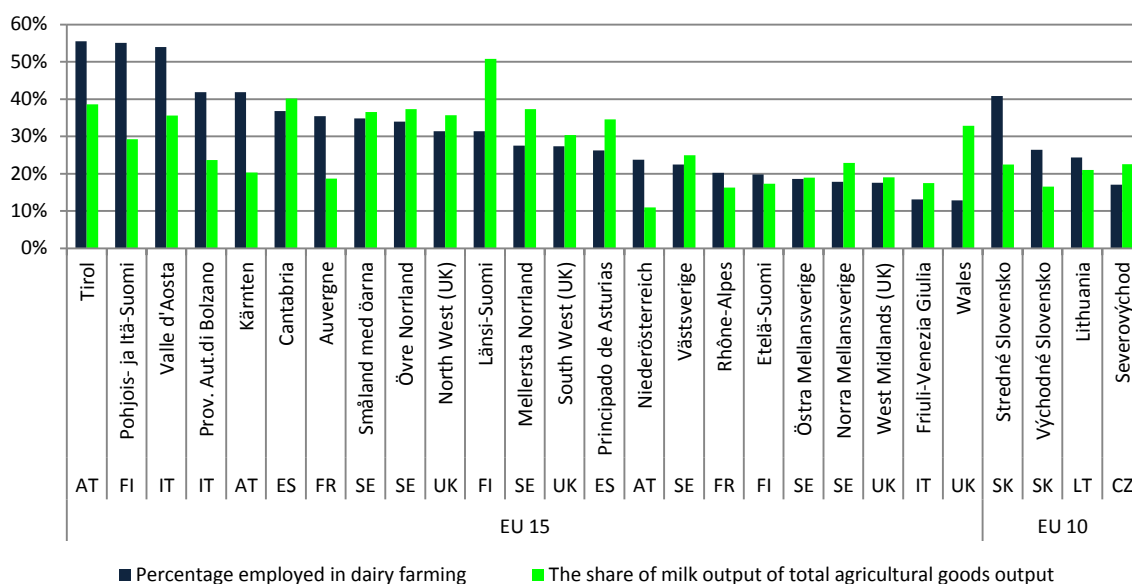
Figure 1.8 combines Figure 1.5 and Figure 1.6 and only includes the regions important for both the agricultural employment and the economy of the region. Tirol (Austria), as well as Pohjois- ja Itä-Suomi (Finland) and Småland med Öarna (Sweden) are included too. In these regions, milk production has not changed over time, but dairy farming has an important influence, for both the employment and the economy within the agricultural sector.

**Figure 1.7:** Farmers with other gainful activities in 2007



<sup>75</sup> Directorate-General for Agricultural and Rural Development, 2010. Rural Development in the European Union. Statistical and Economic Information. Report 2010 pp 114. The figure encompasses all farmers.

**Figure 1.8:** The importance of the dairy sector in terms of percentage employed in dairy farming and the share of milk output of the total agricultural goods output in potential fragile areas.

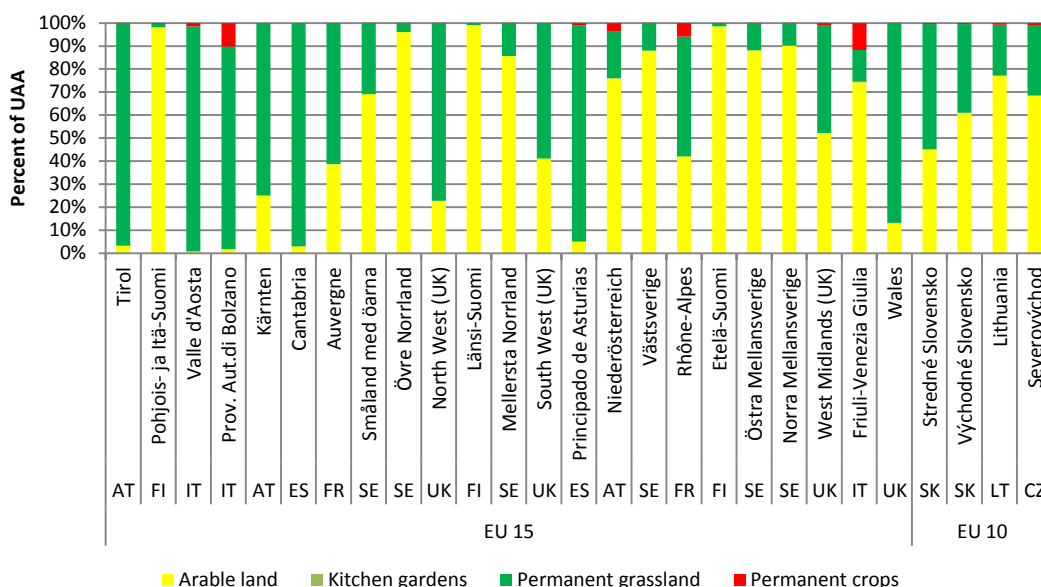


The areas shown in Figure 1.8 produce about 22 billion kilogram of milk or close to 16 percent of the total milk production in the EU27. Of the milk produced by these regions, 39 percent is produced by the UK regions, whereas 26 percent is produced by the mountainous areas and 22 percent by the Nordic regions. Finally, 13 percent is produced by the EU10 regions (see Figure 6 in Appendix 1).

Should milk production decrease dramatically in the regions shown, for instance due to the end of the quota system, it will impact both the employment and economy of the agricultural sector in these regions. It does not necessarily mean that the contribution of the agricultural sector to employment and economy will be less, but it will mean that the contribution from the different agricultural sectors is likely to change.

Some, but not all of these regions are characterised by a high proportion of permanent pasture (see Figure 1.9).

**Figure 1.9:** Agricultural land use in potential fragile regions in 2010<sup>76</sup>



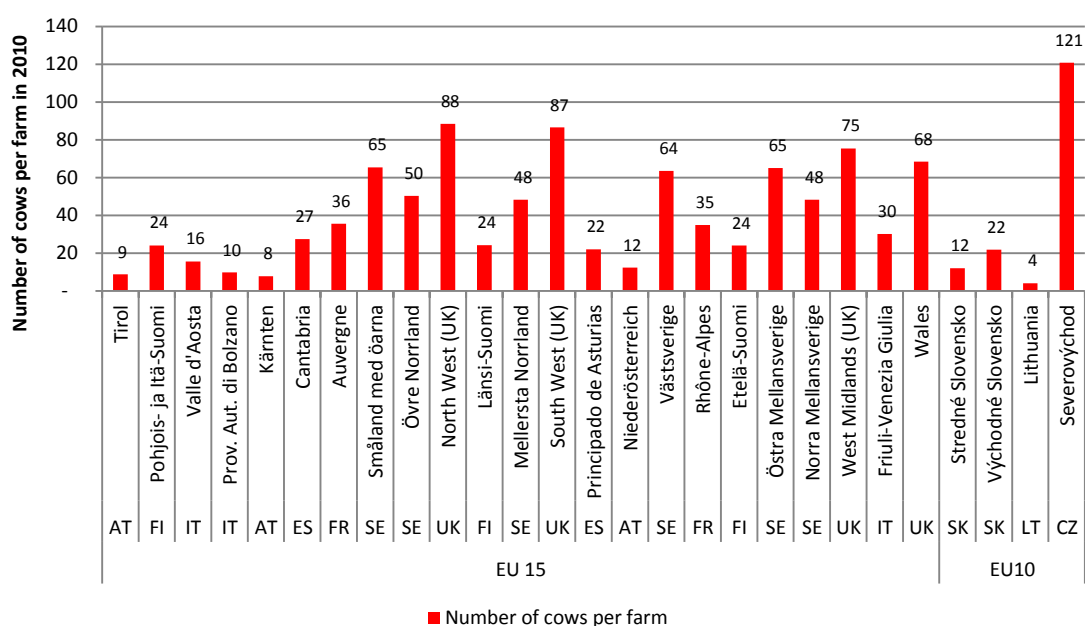
<sup>76</sup> Source: Eurostat: Land use: Number of farms and areas of different crops by agricultural size of farm (UAA) and NUTS 2 regions [ef\_oluaareg]

Permanent pasture dominates land use in the Spanish regions and in some of the Austrian and Italian regions, while it only constitutes a small part of the land use in both Sweden and Finland. Grass and/or grass silage is an important part of the feed used in dairy farming in the latter two regions. However, the areas used for grass production are not classified as permanent pasture. Among the EU10 Member States, permanent pasture makes up a considerable part of land use in the two Slovakian regions, whereas permanent pasture constitutes a smaller part of land use in the other two regions.

In areas dominated by permanent pasture, the farming options are limited to farming activities which can utilise the pasture e.g., dairy, cattle or sheep farming. The competition from other types of farming is less strong compared with areas that have more options. For milk production, the less strong competition from other types of farming speaks for the continuation of milk production in these areas as long as dairy farming can provide farmers with adequate earnings.

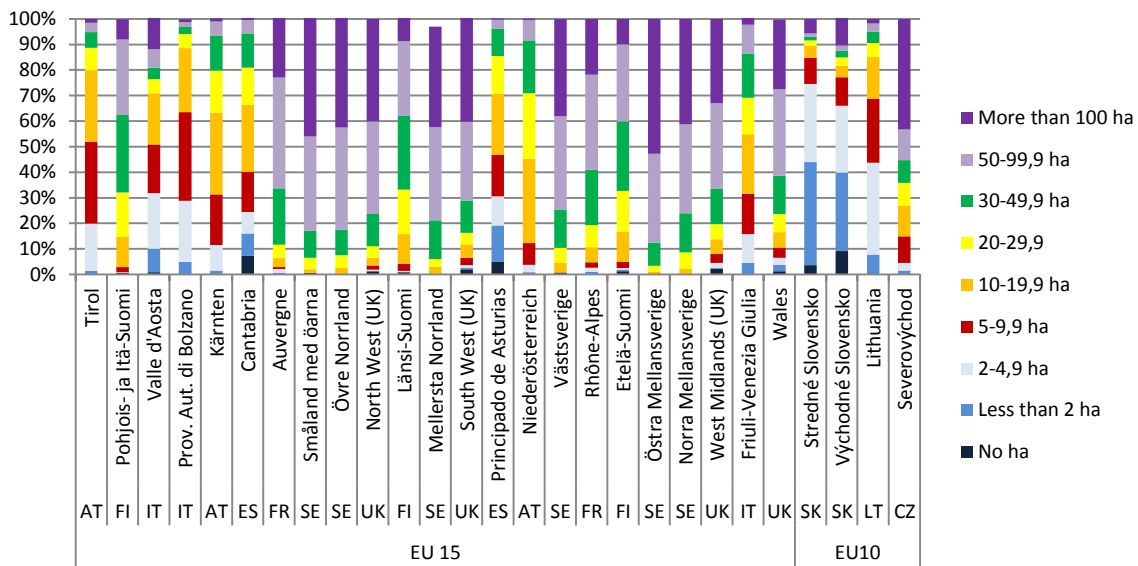
Before turning to the economic performance of the dairy farms in these regions, the farm structure characterising the regions is described. The current farm structure is shown in Figures 1.10, 1.11 and 1.12.

**Figure 1.10:** The number of cows per farm in the potential fragile regions in 2010<sup>77</sup>

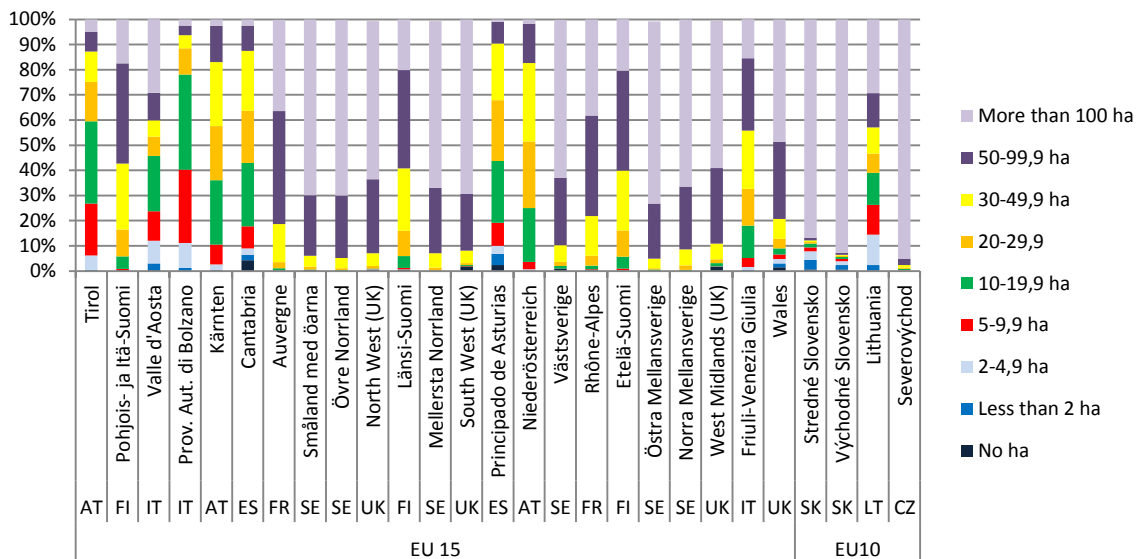


<sup>77</sup> Source: Eurostat. Livestock: Number of farms and heads of animals of different types by agricultural size of farm (UAA) and NUTS 2 regions [ef\_olsaareg]

**Figure 1.11:** Distribution of farms in 2010<sup>77</sup>



**Figure 1.12:** Distribution of cows on different farm sizes in 2010<sup>77</sup>



Of the 27 regions, 19 are characterised by an average herd size below 50 cows. The mountainous regions are often characterised by very small farms as seen in Austria and in some of the Italian regions. The average herd size is typically from 10-20 cows. Farms in the mountainous areas of France and Spain and in Finland are relatively larger (from 20-40 cows per farm). Somewhat larger farms (50-60 cows) are seen in Sweden, while the largest farms (70-90 cows) are seen in the UK regions. A similar difference is seen among the EU10 regions.

The breakdown of farms into different size groups shows that the Austrian, Italian and Spanish farms are very homogeneous, while a relatively large share of the French and Swedish farms operates more than 50 ha. The breakdown of farms into different size groups also reveals a considerable number of very small farms in both the Slovakian regions and in Lithuania, whereas the farm structure in the Czech region is very heterogeneous.

Despite many small farms, most of the cows are housed on larger farms in the EU10 regions except for Lithuania. In the EU15 regions, most cows in the mountainous regions of Austria, Italy, Spain and partly Finland are housed on small farms. The high incidence of many small farms may be due to geographical conditions of the areas, which make the establishment of larger and more rational units difficult.

In Tirol, Kärnten, Niederösterreich and Friuli Venezia, the number of farms did not change from 2007 to 2010. In all other regions, the number of farms decreased. The largest decreases in number of farms were seen in the EU10 regions. In Kärnten and Tirol, neither cow number nor the farm size changed from 2007-2010, while in Niederösterreich, both cow numbers and average herd size increased. Consequently, many Austrian regions are characterised by little structural development. In the other regions, the number of farms and the cow number decreased, while the average herd size increased. In percentage, some of the largest increases in herd size were seen in the EU10 regions (Appendix 1, Figure 7).

Most of the farms in these potentially fragile regions are owned by sole holders. The lowest proportion of farms owned by sole holders is seen in the French regions and in the Czech region as well as in Cantabria (ES). The remaining part of the farms is owned either by legal persons or by group holdings. The latter is common in France, and these often consist of family members. Thus, many of the farms are family-owned farms, where most of the work on the farm is provided by the family members. The exceptions to this are the Czech and UK farms, which are characterised by a larger share of hired labour. The higher share of hired labour on these farms is a consequence of their size. The owner structure and the share of family labour on these farms are shown in Figure 8 and 9 in Appendix 1<sup>78</sup>.

Many of these farms are inherited ones, passed on from one generation to the next and many of them may have been in the family for generations. Because of that, the emotional bonds between the family and the farm are often strong and due to this, these owners are often willing to fight hard and make sacrifices in order to save the farm in severe economic times. In comparison, other types of ownerships are characterised by less strong emotional bonds; these owners are more ready to drop the current activities and turn to other types of production, when the current activities do not provide adequate earnings.

For many of the owners of these farms, farming is more a way of life than an occupation. They are often satisfied as long as farming provides earnings adequate to cover the living expenses of the family. One may say it is part of the farming culture that probably applies for a broad range of the farmers in the EU and therefore not only for the regions shown.

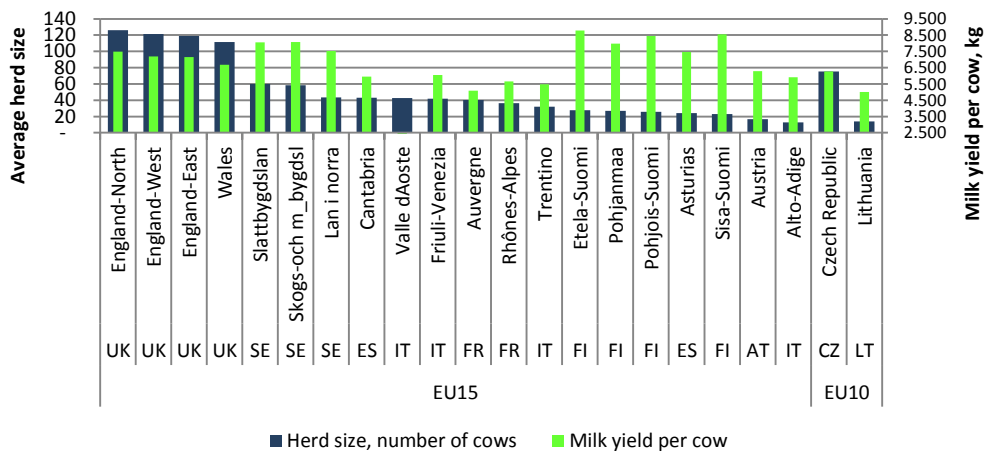
Having described the characteristics of the regions in terms of land use, farm structure, typical type of ownership and the typical type of labour applied on these farms, the technical and economic characteristics of these are identified. The FADN data are used to describe the technical and economic performance of these farms. Figure 1.13 shows the average herd size and the achieved milk yield per cow in the potentially fragile regions based on FADN data.

FADN data are used to describe the technical and economic performance of these farms. Unfortunately, FADN data do not in all cases cover the same regions as Eurostat (Sweden, the UK, Finland) and in some cases, data are only available on a national basis (Austria, the Czech Republic, Slovakia). Moreover, the Slovakian figures correspond to farms which are much larger than the farms in the regions identified. Owing to this, no results are shown for the Slovakian farms. Results are shown for the remaining part even though the regionalisation of the FADN data does not fully match with the regionalisation applied by Eurostat.

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<sup>78</sup> FADN data do not in all cases cover the same regions as Eurostat (SE, UK, FI) and in some cases data are only available on a national basis (Austria, Czech Republic, Slovakia). Moreover, the Slovakian figures correspond to farms which are much larger than the farms in the regions identified. Owing to this, no results are shown for the Slovakian farms. Results are shown for the remaining part even though the regionalisation of the FADN data does not fully match the regionalisation applied by Eurostat.

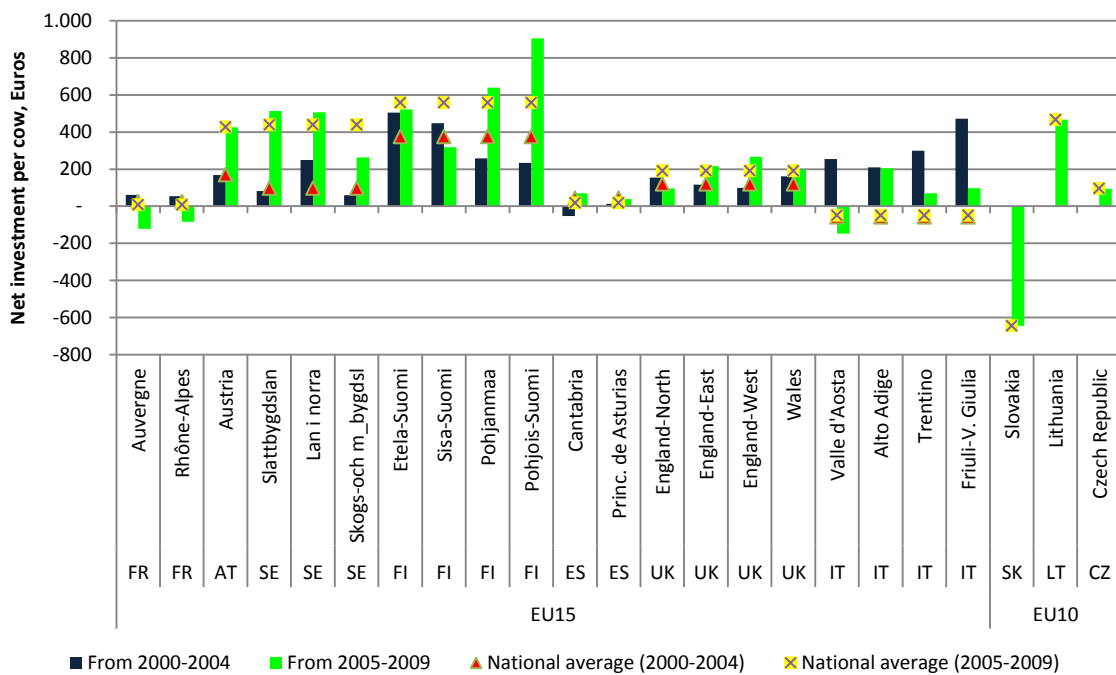
**Figure 1.13:** Average number of cows and milk yield per cow from 2007-2009 (Source: FADN)



Milk yield per cow is very low in Valle de Aoste, moderate in the French and Italian regions as well as in Austria. High milk yields per cow are seen in the remaining part of the regions. Difference in milk yield per cow may be caused by differences in management levels, feeding levels and type of cow breed used for milk production. The use of dual purpose breeds causes lower milk yields per cow as these cows are bred for both milk and beef production.

If farmers do not invest at a level which allows the current facilities to be maintained, these will gradually be run down and milk production is very likely to decrease over time. Thus, when net investments are negative over time, farmers are not investing enough to maintain the current facilities. When net investments are about zero, then farmers are maintaining the current facilities, while positive net investments indicate that the farms are being developed. The level of the net investments is therefore an important indicator of the condition of the current production facilities and of the motivation of farmers to continue with milk production. The level of net investments is shown in Figure 1.14.

**Figure 1.14:** Net investment on dairy farms in potentially fragile regions





Negative net investments are seen since 2005 on the farms in the French regions, while zero-net investments are seen on the Spanish farms. The negative level of net investments seen on French farms leads to a rundown of the facilities and it indicates a lack of motivation to invest even at a level necessary to maintain the current facilities. Generally, the level of investments seems to be low in France as the net investments at the national level is just about zero. The Spanish farmers invest at a level sufficient to maintain the current facilities and at a level matching the average national level of investments. Still, if these farms are old and unattractive for young farmers to take over, the current level of net investments may be too low to ensure the continuation of milk production over the longer term at the level currently seen.

Higher levels of net investments are seen on the Italian farms; they exceed the national average level of investments. Apparently, the farmers in these potentially fragile regions are more motivated to invest in dairy farming than Italian dairy farmers in general.

Quite low net investments are also seen on Czech farms and on UK farms; however, the latter showed an upward trend from 2000-2004 to 2005-2009. In both the Swedish and Finnish areas, net investments are generally higher than in any of the other areas, especially from 2005-2009 and especially in the northern parts. The highest level of net investments is seen in the central and northern regions of Finland (the Pohjois-Soumi region and the Pohjanmaa region).

Owing to the low level of investments, the capital loss by switching from dairy farming to another type of farming is also likely to be low. Thus, these farms may in the longer term and in case of further declines in their current income turn to other farming activities, provided these are feasible and provided they can deliver better earnings. In the short term, farmers are likely to stay on dairy farming in order to see if declines in milk prices are only temporary.

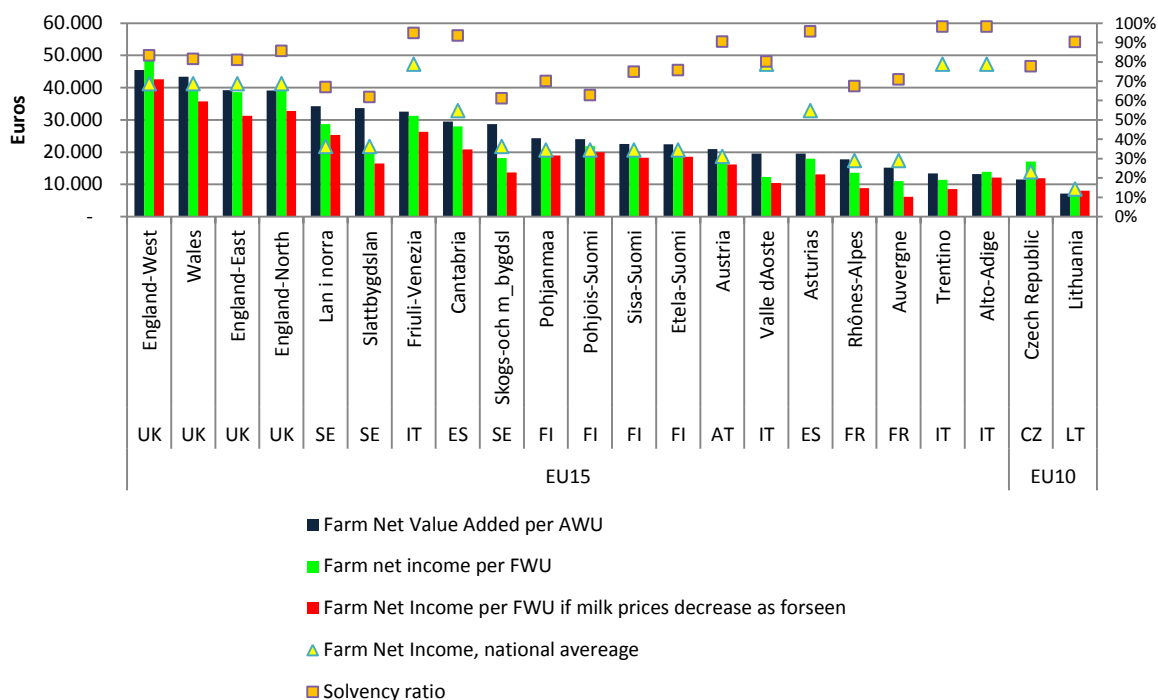
For the future contribution of the milk sector to the vibrancy of these rural areas, the low levels of net investments are of concern. If farmers in these areas continue to invest at the levels currently seen in some regions, milk production is likely to decrease over time. Other types of farming may take over from dairy farming, and due to this, the overall vibrancy of the areas may not change; however, the contribution of the milk sector will decline.

The milk quota is not far from being produced in Spain and France and because of that, farmers have not been able to invest without also increasing their quota. However, the current administration of the quota system may have kept farmers from investing because it has been difficult for them to increase their quota. The end of the quota system may therefore open up for investments in these areas.

Investments at farm level are characterised by being long term and capital intensive. Owing to this, farmers who are investing need some security in terms of their future income and they need access to capital. The Milk Package provides the Member States and in turn farmers with tools that can strengthen the farmers' position in the value chain in order to obtain a higher share of the value created in the chain. Moreover, the contract element provides farmers some security with regard to their future milk income. Both France and Spain have implemented the elements of the Milk Package, but only recently and therefore, it is too early to see the effect of this.

The current income compared to the expected income after the investment is no doubt an important factor for the farmers' decision whether or not to invest. Figure 1.15 shows the farm net value added and the farm net income together with the solvency ratio of these farms. For comparison, the farm net income at the national level is shown too and last but not the least, the impact of the foreseen decreases in milk prices, on the net farm net income is also shown in Figure 1.15. The latter is calculated based on the study described in the descriptive chapter.

**Figure 1.15:** FNVA per AWU and farm net income per FWU from 2007-2009, the national average farm net income, solvency ratio and the impact of the foreseen decrease in milk prices due to the end of the quota system<sup>79</sup>.



Farms in all the regions are characterised by generally high solvency ratios. The high solvency ratios explain to some extent why FNVA per AWU and farm net income per FWU in some regions are almost equal to each other. The farm net income is typically lower than FNVA when the solvency ratio is lower and when hired labour makes up a considerable part of the labour applied.

High FNVA per AWU and high farm net income per FWU are seen in the UK regions, followed by the Swedish regions. The lowest FNVA per AWU and farm net income per FWU are seen in some of the French and Italian regions as well as in the EU10 regions. Financial support is a very important part of the income on farms in these regions. Rural support makes up a considerable part of the support on the farms in Finland, Sweden, Austria, Italy, Czech Republic and Lithuania, whereas low levels of rural support are seen on the Spanish and UK farms (see Figure 10 in Appendix 1).

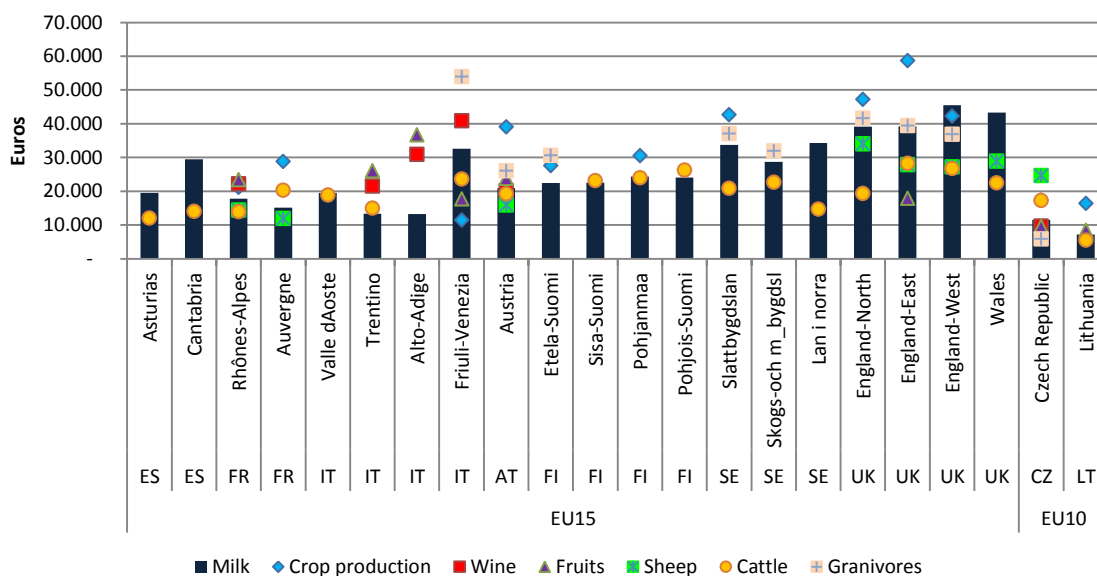
OECD-FAO foresees stable yet slightly positive developments of the market, and from this perspective, dramatic consequences of the end of the quota system on milk prices is likely to be over-dramatised. OECD-FAO foresees much greater volatility in prices in the future compared to the past. Owing to the high solvency ratios, farmers are generally well equipped to deal with a greater degree of volatility in prices. In addition, the implementation of the Milk Package in many of these Member States may provide farmers with more stability and security in terms of future milk price as it may also enable them a greater share of the value created in the chain. The implementation of the Milk Package is, however, at an early stage and therefore, the full consequences of it are yet to be seen.

All farms will see a decline in their farm net income if milk prices should decrease, due to the end of the quota system, as some studies predict. In spite of the decline in milk prices, the farm net income will remain positive (all other things being equal). However, in some regions, the income levels will be very low. Despite very low incomes, many farmers are in the short term likely to continue milk production as long as the income obtained is sufficient to cover the living expenses. Because of the strong emotional bonds between the family and the farm, farmers will be willing to make sacrifices and they will seek to improve the farm performance and to increase their income for instance by taking up off farm activities in order to be able to stay on the farm.

<sup>79</sup> FADN, Descriptive chapter Table 8, pp. 15 and Table 25, pp. 58.

Should incomes continue to be low, farmers will in the longer term switch to other types of farming when this is possible and when they can provide them with better incomes than dairy farming. The income from alternative types of agricultural production is shown in Figure 1.16.

**Figure 1.16:** The average FNVA per AWU achieved from 2007 to 2009 by different types of farming



All the alternatives shown will not be feasible in all areas of a given region; however, Figure 1.16 gives an impression of the number of alternatives within the regions and the FNVA per AWU, which may be achieved by these agricultural production branches. In many regions, crop farming could be an alternative to dairy farming and in many cases, crop farming provides better FNVA per AWU than dairy farming. Should milk prices decrease further, it is natural to assume that over time, more dairy farmers will switch to crop farming when this is feasible. Cattle farming also make up an alternative farming option in many regions, yet contrary to crop farming, cattle farming, in many cases, appears to provide lower incomes than currently seen in dairy farming. Fruit, wine, granivores provide similar or better FNVA per AWU than dairy farming, yet in some cases, these will not be relevant alternatives and if they are, they require special skills, which mean it is not easy for existing farmers to switch to them, even if they should be feasible options. A trend towards these types of farming will only take place over the very long term when specialist farmers within these production branches acquire more land.

In the period till 2020, OECD-FAO foresees a stable development in prices and therefore, a very dramatic change from one production branch to another does not seem likely.

### 1.5 Conclusions and policy recommendations drawn directly from the analysis

Milk is produced in all the Member States and in most areas within the different Member States. Up till now, milk production has moved from areas with low densities of milk production to areas with high densities. This has happened both at the Member State level and at the regional level within the Member States. The end of the quota system is not likely to change this, though the end of the quota system may accelerate the development already seen. The areas which have seen increases in milk production over time are likely to see further increases in production, especially if these areas are located in the Member States, which currently produce the milk quota or are close to producing it. In these Member States, it will be easier for dairy farmers to expand and the expanding costs will be lower, as farmers will not have to invest in milk quota.

Some areas have seen a decline in milk production over time and in some of these, milk production is important for the employment and the economy of the agricultural sector and in turn for the vibrancy of these areas. Regions which meet these criteria have been identified as potentially fragile. They encompass the Nordic areas, mountainous areas in Austria, Italy, France and Spain and areas of the UK as well as areas of Slovakia, the Czech Republic and all of Lithuania.

Some studies predict that milk prices will fall as a result of milk quota abolition. This will lead to a decline in earnings. In spite of this, the incomes on farms in the potentially fragile areas are likely to remain positive.

Even if income should decline due to the end of the quota system and even if incomes should be negative from time to time as a result of price fluctuations, this is not likely to cause major changes in milk production in the potentially fragile regions in the short term. Owing to the characteristics of the farms in terms of ownership, labour applied and solvency, farmers will at first seek to improve performance, cut costs or to supplement the current income by off farm activities in order to stay on the farm. The willingness to make sacrifices in severe economic times is related to the strong emotional bonds between the family and the farm, which typically has been passed on from one generation to the next.

These farms have often been in the family for several generations and the way farms change ownership explains the high solvency seen. This also makes the farms well equipped to deal with a greater degree of volatility in prices, which among others, OECD-FAO predicts.

In the longer term, milk production may be vulnerable in these areas but for different reasons.

In the Nordic areas, milk production is vulnerable to changes in financial support, but apart from that, the relatively high level of investment and the relatively few alternatives to milk production speak for continued milk production in these areas without major changes.

In the UK regions, milk production is vulnerable to strong competition from other types of farming, especially from crop farming in the northern and eastern part of the UK. Owing to this, these areas may see further declines in milk production over time. Net investments have been positive, which means farmers have tied up capital in production facilities for milk production. This may dampen farmers' switch from dairy farming to crop farming in the medium term. In Wales and the western part of England, alternatives to dairy farming are fewer and appear to provide lower incomes than dairy farming. Along with the positive net investments in dairy farming, this speaks for a continuation of milk production in these areas.

In the EU10 regions, milk production is also vulnerable to strong competition from other types of farming, especially crop farming, and as the level of net investments has been low (Czech Republic), a strong movement from dairy farming to arable farming could be foreseen, especially if incomes from dairy farming continue to be low. Higher levels of investments in Lithuania may to some extent dampen the switch from dairy farming to crop farming.

In the mountain areas of Austria and Italy, the farms are vulnerable to a decrease in financial support as this make up an important part of the income on these farms. The number of alternative options to dairy farming is limited and because of that, the competition from other types of farming is lower. Yet, in the Italian regions, cattle-farming is an alternative to dairy farming. Owing to the low levels of investments and due to the low income levels seen on these Italian farms, milk production may be vulnerable in these areas as farmers are likely to switch to cattle farming, provided this can provide better earnings.

In the mountainous areas of France and Spain, milk production may be vulnerable in the longer term due to low levels of investments. The French regions appear to be most vulnerable to further declines in milk production, especially the Auvergne region, which is characterised by negative net investment, low earnings and a relatively high competition from other branches of production. Except for the less strong competition from other types of farming, Rhone Alps (France) shares the same characteristics as Auvergne. Earnings are better on the Spanish farms and the competition from other types of farming is relatively low; however, production in these areas may in the longer term be vulnerable to the low level of investments which currently are just sufficient to maintain the facilities. Investments at this level may not be sufficient to ensure milk production in the longer term because the next generation of farmers may not find these attractive for milk production.

**In conclusion**, the contribution of the milk sector to the vibrancy of rural areas is likely to change over time, just as it has in the past. Changes over time are also likely to be seen in the potentially fragile regions; however, dramatic changes are not likely in the short term as long as the current level of financial support remains unchanged.

Some of the potentially fragile regions may see some major changes over the medium term because of a strong competition from other types of farming and low levels of investment and low earnings (The Czech Republic and possibly also Lithuania). Changes in Lithuania may, however, to some extent be dampened by a relatively high level of net investments over the past five years. Negative investments and low earnings along with competition from other types of farming may also in the medium term cause major changes in milk production in the French regions (Auvergne and Rhone Alps) and some of the Italian regions (Trentino, Valle de Aosta). In turn, the contribution of the milk sector to the vibrancy of these areas may decline over time. Low levels of investment and an older farmer population may cause changes in milk production in the Spanish regions in the medium term.

Relatively high levels of investments, few alternatives to dairy farming and moderate to high income levels speak for a continuation of milk production in the Nordic areas as long as the level of financial support does not change. Positive net investments, fewer alternatives to dairy farming and lower incomes from alternatives to dairy farming speak for the continuation in the western part of the UK and Wales whereas production may decrease in the northern and eastern parts of England due to strong competition from other types of farming.

A decline in the dairy sector's contribution to the vibrancy of rural areas does not necessarily imply an overall decline in the contribution of the agricultural sector to the vibrancy of these potentially fragile areas, as the contribution of other sectors of agricultural production typically will increase as farmers switch from dairy farming to them. From this perspective, none of the identified regions are solemnly dependent on the milk sector in terms of employment and economy. Yet, it cannot be denied that there might be areas within these regions that are very or even entirely dependent on dairy farming in terms of employment and economy.

The milk quota system has not prevented structural development in the dairy sector, as milk production has moved from some areas to other both within the EU and within the Member States. Yet, the quota system has certainly dampened structural development. The abolition of the quota system is not likely to cause major changes in milk production in the fragile areas in the short term. However, changes may be seen in the longer term. Depending on EU's desire regarding the geographical location of milk production in the future, some **political initiatives and incentive** may be necessary. These could be as follows.

- A. If milk production is to remain in areas which are unfavourable for milk production and are characterised by few or no alternatives to milk production, it is necessary to provide financial support in order to cover the extra costs associated with farming in these areas. If the aim is to keep milk production in these areas, for instance because these areas are best preserved by cattle, most of the support should be coupled. The support should be calculated based on objective criteria and be "dynamic" over time allowing the support to be adjusted for productivity gains in order to encourage dairy farmers in these areas to improve their competitiveness. If the aim is to inhabit the areas, the support may be given as decoupled rural support.
- B. Many farms in the less favoured areas are very small and the level of investments is often fairly low. A way to develop farms could be to promote group farming. This could enable establishment of larger units, which not only will lower the costs of production, but also benefit the environment and animal welfare due to investments in better technology and in better facilities. Last but not the least, it may also benefit the social life of farmers by enabling days off, holidays, the opportunity to specialise etc. Owing to this, farming could be an attractive occupation for young people.
- C. The level of rural support differs from region to region. Some of the differences may be ascribed to the different conditions inherent in nature and in turn the level of support that can be obtained in this area. However, some differences may also be down to the way Member States utilise the measures set out in the Council Regulation No 1698/2005 of 20 September 2005 on support for rural development by the European Fund for Rural Development (EAFRD) - especially because these often require co-financing from the Member States. If the aim is to encourage investments and structural development, a way forward could be to finance these measures 100 percent by the EU.
- D. The Milk Package provides important tools to improve the position of farmers in the value chain in those potentially fragile regions not dominated by farmer-owned cooperatives. Many Member States have set minimum criteria for POs and APOs and have also provided compulsory contracts. Yet, the full effect of these depend on the farmers' ability to use these opportunities to form strong producer organisations

which can negotiate favourable conditions for a large group of farmers, which in turn is essential for the success of the Milk Package. In areas where farmers have little or no tradition for forming and running farmer organisations, it will be very important to offer them knowledge, training and advisory service on how to form such organisations, how to run them efficiently and how to negotiate favourable terms.

- E. Owing to the unfavourable condition for farming, farmers in these areas need a high milk price to cover the extra costs. Innovation in product development is therefore important in particular in these Member States. The Milk Package provides tools for a greater creation of value within the dairy chain. Yet, initiatives which support product innovation and development will remain important.

## 2. How will the balance between the territorial and economic dimension of milk production evolve over time?

### 2.1 Interpretation and comprehension of the key terms of the evaluation question

The overall objective of this question is to shed light on how the balance between the territorial and the economic dimensions of milk production will evolve over time i.e., both short term and long term. The territorial dimension is assumed to relate to the Member States, whereas the economic dimension is assumed to relate to economy and competitiveness of dairy farms.

The future balance between the territorial and economic dimension of milk production may be influenced by numerous factors, one of which being the end of the milk quota system. Differences in terms of implementation of the Milk Package, national politics, conditions inherent by nature, environmental intensity, competitiveness of farms and of the value chain are all also likely to impact the future balance of the two dimensions. Moreover, the influence of future commodity prices may impact dairy farming differently in the individual Member States. The answer to this question will neither touch on the impact of national politics nor the competitiveness of the value chain.

### 2.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

The current balance between the territorial and economic dimensions of milk production will be identified based on the current farm structure. On the basis of this, the impact of the end of the quota system, the Milk Package and the future expected price developments on agricultural commodities will be assessed and discussed. Conclusions will then be drawn and policy recommendations made.

The answer to this question relies on official quantitative statistics from: DG Agri, Eurostat, European Environmental Agency and FADN. Data from all of these sources are of high validity. Some of the data is from 2009, which means it does not capture the latest developments in all cases. This can impact the final conclusions, if years not captured by the data sources deviate from years which the data sources cover. In regard to the age of farmers, this information is only available for all farmers, not dairy farmers in particular. Information from the descriptive chapter about farm structure, farm economy and implementation of the Milk Package is used to answer this question.

Information about the possible impact of the end of the quota system on milk prices is also drawn from the descriptive chapter. EY refers to several studies and shows specific data from one of these studies. The results of this particular study are used to answer this question. The information is assumed to be of high validity. Other studies also predict a decrease in milk prices, yet the size of the predicted decrease in milk prices varies between the studies. All of the studies are some years old and therefore, the conclusions made may not apply to the current situation. Information on future commodity prices is drawn from the latest OECD-FAO report<sup>80</sup>.

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<sup>80</sup> <http://www.oecd.org/site/oecd-faoagriculturaloutlook/> (17.05.2013).

Qualitative information from national experts is used to assess the availability of spare capacity in some of the Member States, which currently produce the national milk quota. The information is based on their assumption and is therefore, only an indication of the amount of spare capacity available.

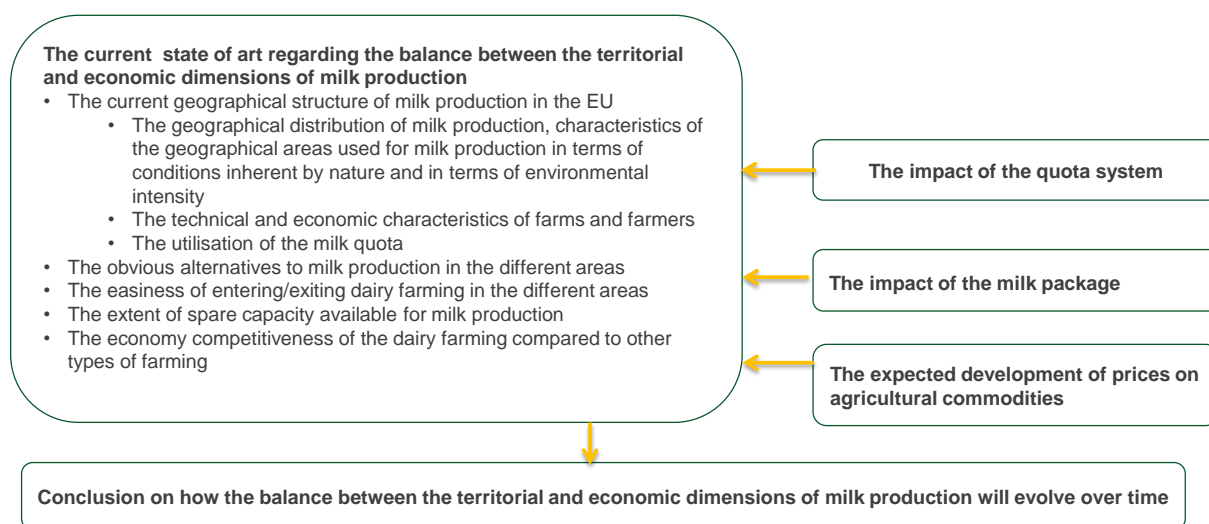
### 2.3 Description of the method(s) used and an indication of its (their) limitations

The current situation in terms of milk production is established for each Member State. The conditions inherent by nature and the environmental intensity characterising the individual Member States are briefly described in order to assess the conditions under which milk is being produced. The current milk production as well as the current utilisation of the national milk quota is assessed. The structure of milk production in terms of farm structure (number of cows per farm and distribution of farms and of cows on different farm sizes), land use as well as milk yield per cow is described. The types of ownership characterising the farms and the age of owners (sole holders) is discussed as only information on the age of all farmers is available. The economy of farms is described by a set of key economic factors, such as milk price, level of economic support, farm income as well as net investment per cow. The latter indicate the current condition of the production facilities. Farm net value added per annual work unit (FNVA per AWU) and total costs of production are used to assess the competitiveness of farms. There are limitations associated with FNVA per AWU, as it will be lower for farms with no land that buy in most of the feed compared to farms with land that therefore grow more of their own feed. In terms of costs of production, assumptions regarding interest on equity and salary for own labour have to be made in order to calculate these. The FNVA per AWU from the immediate alternatives to dairy farming is described and entering and exiting barriers are discussed. The impact of the end of the quota system, the Milk Package and future developments of the market is discussed when going through the elements which the current balance is a result of. The actual impact of the Milk Package is difficult to assess as it has just recently been introduced.

### 2.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

The overall approach to answering the question is shown in Figure 2.1

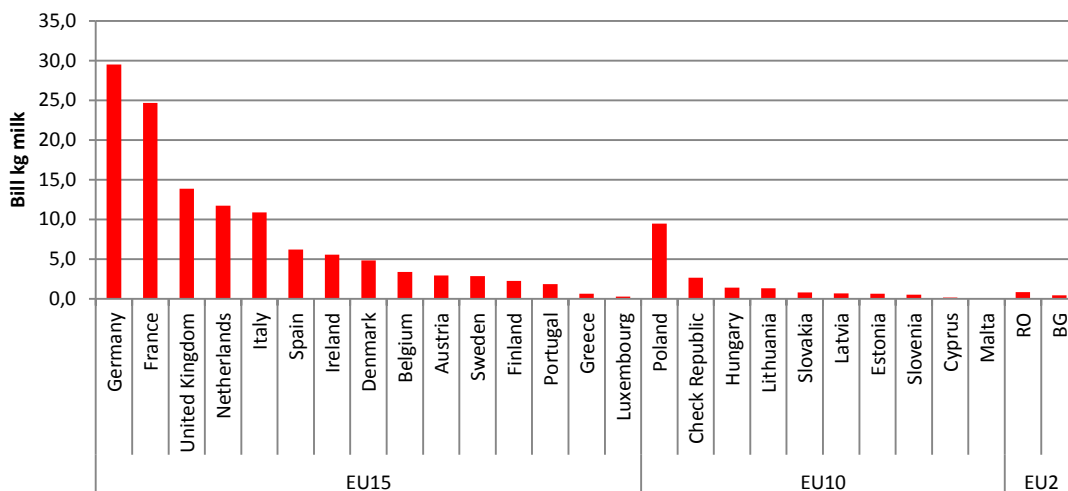
**Figure 2.1:** Overall approach for answering Question 2



Milk is produced in all Member States of the EU, yet the density of milk production is higher in some geographical areas compared to others<sup>81</sup>. The largest milk producing Member States of the EU are DE, FR, UK, NL and IT (see Figure 2.2).

<sup>81</sup> Descriptive chapter: Figure 11. pp. 44

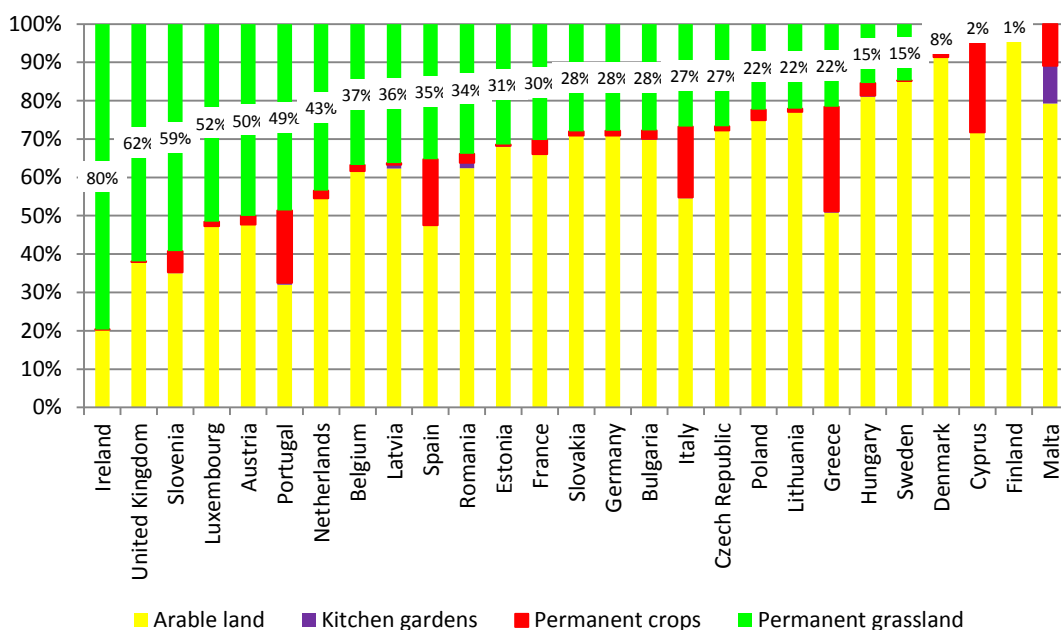
**Figure 2.2:** Delivery of milk in 2011/12<sup>82</sup>



Milk production in the EU takes place under very different climatic conditions. These range from subarctic conditions in most of FI and SE to subtropical dry summers in the Mediterranean Member States. Huge variations in terms of precipitation are also seen not only between the different Member States but sometimes also within the different Member States. Thus, precipitation ranges from 300-400 mm a year in south of Spain to 1400-1600 mm in the northern part of Spain. High precipitation levels are also seen in the western parts of the UK and Ireland. Also Member States, such as Austria and Slovenia see high levels of precipitation.

In some Member States, the terrain is often flat or consists of gently rolling hills (For instance Denmark, the Netherlands) whereas in other Member States, the terrain is more mountainous (for instance Austria, and parts of Italy, France and Spain). The share of permanent pastures of the utilised agricultural areas (UAA) also varies between the different Member States. On the Member State level, about 80 percent of the utilised agricultural area consists of permanent pastures in IE. High proportions of permanent pastures are also seen in the UK, the Netherlands, Portugal, Luxembourg and Austria. In comparison, the proportion of permanent pastures is low in the Scandinavian Member States (Denmark, Sweden, Finland) (see Figure 2.3).

**Figure 2.3:** Land use in the different Member States<sup>83</sup>



<sup>82</sup> [http://europa.eu/rapid/press-release\\_IP-12-1116\\_en.htm](http://europa.eu/rapid/press-release_IP-12-1116_en.htm)

<sup>83</sup> Eurostat. Land use: number of farms and areas of different crops by agricultural size of farm (UAA) and NUTS 2 regions [ef\_oluaareg]



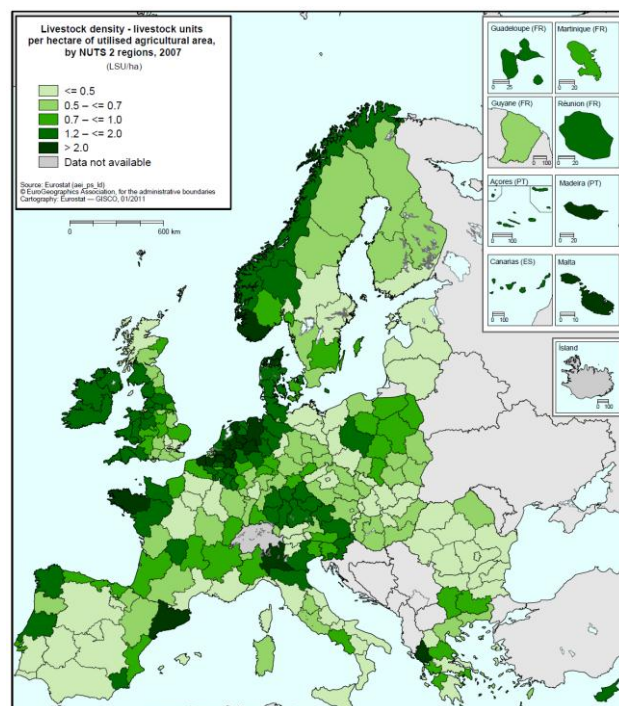
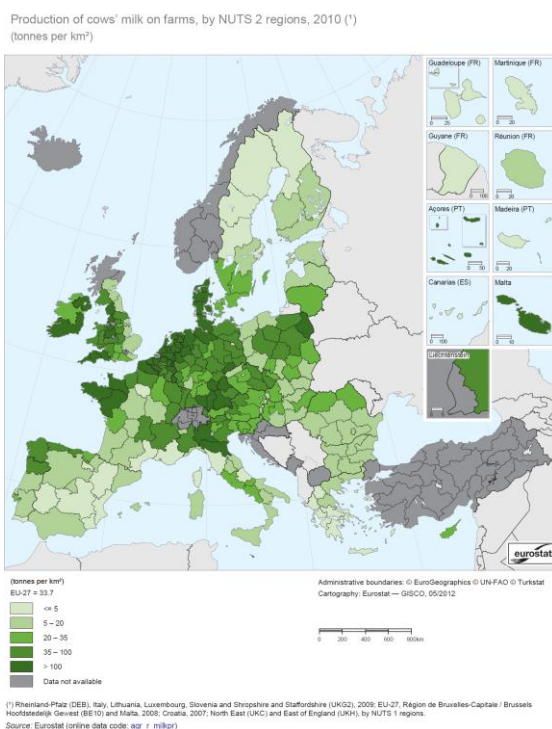
The high level of precipitation, the relatively flat terrain along with a high occurrence of permanent pastures provide some Member States with comparative advantages in terms of milk production, which in turn explains the high density of milk production in Ireland, the UK, the Netherlands, Belgium and in the northern parts of France and Germany. Precipitation and the occurrence of permanent pastures are also high in the mountain regions, which in turn also favour milk production. However, because of the terrain, the fields are often small and facilities to house cows are necessary due to the large amounts of snow in the winter. These conditions significantly reduce the otherwise favourable conditions for milk production.

The different farming sectors will compete with each other for land. In the Member States where a large proportion of the land is arable, the competition from other types of farming is strong as there are several farming options. In the Member States where a large proportion of the land is permanent pasture, the competition from other types of farming is typically limited to cattle and sheep farming. The competition from other types of farming is also low in the Member States characterised by a short growing season (Finland and parts of Sweden). Owing to the lower level of competition, milk production may remain in these areas at least as long as dairy farming can provide the farmer with sufficient income. Milk production may be under threat in areas where there are several alternatives to milk production if these are able to provide better incomes.

The Member States characterised by a high density of milk production are also characterised by a high density in terms of livestock as is shown in Figures 2.4 and 2.5<sup>84</sup>. In turn, high surpluses of N and P as well as high emissions of ammonia are generally seen in these Member States (see Figures 2.6, 2.7 and 2.8)<sup>85, 86, 87</sup>.

**Figure 2.4:** Production of cow's milk, tons per km<sup>2</sup> in 2010

**Figure 2.5:** Livestock density, LSU per km<sup>2</sup> in 2007



<sup>84</sup> [http://epp.eurostat.ec.europa.eu/portal/page/portal/gisco\\_Geographical\\_information\\_maps/maps\\_posters/PER\\_AGRFIS/agriculture](http://epp.eurostat.ec.europa.eu/portal/page/portal/gisco_Geographical_information_maps/maps_posters/PER_AGRFIS/agriculture)

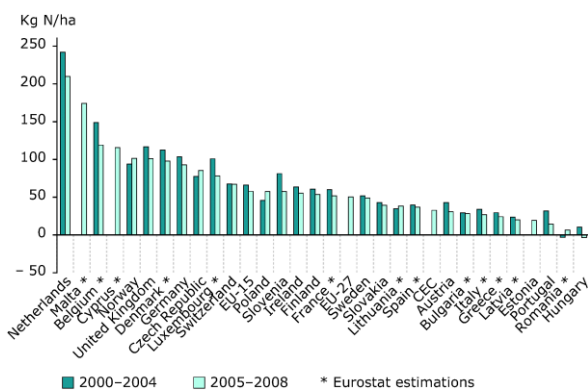
<sup>85</sup> <http://www.eea.europa.eu/data-and-maps/figures/average-nitrogen-surplus-in-the>

<sup>86</sup> [http://epp.eurostat.ec.europa.eu/statistics\\_explained/index.php/Phosphorus\\_balance\\_in\\_agriculture](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Phosphorus_balance_in_agriculture)

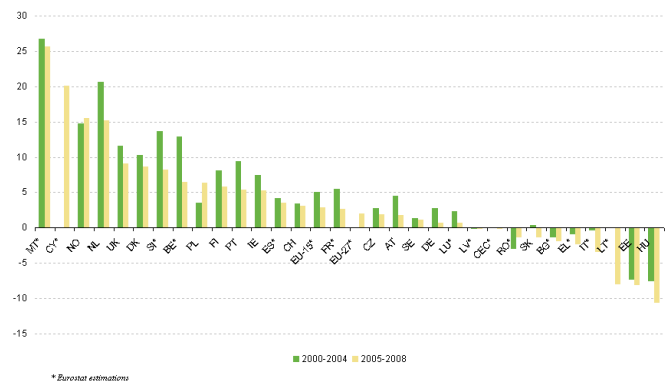
<sup>87</sup>

[http://epp.eurostat.ec.europa.eu/statistics\\_explained/index.php?title=File:Aggregated\\_emissions\\_of\\_agricultural\\_NH3\\_per\\_utilized\\_agricultural\\_area\\_\(kilotonnes\\_per\\_million\\_ha\),\\_2010,\\_EU-27.png&filetimestamp=20130117092528](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Aggregated_emissions_of_agricultural_NH3_per_utilized_agricultural_area_(kilotonnes_per_million_ha),_2010,_EU-27.png&filetimestamp=20130117092528)

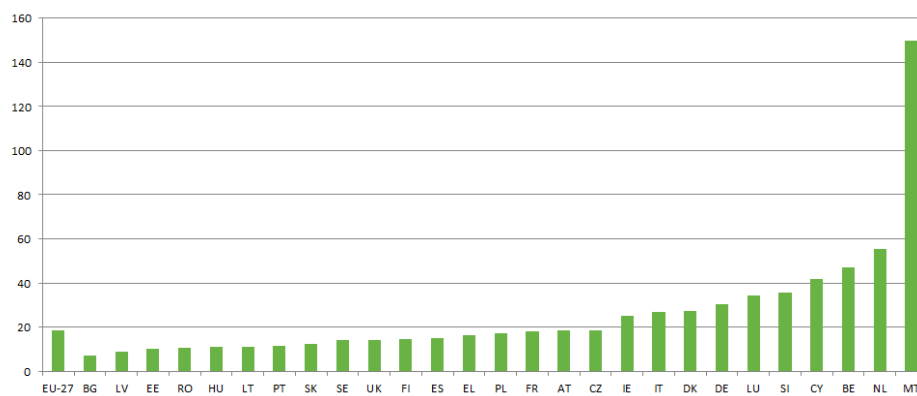
**Figure 2.6:** Nitrogen surplus in 2000-2004 and 2005-2008.



**Figure 2.7:** Gross phosphorus balance, 2000-2004 and from 2005-2008 (kg P per ha agricultural land).



**Figure 2.8:** Ammonia emissions from agriculture, kilo tonnes per million hectares in 2010.



Nitrogen emissions have a negative environmental impact on both ground water and fresh waters and high emissions of ammonia are harmful to N-sensitive plants. Diffuse phosphorus emissions from agriculture, industry and households are also harmful to water courses and lakes like nitrogen. Figure 2.7 shows the potential risk of phosphorus to the environment (water and soil). The actual risk depends on many factors, such as climate conditions, soil type and soil characteristics, soil P saturation, management practices such as drainage, tillage and irrigation, and therefore additional information on the vulnerability of the soil to P leaching and run-off is necessary to assess the risk of P to water. Despite this, Figure 2.7 indicates a potentially greater risk of adverse effects of phosphorus in the Member States which have high phosphorus surpluses per hectare. In order to protect the environment against the negative impact of agricultural production, the EU has established common environmental regulations.<sup>88,89</sup>

The high density and the consequently large surplus of N and P in some Member States will reduce the rate at which milk production can grow in these areas. A significant increase in milk production may not be possible in some areas due to the current environmental intensity. In other areas, an increase in production would require farmers to invest in additional technology and/or change their current management practices, which in either case, may be associated with additional costs. In order to achieve a significant increase in milk production in these areas, further research on how to minimise the environmental impact is therefore needed.

When the quota system ends in 2015, environmental regulations are probably going to be the most limiting factor for the expansion of cow numbers and milk production in Member States characterised by high livestock

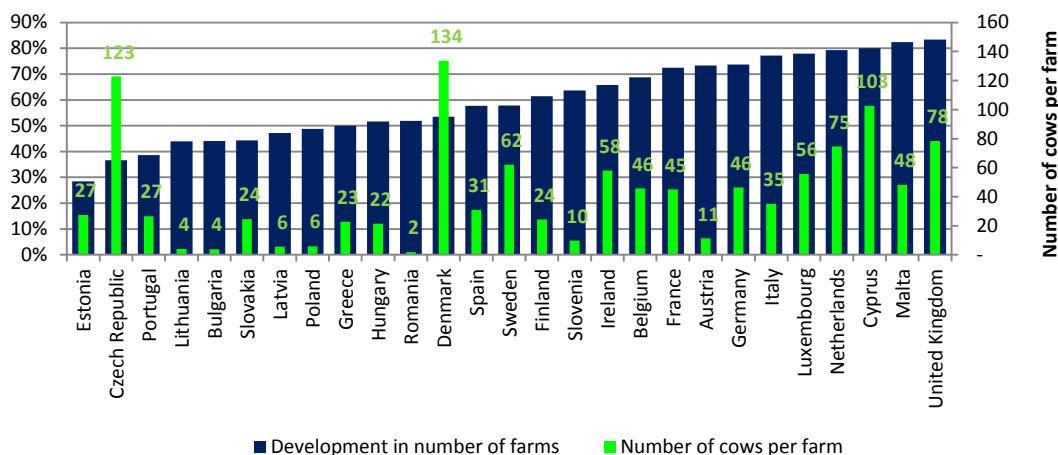
<sup>88</sup> Nitrate Directive and the Water Framework Directive

<sup>89</sup> EU habitat directive

densities. Thus, even though these Member States do have comparative advantages in terms of milk production, environmental regulations are likely to be the new limiting factor for the growth of milk production.

In 2010, the average farm size in the EU varied from two cows in Romania to 134 cows in Denmark (see Figure 2.9). The strongest structural development was seen among the EU12 Member States. As the average farm size is still very small in these countries, the strong structural development is likely to continue into the future in many of these Member States.

**Figure 2.9:** Number of farms in 2010 in percentage of farms in 2003 and average number of cows per farm in 2010<sup>90,91</sup>



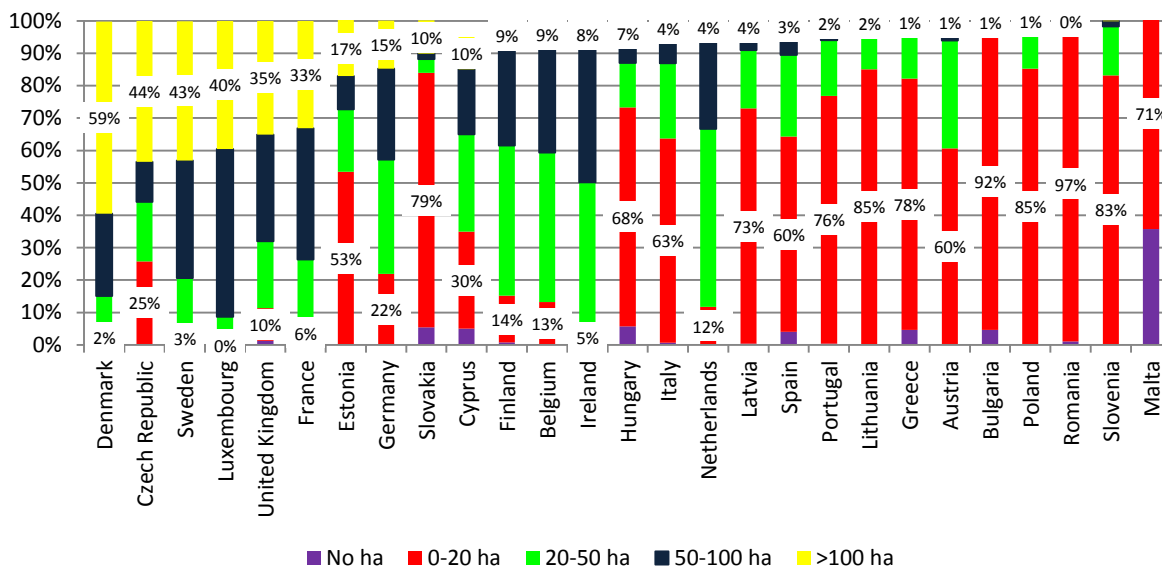
There is a considerable variation in the size of holdings in the individual Member States as shown in Figures 2.10 and 2.11<sup>92</sup>.

<sup>90</sup> Table 14, descriptive chapter pp. 37

<sup>91</sup> Eurostat: Dairy cows: Number of farms and heads by size of farm (UAA) and size of dairy herd [ef\_ls\_gzdcow] and livestock: Number of farms and heads of animals by type of farming (2-digit) [ef\_olsuoft]

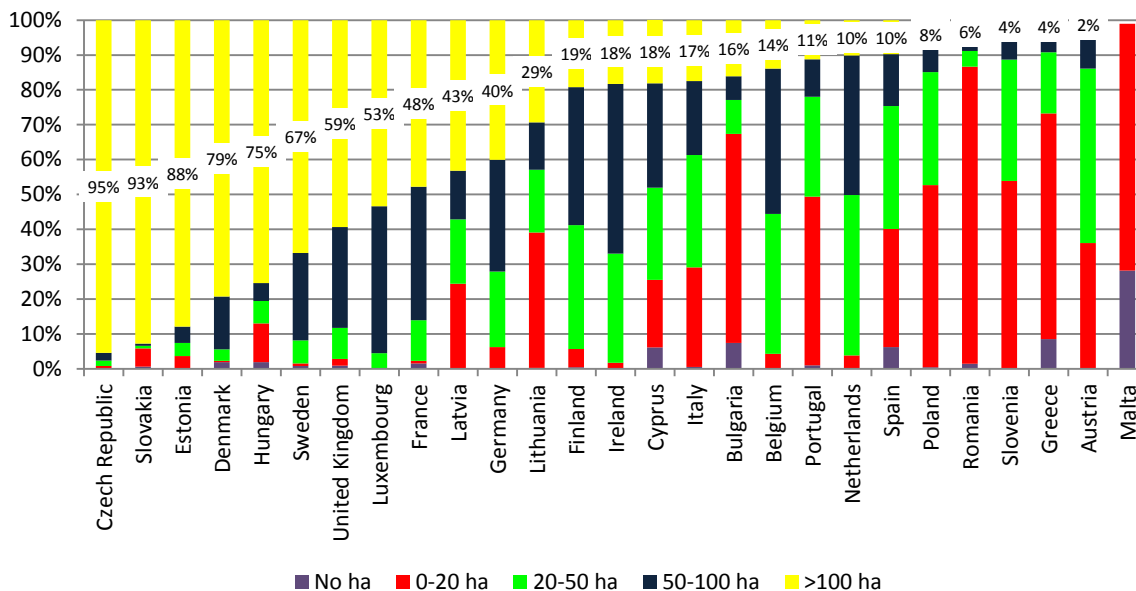
<sup>92</sup> Livestock: Number of farms and heads of animals of different types by agricultural size of farm (UAA) and NUTS 2 regions [ef\_olsaareg]

**Figure 2.10:** Distribution of farms on different farm sizes



The Member States with the highest proportion of large farms (measured by number of hectares) are seen in Denmark, the Czech Republic, Sweden, Luxembourg, the UK and France, while a very high proportion of farms operating less than 20 ha are seen in many of the EU12 Member States (Estonia, Latvia, Lithuania, Poland, Hungary, Slovenia, Rumania, Bulgaria and Malta). In Malta, a considerable part of the farms have no land (36 percent) and the remaining part operates less than 20 ha. As the average herd size is 48 cows, many of the Maltese farms are very intensive in terms of a low number of ha per cow and in turn many of these farms are likely to buy in most of their feed. Like in the EU12, a high proportion of farms also operate less than 20 ha in Spain, Italy and Portugal and Greece. Similarly, farms with no land can also be found in many of these Member States, but they constitute only a small proportion of the farms.

**Figure 2.11:** Distribution of cows on different farm sizes.

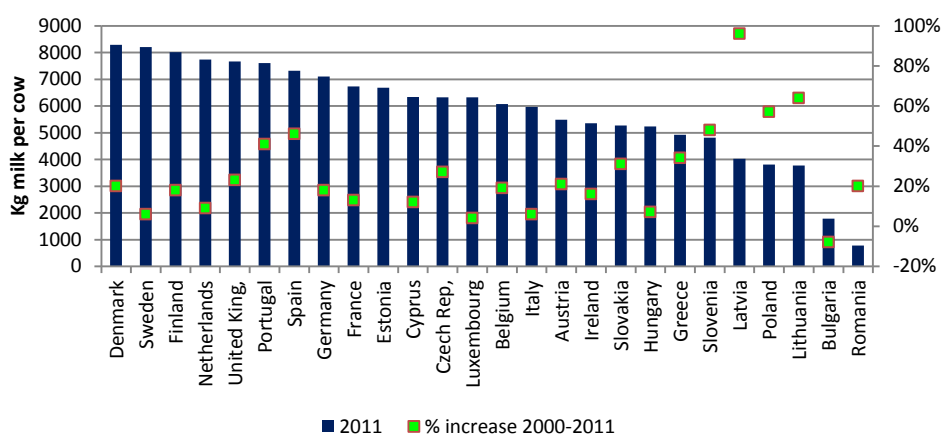


In the Czech Republic, Slovakia, Estonia, Denmark, Hungary, Sweden, the UK and Luxembourg, more than 50 percent of cows are housed on farms operating more than 100 ha. Apart from the Czech Republic, the EU12 Member States mentioned are characterized by a very diverse dairy farm structure, consisting of many small farms and a few large farms which house most of the cows and therefore, also produce a large proportion of the milk. The average number of cows is relatively high on the Dutch farms (75), yet these farms are generally

smaller in terms of the land they operate compared to farms in other Member States, such as Sweden, where farms have fewer cows but operate more land per farm.

Milk yield per cow is a result of cow breed, feeding levels, housing facilities, technology used and management level applied on-farm. Some farmers aim at very high milk yields per cow (often the farmers farming in very intensive systems) while others choose a more extensive production method, which results in a lower milk production per cow (typical for a grass-based system). These factors explain the considerable differences seen in milk yield per cow between the different Member States (see Figure 2.12).

**Figure 2.12:** Milk yield per cow in 2011 and increase in milk yield per cow from 2000 to 2011<sup>93</sup>



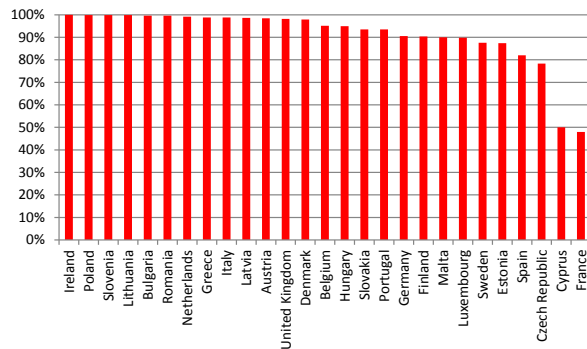
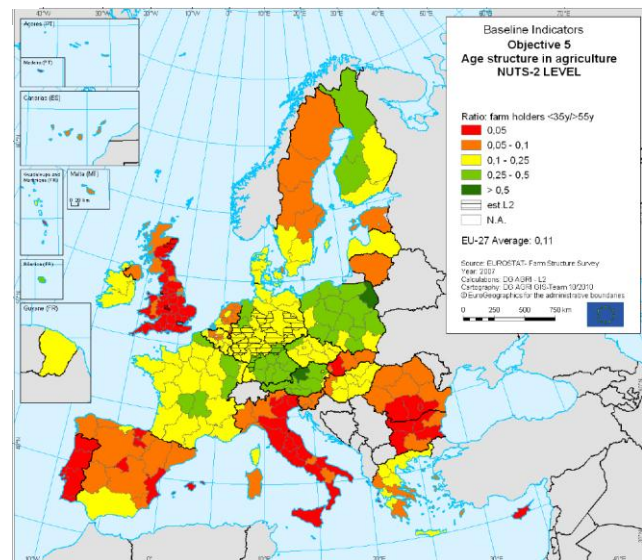
Poland and the Baltic Member States have seen the highest increase in milk yield per cow over the past decade. High increases are also seen in some of the Mediterranean Member States (Spain, Portugal and Greece). The sharp increase in milk yield per cow in these Member States is likely to be a result of improved management skills and a strong structural development which has resulted in improved management practices and housing facilities and in an increasing use of technology. As structural developments are likely to continue in the future, further improvements are likely to be seen, although probably at a lower rate.

Most of the dairy farms in the EU are owned by sole holders as shown in Figure 2.13.<sup>94</sup> There are no statistics on their age, as this is only available for sole holders of all farms. The age structure of sole holders of all farms is shown in Figure 2.14<sup>95</sup>.

<sup>93</sup> Descriptive chapter Table 16, pp. 41.

<sup>94</sup> Key variables: Area, livestock (LSU), labour force and standard output (SO) by type of farming (2-digit) and NUTS 2 regions [ef\_kvftreg]

<sup>95</sup> Rural development in the European Union. Statistical and Economic Information. Report 2010. European Union. Directorate-General for Agriculture and Rural Development pp67.

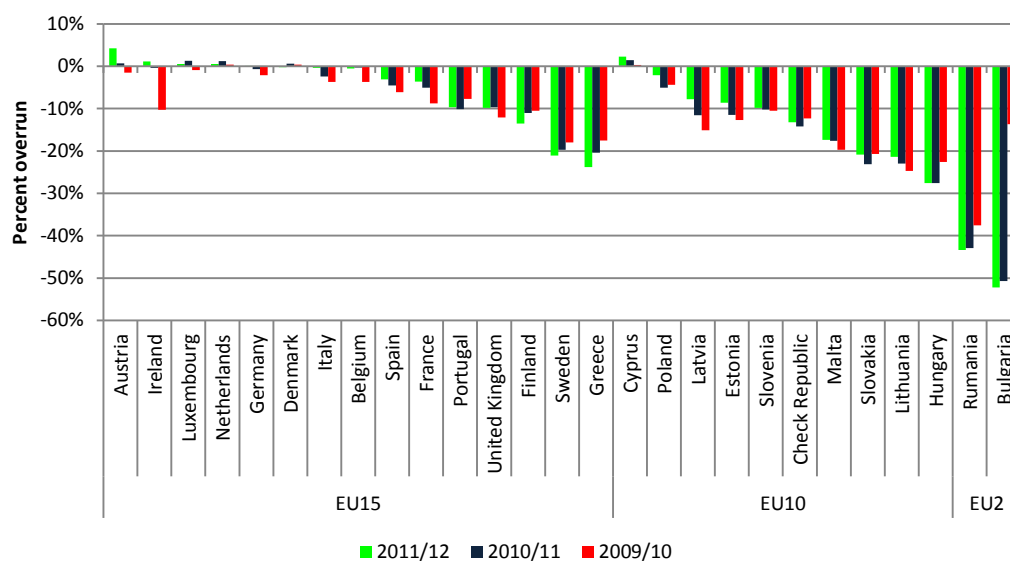
**Figure 2.13:** Percentage of specialised dairy farms owned by sole holders in 2010**Figure 2.14:** Age structure in agriculture in 2007

About 50 percent of French and Cypriot farms are owned by sole holders. The remaining part is owned by either group holdings or by legal persons. Group holdings are a common type of ownership in France; however, many of them consist of family members. The dominance of sole holder ownership and the characteristics of many of the French group holdings mean that most of the farms in the EU are family-owned farms. Family-owned businesses are characterised by strong emotional bonds between the business and the owner and a strong willingness of the owner to work long hours and make sacrifices for the sake of the business in both hard times as well as in more prosperous times. This most likely also applies to dairy farmers irrespective of the size of the farm they operate and irrespective of their nationality.

Owing to the prevalence of family-owned farms and the characteristics associated with these, most of the dairy farms are likely to continue to produce milk in the short term even in times when prices are not favourable. Only when the farm's cash flow becomes negative, production may have to cease. Long term, the continuation of milk production on the farms will depend on the income prospects associated with dairy farming compared to income prospects associated with other types of farming. As mentioned previously, there are more options available in some areas than in others due to conditions inherent by nature.

The age structure of sole holders of all farms, including dairy farmers, generally show an older population of farmers in some of the Mediterranean Member States (Portugal, Spain, Italy) in the UK, in some of the EU12 Member States (Rumania, Bulgaria, Slovakia, Lithuania, Latvia) and in some areas of Sweden and the Netherlands. Provided these figures are representative for dairy farms as well, they indicate a need for generational change in the near future in some Member States.

Milk production developments in the Member States characterised by a relatively high proportion of older farmers will depend on the extent to which the next generation wants to take over the farm and continue milk production and/or the conditions for structural development within these Member States. In many Member States, farmers no longer produce the National milk quota. In these Member States, the remaining farmers are not expanding production at a sufficient rate to counter the decrease in milk production caused by farmers stopping milk production. The utilisation of the milk quota is shown in Figure 2.15.

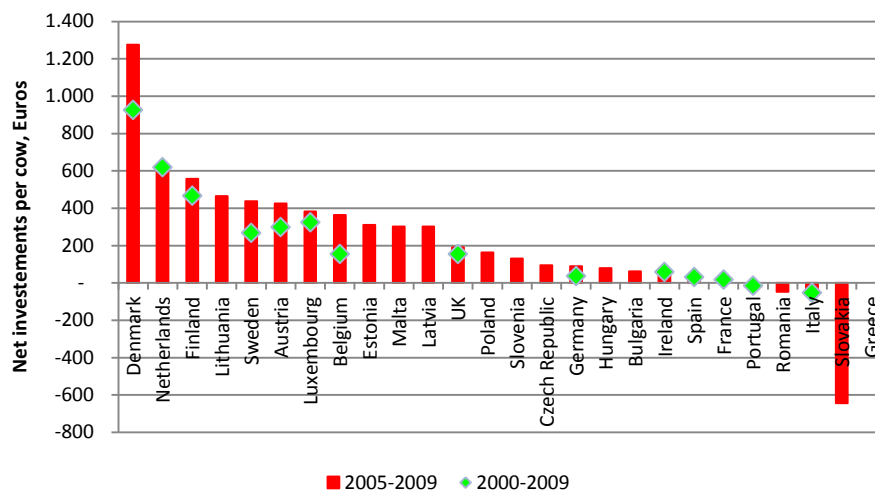
**Figure 2.15:** Utilisation of milk quota for 2009/10 to 2011/12<sup>72</sup>

In the Member States, where the overall milk quota is far from being produced, the end of the quota system is unlikely to cause an increase in milk production as farmers are already able to increase milk production without any risk of having to pay a penalty.

Dairy farmers in the Member States still producing the quota (Austria, Ireland, Luxembourg, the Netherlands, Germany, Denmark, Italy and Belgium) may either feed some of the milk to calves or they may have spare capacity, which they are currently not utilising because they will otherwise exceed their milk quota. Spare capacity is available in Luxembourg, the Netherlands and Denmark whereas Austrian farmers feed some of the produced milk to calves<sup>96</sup>. Similar observations may be made in some of the other Member States which produce or are close to producing the milk quota. In either case, milk deliveries are likely to increase in these Member States as soon as the quota system ends in 2015. Increases in milk deliveries beyond these levels will require further investments and therefore take longer and, as already mentioned earlier, in many of these Member States, large increases in milk production will be restrained by environmental regulations. The current level of investments expresses the condition of production facilities and the motivation of farmers to invest to develop their farms. When net investments are positive, farmers are developing their production facilities. When net investments are close to zero, the current production facilities are maintained and when net investments are negative, current facilities are run down. When net investments are negative over a longer period of time, milk production will gradually decrease as a result. Milk production may also decrease even when net investments are close to zero and the current facilities are maintained. This is the case when current facilities are unattractive for young farmers to take over, for instance because they are small and labour intensive. Figure 2.16 shows net investments on specialised dairy farms over the last decade and within the past five years.

<sup>96</sup> Simone Adam, Ministère de l'Agriculture, Service d'Economie Rural, Luxembourg; Leopold Kirner, Federal Institute of Agricultural Economics, Vienna, Austria (personal communication IFCN Conference, Kiel 2012); Mark Voorbergen, the Netherlands (Personal communication, February 2013); own observation.

**Figure 2.16:** Net investments per cow on specialised dairy farms over the past decade and the past five years, respectively (Source: FADN)



High net investments were seen in the Scandinavian Member States, the Baltic Member States and the Benelux Member States as well as in Austria. These farmers have been motivated to invest in the development of their holdings. Judged by the level of investments, the most up-to-date and modern production facilities are seen in Denmark and the Netherlands. Moderate levels of investments were seen in the UK, Poland and Slovenia, while net investments close to zero were seen in the central part of the EU. Farmers in these Member States have, as a group, been less willing to invest in developing their holdings. They have primarily invested in order to maintain the current facilities. Whether or not this is sufficient to ensure current levels of milk production in the longer term is difficult to assess. Finally, negative investments were seen in several of the Member States in the southern part of the EU. Investments on these farms are insufficient to maintain current levels of milk production in the longer term. The low level of investment might be a result of the age structure of farmers. If these are older, their motivation to carry out large investments may be low. Milk production in these Member States will depend on the willingness of the next generation of farmers to continue milk production and/or on the conditions for structural development in these Member States.

The termination of the milk quota system may encourage investments in the Member States which currently produce or are close to producing the milk quota because farmers no longer have to invest in more quotas in order to increase production. In the Member States close to producing the quota, farmers may in addition have been refrained from investing because they have found that the quota price was too high or because the national administration of the quota system has made it difficult for them to obtain additional quota. Whatever the reason, the quota termination is likely to encourage farmers in these Member States to invest and increase milk production, all other things being equal.

Apart from Ireland, milk production in many countries is capital intensive and requires farmers to tie up large amounts of capital when they invest in new production facilities. To take on such a large investment, farmers have to be relatively sure of the conditions for milk sales and they need to have some certainty regarding their future earnings. Farmer-owned cooperatives ensure that farmers are always able to sell their milk. They also ensure that a considerable part of the value created within the chain is returned to the farmers. For farmers selling to private processors, the elements of the Milk Package provide the Member States, and in turn farmers, with the necessary tools to obtain similar benefits in terms of milk sales and value creation within the chain. Introduction and implementation of the Milk Package is therefore very important for the willingness of farmers to take on larger investments in the Member States less dominated by farmer-owned cooperatives.

Except for Greece, Ireland, Malta, Slovenia and the UK, all Member States have set minimum standards for producer organisations (Poland), in addition Austria, Germany, Hungary, Latvia, Lithuania and Rumania have set minimum standards for associations of producers (APO). Little more than half of the Member States have introduced contractual relations (Austria, Bulgaria, Cyprus, France, Greece, Hungary, Italy, Latvia, Lithuania,

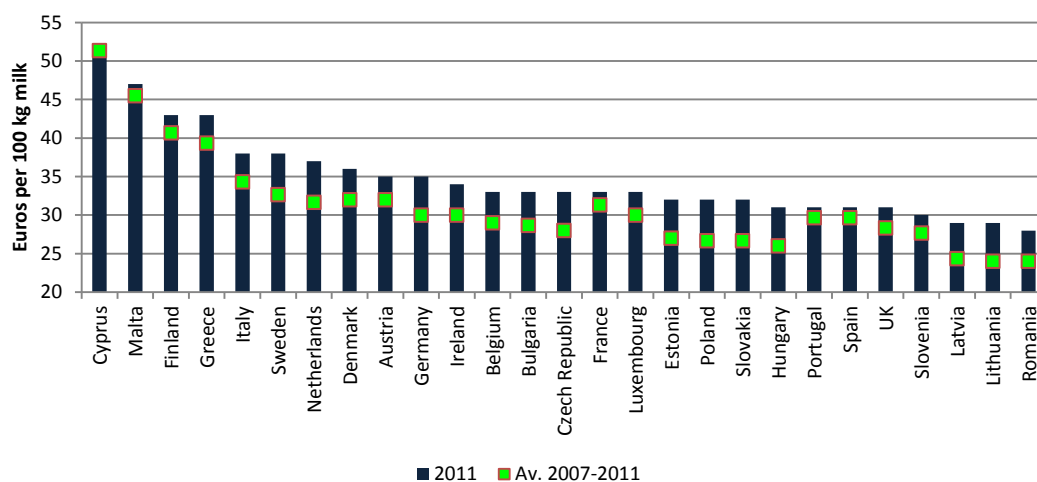


Portugal, Rumania, Slovakia, Slovenia, Spain)<sup>97</sup>. Those Member States dominated by farmer-owned cooperatives have typically not introduced contractual relations as these are needless due to the prevalence of cooperatives.

The Milk Package provides only the framework for a closer collaboration between the actors in the value chain. At the end of the day, the most crucial point for creating and distributing value within the chain will depend on whether or not the actors within the chain are able to collaborate for the mutual benefit of all parties.

The future income on specialised farms is important for the survival of farms and for the farmers' motivation to invest in the continuation of milk production. For specialised dairy farms, the price of milk is, for obvious reasons, very important for the income. A considerable variation in milk prices is seen between the different Member states (see Figure 2.17) and from year to year<sup>98</sup>.

**Figure 2.17:** Prices of raw cow's milk in Euro per 100 kg

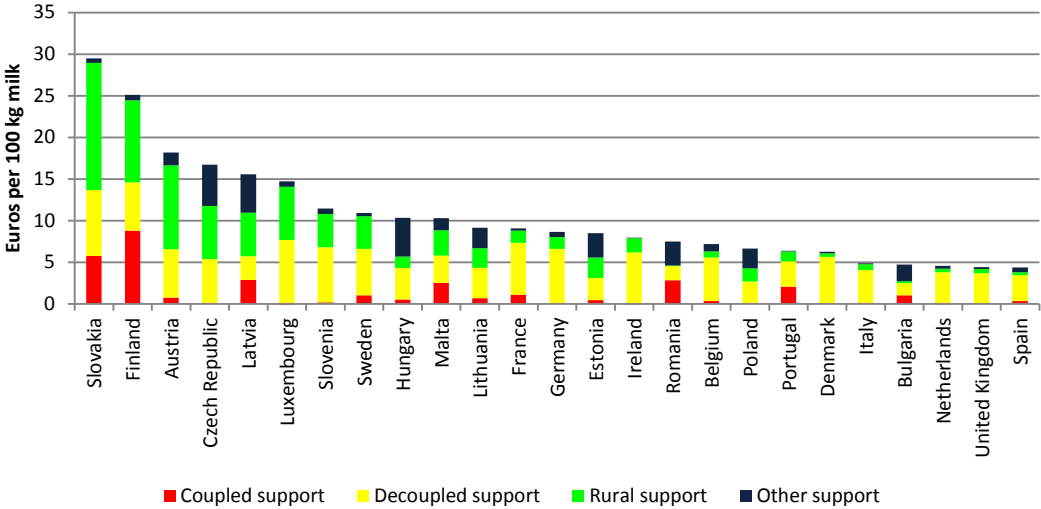


In 2011, high milk prices were seen in Cyprus, Malta, Finland and Greece and generally also in Italy, Sweden, the Netherlands, Denmark, Austria, Germany and Ireland. In many of these Member States the quantity of milk produced is still close to the quantity imposed by the quota. Some of these are also characterised by strong farmer-owned cooperatives. Not only milk prices but also levels of support are important for the income of the dairy farms. The average level of support per 100 kg milk from 2007 to 2009 obtained by specialised dairy farms is shown in Figure 2.18.

<sup>97</sup> Descriptive chapter pp. 92-97.

<sup>98</sup> Descriptive Chapter Table 25 pp. 58.

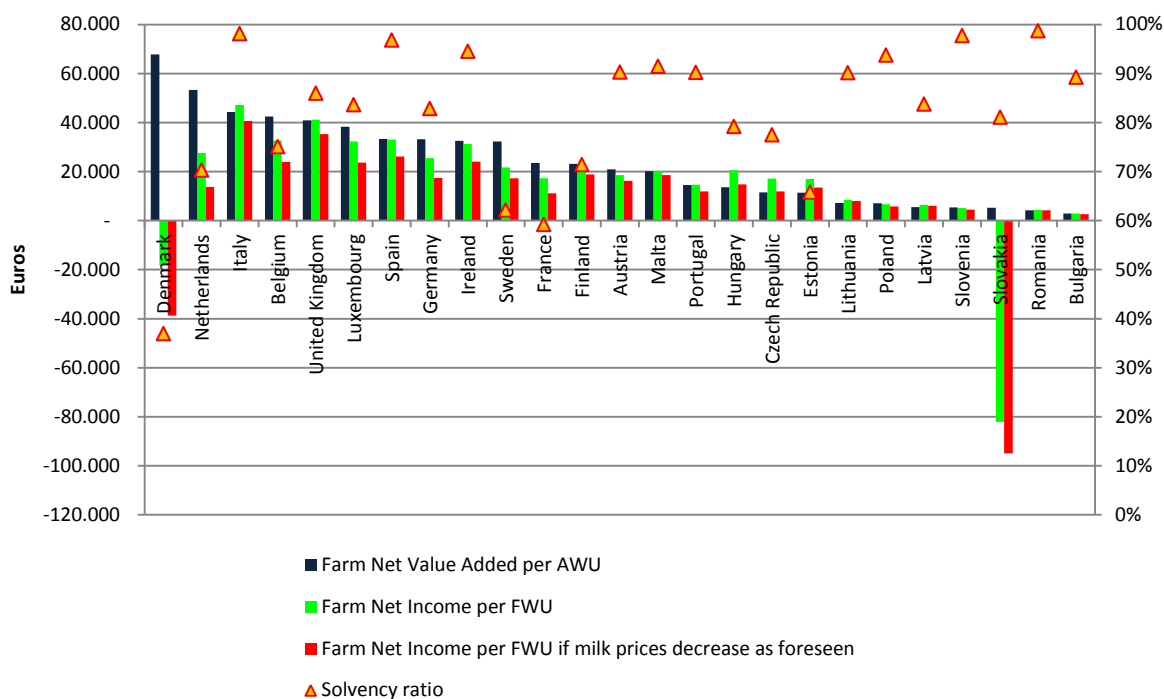
**Figure 2.18:** The yearly level of support per 100 kg of milk obtained on specialised dairy farms from 2007-2009 (Source: FADN)



The highest level of support per kilogram milk was obtained by the Slovakian farms. Here, the level of support per kilogram milk almost corresponded to the milk price. Rural support and coupled support appear to be the main reasons for the very high level of support. High levels of support were also obtained by dairy farms in Finland, Austria, Czech Republic, Lithuania and Luxembourg, while the lowest level of support was obtained by dairy farms in Spain, the UK, the Netherlands, Bulgaria and Italy. Figure 2.18 shows a very large variation in especially the amount of rural support received by dairy farms within the individual Member States. The differences may partly be explained by differences in conditions inherent by nature. However, differences in the individual Member States’ use of the rural development programmes may also explain some of the differences seen.

Farm net value added per annual work unit (FNVA per AWU) shows the amount that farms have left to remunerate fixed factors of production (labour, capital and land) irrespective of whether these are family factors or external factors. Net farm income per family work unit (FWU) show the income the farmer has left to remunerate family work and equity. Figure 2.19 shows the FNVA per AWU and farm net income per FWU. In addition to this, Figure 2.19 shows the solvency ratio of farms and the impact of the expected decrease in milk prices due to the termination of the quota system.

**Figure 2.19:** The average FNVA per AWU and farm net income per FWU from 2007-2009, solvency ratio in 2009 and the impact of a foreseen decrease in milk prices due to the end of the quota system<sup>99</sup>



High farm net value added per AWU is seen on farms in Denmark, the Netherlands, Italy, Belgium and the UK, while the highest farm net income per FWU is seen on farms in Italy, the UK, Spain and Ireland. On these farms, the farm net income per FWU is more or less equal to the FNVA per AWU, because of the low level of debt and because of the generally low costs of hired labour. In other Member States, the farm net income is much lower than FNVA because their farms have a greater amount of borrowed capital and because the costs of hired labour are higher. Another interesting point is the very low income level on the Slovakian farms, despite a very high amount of financial support per kilogram milk. Danish and Dutch farmers have invested the most in milk production, yet in terms of farm income they do not achieve the highest income levels.

As described in the descriptive chapter, some studies foresee a decrease in milk prices when the quota system is terminated in 2015. If milk prices should decrease as expected by the study described in the descriptive chapter<sup>99</sup>, the consequence will be a decrease in farm net income on all farms in the EU, all other things being equal. The farm net income will however remain positive in all the Member States apart from Denmark and Slovakia. Contrary to the studies mentioned in the descriptive chapter, the latest OECD-FAO report does not support a decrease in milk prices as it foresees a slightly positive development of the market for dairy products in the years ahead.

Owing to the positive farm net income and, in turn, positive cash flow, and due to the high solvency ratios, most farms are likely to continue milk production even if milk prices should decrease as predicted. The level of negative farm net income seen on the Danish and Slovakian farms indicate that some, but not all, of these will be characterised by a negative cash flow. For Danish farms, a further decrease in milk prices will make the current severe economic situation even worse. Some Danish farms might be forced into bankruptcy, yet milk production is likely to continue on these farms as the production facilities are large and often only a few years old. The level of net investments on the Slovakian farms indicate that the facilities may be run down and, due to this, further decreases in milk prices may force these farms to switch to other types of farming. They are not likely to be forced into bankruptcy in the short term due to the high solvency ratios.

The calculations made in Figure 2.19 regarding the end of the quota system assume all other things to be equal. This will, however, not be the case as all farmers will try to counter a decrease in milk prices irrespective of

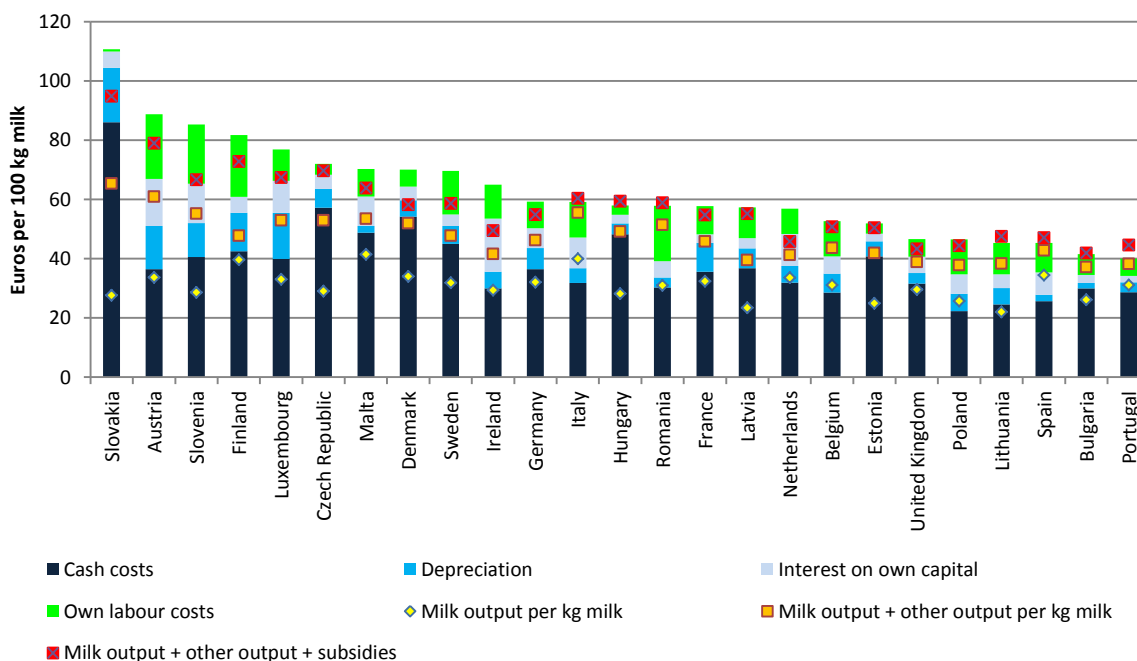
<sup>99</sup> FADN, descriptive chapter Table 8 pp. 15 and Table 25 pp. 58.

their current income level. They will try to improve performance on the farm by cutting costs and/or by increasing milk production either by increasing milk yield per cow or by utilising the current production capacity better. For farmers producing in the Member States where the National milk quota is still being or is close to being produced, the end of the quota system will reduce the costs associated with an increase in production, as farmers will no longer need extra quotas. Because of this, the incentive to increase milk production will be strong in the short term for these farmers. Some of these farmers have spare capacity or can deliver more milk than they currently do and they will use these opportunities as soon as the quota system ends.

The end of the quota system may cause some turbulence in prices in the following years until a new situation without quotas has emerged. Moreover, the OECD-FAO foresees much more volatility in terms of prices in the future compared to the past. The farms most vulnerable to such volatility are those which are specialised in milk production and characterised by an intensive production system, low solvency ratios and small amounts of subsidy. No farms in the EU match this description; Dutch farms are intensive and specialised farms, which receive a relatively small amount of subsidies, yet their solvency ratio is relatively high which should enable these farms to obtain extra credit needed in times of unfavourable price relations. Because of the high solvency level, most farms in the EU are generally well equipped to handle a greater degree of volatility in prices. Only the Danish and Slovakian farms are less well equipped to handle such greater volatility due to the low income levels already seen on these farms and due to a much lower solvency on the Danish farms. These factors are likely to affect the number of bankruptcies among the Danish farmers but not the amount of milk produced because of the good condition of the production facilities on many of these farms.

The cost of producing milk is often used to describe the competitiveness of dairy farms. Based on FADN data, the costs of producing milk on specialised dairy farms are calculated along with the output per kilogram milk. In order to show the full costs of production, the cost of equity is calculated by using an interest rate of 4 percent for all farms, whereas the cost of own labour is calculated as the number of hours the family uses on the farm times the hourly wage the farms pay for hired labour. In other words, the farmer and his family shall at least achieve a salary which is similar to the one received by the farm's employees. Figure 2.20 shows the cost of milk production.

**Figure 2.20:** Cost of milk production, Euro per 100 kilogram milk calculated over the period over 2007 to 2009 (Source: FADN)



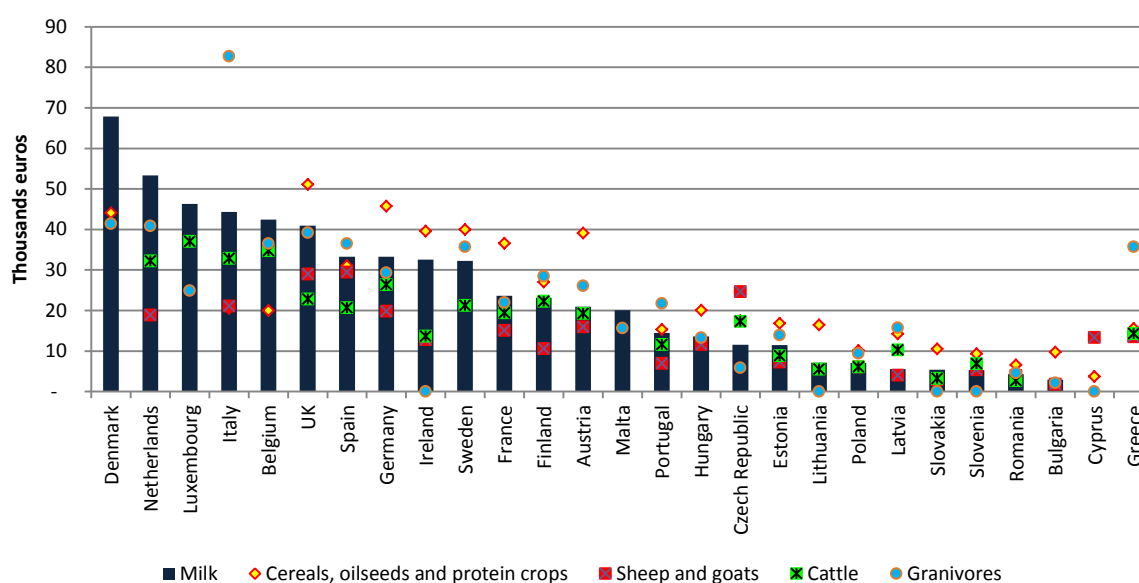
There is a considerable variation in the total output and total costs of production per 100 kilogram milk. The highest output is seen on the Slovakian farms, yet the total costs of production are even higher on these farms and they are only able to cover their cash costs and part of the depreciation costs. On the Portuguese farms,

the total output is much lower; however, on these farms, the total costs are also much lower and these farms in fact earned a profit per kilogram milk they produced.

Cost of production is one of the several factors which can be used to predict the future developments in milk production, but it cannot stand alone because even if the costs per kilogram of milk is low, the amount of milk the farm produces may be insufficient to provide the farmer and his family with an income that can cover their living expenses. Moreover, the low costs of production may be caused by low investments. In turn, capital costs are often low; however, the facilities are run down and milk production will decrease over time on such farms unless they invest in new facilities.

In the longer term, the competitiveness of dairy farming compared to other types of farming will determine the amount of milk that will be produced in the future. Figure 2.21 shows farm net value added per AWU for various types of farming.

**Figure 2.21:** Farm net value added per AWU obtained by various types of farming (average of 2007-2009) (Source: FADN)



In Denmark, the Netherlands and Luxembourg, dairy farming provided higher farm net value added (FNVA) per AWU than crop farming and pig/poultry farming (granivores). In Italy and Spain, the highest results were seen in pig/poultry farming. In most other Member States, crop farming provided the highest FNVA per AWU. In the latter Member States, crop farming is a strong competitor to dairy farming in the areas where the land is suitable for both.

Farmers with new or relatively new production facilities will in the short and medium term continue milk production because the facilities have been built for this type of farming and the value of these in terms of alternative use is often low. Thus, on these farms, costs of exiting dairy farming are very high in the short and medium term. Even if the current owner of the farm should go bankrupt, milk production will most likely continue on the farm as the facilities have been built for milk production and therefore, the creditors selling the farm will achieve the best price if the farm is sold for milk production.

When production facilities are run down, the costs of exiting dairy farming will be low and farmers are more likely to switch to alternative types of farming if they can provide a better income. The more alternatives there are to milk production, and the more run down the facilities are, the more likely farmers will be to stop dairy farming when income in dairy farming is low. This may to some extent explain the decrease in milk production seen in some of the EU12 Member States.

## 2.5 Conclusion and policy recommendations drawn directly from the analysis

When the quota system ends in 2015, there will no longer be an upper limit to how much milk the individual Member States can produce and due to this, the current territorial balance in milk production may change. The balance is, however, not only controlled by the milk quota, it also depends on the characteristics of the Member States in terms of:

- Conditions inherent by nature
- Environmental conditions
- The level of investments on farms until now and in the future
- Farm structure and the structural development up till now
- The efficiency, profitability and competitiveness of dairy farming both in relation to dairy farming in other Member States but even more so in relation to other types of agricultural production within the different Member States
- Age of farmers
- Type of ownership

Based on the analysis of these factors, along with the current utilisation of the milk quota, the Member States may be divided into the following clusters in terms of future developments in milk production.

**The “increasing milk production cluster”** includes Ireland, the Netherlands, Belgium, Luxembourg, Denmark and possibly also Germany. These Member States are characterised by favourable conditions for milk production inherent by nature i.e., high levels of precipitation and a high proportion of permanent pastures (except for Denmark). Moreover, this cluster is characterised by a good farm structure (larger farms) and good farmer demography. The creation of value added is high which results in higher milk prices generally compared to other Member States. The competitiveness of dairy farming compared to other types of farming is high as FNVA per AWU is greater than the FNVA per AWU achieved in other types of farming. The level of net investments is high, in some cases very high, indicating a willingness of farmers to develop their farms and to continue with milk production. Because of these factors, milk production is likely to grow, especially in the short term, as many farms have not fully utilised the facilities and some have been holding back milk, which otherwise could be delivered to the dairy processors. However, many of these Member States are also characterised by high levels of N- and P-surpluses as well as high ammonia emission. Owing to this, further increases in milk production will be mitigated by environmental regulations, which are highly likely to be the most limiting factors for further growth in milk production in the longer term in many of these Member States.

**The “decreasing milk production cluster”** includes all the EU12 Member States apart from Cyprus and Malta and possibly not Poland either. The farm structure is very fragmented. In some Member States, there are many very small farms and a few very large farms housing most of the cows. Some Member States have a more homogenous farm structure, yet these farms are often small. Apart from the Baltic Member States, the level of net investments has been low, which could indicate many run down facilities. At the same time, competition from other types of agricultural production is strong as these appear to provide higher FNVA per AWU than dairy farming. Owing to the run down facilities and the prospects of better incomes by other types of farming, some of the current dairy farmers may be tempted to switch from milk production to other production branches.

The level of investments is higher in some of the Baltic Member States and in Poland and milk production has increased over the past three years in these Member States. The question is, however, if investment levels are sufficient to compensate for the decrease in production caused by the exiting farms. Poland has been quite far from producing the milk quota. However, in 2011/12 milk production was only 2 percent below the quota and due to this, the quota system may currently influence farmers’ decisions about milk production. In turn, the end of the quota system could influence milk production and an increase in production cannot be excluded.

So far an increase in milk yield per cow has partly compensated for the decline seen in the number of farms and cows in the Member States included in this cluster. For some, this may still be possible in the future as milk yield per cow is still rather low. Yet, in other Member States, this may be more difficult to achieve, as milk yield per cow is already relatively high. Future milk production in these Member States will therefore, rely more and more on the willingness of owners of medium and large-sized farms to invest in milk production. Currently,

these farmers seem to turn to crop production instead of investing in dairy farming. This trend is likely to continue if the competitiveness of dairy farming is not improved. A further decrease in milk prices will just accelerate the current trend.

**The “unchanged milk production cluster”** includes Finland, Sweden, the UK and Austria. Austria is included in this cluster even though milk production is likely to increase in the shorter term (because some of the milk produced is currently fed to calves). Yet, in the longer term, milk production in these Member States is likely to be more or less unchanged. These Member States have, all except for Austria, seen a decline in production, yet the level of investments is generally high, the farms achieve medium to high levels of income and they either farm in areas where the competition to dairy farming is less strong as a large proportion of the land is permanent pasture, or in areas where the climate is not favourable for other types of farming. In the short term, milk production is, except for Austria, not likely to change, as these Member States are currently far from producing their milk quota.

**The “uncertainty cluster”** includes France, Spain, Portugal and Italy. All of these are characterised by low levels of investment and, except for FR, a generally older population of farmers. Income levels are generally high in Italy and Spain but lower in France and Portugal. The competition from crop farming is strong in France but lower in Portugal, Spain and Italy. The low levels of investment in Spain and Italy may be explained by a generally older population of farmers with relatively good incomes and a less strong competition from other types of farming. In other words, the need for change is less strong. Owing to the age structure in these Member States, milk production in the near future will be determined by the willingness of the next generation of farmers not only to take over these farms, but also to develop them.

The demography of French farmers is better, but due to the low levels of investment seen in the past, many farmers can switch to crop farming without a capital loss. This speaks for a decline in milk production especially in the areas suitable for crop production. Yet, the current administration of the quota system may have repressed structural development as it has been difficult for farmers to obtain extra quota. The end of the quota system may therefore open up for a structural development which could improve the economy and competitiveness of the dairy sector and in turn lead to an increase in production. Otherwise, production may decline over time.

The future territorial balance will not only depend on the current farm structure. It will also depend on the degree to which the Member States generally encourage investments and structural development in the dairy sector. Investments on farms are often long-term investments which require considerable amounts of capital. For farmers, it is important to have some security concerning their milk delivery as the risks associated with the investments are too high otherwise. Both the strength of the value chain and the farmers' position in the value chain is therefore important for the motivation of farmers to invest. With the Milk Package, the Member States have been provided with the tools to strengthen farmers' position in the value chain and therefore the implementation of this is important for the development of milk production in the Member States where the position is currently weak. The Milk Package provides only the framework for closer cooperation among the actors in the chain. Ultimately, it is up to them to cooperate in order to maximise value creation in the chain for the mutual benefit of all parties.

Milk production will over time move to areas favourable to milk production, yet these are also characterised by being environmentally intensive. The EU has established common environmental regulations, which will prevent powerful and uncontrolled growth in milk production in these areas, given the Member States have implemented these regulations.

Owing to the environmental intensiveness, milk production in these areas is unlikely to outflank milk production in other areas of the EU.

**Political actions:** Owing to the low levels of investment, further declines in milk production may be seen in the southern part of the EU and also in the EU12 region except for Cyprus and Malta and maybe also Poland. If the aim is to prevent milk production from decreasing over time in these areas, political actions should aim at encouraging farmers to invest. Political actions which could have an impact on farmers' motivation for investing in milk production include:

- A. **The Milk Package:** Farmers are unwilling to invest if squeezed by the other parties in the value chain in terms of milk price or if they have to carry all the risks associated with volatile milk prices. Therefore, the implementation of the Milk Package is very important if further declines in milk production in southern and eastern parts of the EU are to be reduced. As stated earlier, many Member States have set minimum standards for POs and APOs and many have or are considering to introduce compulsory contracts, yet this is only the first step and do not in itself provide farmers with a better position in the chain. The benefits can be reaped when farmers have formed strong efficient organisations, which can negotiate favourable terms for the participating farmers. In addition, these may provide a better understanding of the functioning of the chain and a better understanding of the market, which in turn may lead to further innovation and value creation within the chain. As also stated earlier, it might be necessary to support farmers with knowledge, training and advisory service on how to form and run such organisations in an efficient way for the benefit of all members of the organisation. Furthermore, it is crucial to follow up on the Milk Package to make sure it works as intended.
- B. **Access to capital on reasonable conditions:** Milk production in most parts of the EU is capital intensive and therefore investments require considerable amounts of capital, a large part of which the farmer will have to borrow. If farmers are to invest, they need access to capital on reasonable conditions. In some areas, it may be very difficult for farmers to raise capital and the capital might be associated with very high interest rates which reduce the profitability of the investment. If farmers are to invest, they need access to patient capital. The EU could establish a loan fund for farmers in this respect or provide guaranties which enable farmers to obtain loans through the normal routes of raising funds.
- C. **Reduce risks:** Many farmers are characterised by high solvency ratios. If farmers are to invest, they have to give up the current very high solvency ratio. Some or even many farmers may be risk-averse and therefore unwilling to give up their current level of security if deemed to be too risky. Political actions should therefore aim at reducing the risks associated with an investment, i.e., enable farmers to better protect their margins (milk returns over feed costs).

In the US, the Dairy Producer Margin Protection Program (DPMPP) is proposed as a part of the new Farm Bill to help dairy farmers protect their margins. The DPMPP is a voluntary programme which provides a floor for producer margins (milk returns over feed costs) and helps to offset low margins caused by low milk prices and/or high feed prices and prevents erosion of equity. Farmers who sign up for the programme have to pay an annual fee and are provided a basic level of protection. The producers who want more protection can make use of a “supplemental plan”, which is associated with some extra costs. There is no limit as to how much milk the farmer can produce; nevertheless, there is a limit on the amount of milk that can be insured. The advantage of the DPMPP is its flexibility. However, farmers who sign up for the programme automatically become subject to The Dairy Market Stabilisation Programme (DMSP) that reduces milk returns if the margin falls below proposed statutory thresholds. The funds from the reduction in milk returns are diverted to the USDA and used to purchase dairy products for donation and/or expanding demand. The Farm Bill has not yet been passed and it is yet to be seen whether or not such a programme is attractive for farmers and will work in practice. The insurance part of the programme (DPMPP) may be attractive for farmers whereas the DMSP part is deemed to be unattractive as it reduces milk returns in times when margins are already low. Moreover, it may be questioned whether the DMSP system will work as intended as farmers, in case of poor margins, will seek to improve performance in order to improve their cash flow. A way to improve performance is to increase milk yield per cow through better management practices or to better utilise available capacity. In either case, this in turn leads to an increase in milk production. Moreover, farmers will normally hesitate to decrease production when they expect the low margins to be only temporary, and when they expect the consequence of lowering the number of cows and/or the feeding level to be long term. They think that when they decrease cow numbers or reduce the feeding level, they will not be able to quickly increase production when milk returns over feed costs start to improve. Thus, it may be questioned whether farmers will sign up for such programmes, and even if they do, whether they will in fact decrease production in times of a crisis as the stop/go costs are regarded to be too high. Another disadvantage of insurance systems like the DPMPP and DMSP is the high administrative burden associated with this. Moreover, the DMSP prevents full utilisation of the dairy processor’s capacity and prevents them from meeting the consumers’ demand as quickly as it arises. Both of these drawbacks may impact the milk price paid to farmers negatively. Thus, the best way to balance supply and demand is



to let it be done in the negotiation between the processors and the farmers delivering milk to them. Owing to this, the implementation of the Milk Package is important.

In any case, it will be difficult to copy the proposed US-system to the EU as dairy farming in the EU is much more heterogeneous in terms of for instance structure, culture, climatic conditions and feeding systems applied. Because of this, it will be difficult to establish a margin which applies to all dairy farmers across the EU. In conclusion, insurance systems combined with supply management systems may seem attractive in theory. The applicability of these are yet to be seen in practice. Based on the reasoning made above, they are, however, not likely to be effective.

A better way for farmers to protect their margins may be by use of a futures market as it enables farmers to hedge their margins on the basis of their individual situation. However, as EU-farmers are generally not used to use a futures market, the introduction of such a market will require substantial education and training of farmers in how to use this to protect their margins. In addition to the futures market, the Milk Package may provide farmers with some security in terms of milk sales, while the use of patient capital to finance investments also enables farmers to better tackle temporary crisis.

- D. Make milk production attractive for young farmers:** Owing to the age structure seen especially in southern parts of the EU, milk production may decline when the current generation of farmers retires and the young generation chooses not to take over the farm or stop milk production. Political initiatives targeted at young farmers will be necessary. As most farms are inherited, it is very difficult for young farmers to buy a farm. Therefore, initiatives should not only aim at encouraging young farmers who have inherited a farm to invest in developing the facilities, but also make it easier for those not born on a farm to invest in and develop one. The latter may also be very beneficial for the development of the milk sector overall, as new ideas and new ways of doing things may be introduced. One of the main obstacles for these young farmers is access to capital and initiatives, which could ease access to capital for these farmers and are therefore important.
- E. Education and training:** Thirty years with milk quotas has repressed structural development in some Member States and as long as dairy farming provided an income sufficient to cover living expenses, the need for change was only minor. Thus, many farmers may not be well prepared for the changes which confront them due to both the end of the quota system and the greater volatility in prices. Training and education on how to tackle future challenges could be important, as well as training, knowledge and advisory services on how to operate larger farms. This could also include training and education of farmers across the Member States or support of transnational discussion groups for farmers in order to transfer farmer knowledge between the Member States.
- F. Knowledge about production systems:** Low levels of investment in many Member States could indicate that knowledge about how to design production facilities which both meet environmental and animal welfare requirements may be lacking in some Member States. Moreover, if milk production is to grow further in those areas with a high density of milk production, there is a need for further research on how to design facilities which minimise the environmental impact.

### 3. What are the regions and production systems which could endeavour difficulties?

#### 3.1 Interpretation and comprehension of the key terms of the evaluation question

The overall objective of the question is to identify the regions and production systems that could endeavour difficulties due to the ending of the milk quota system. It is assumed that "difficulties" in relation to regions mean a decrease in milk production, while "difficulties" relating to production systems mean vulnerability to changes in prices and a lack of competitiveness. "Regions" are assumed to be areas which share some kind of geographical and climatic similarities. Production systems in broad terms reflect the way milk is produced i.e., the characteristics in terms of physical facilities, feeding systems, feeding levels, type of breed used and technology applied. They also reflect the cost structure and type of ownership. The answer to this question will seek to include a broad range of these characteristics.

### 3.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

The regions which may endeavour difficulties are discussed based on the information obtained when answering Question I and II. An overview of the different production systems seen in the different regions and a qualitative description of these, highlighting their special characteristics are given. The future competitiveness and vulnerability of the different production systems is assessed and discussed by taking into account the impact of the abolition of the milk quota as well as the impact of the Milk Package and the future developments in the prices on agricultural commodities.

Data from Eurostat and FADN are used to describe the farm structure at the regional level for the regions that may not have been described in detail when answering Questions I and II. Data from both of these data sources are of high validity.

The general description of the different production systems will draw on information from the Result Database from the International Farm Comparison Network (IFCN) and on the knowledge obtained by the expert's participation in this network for many years.

Existing information describing the different production systems in detail is modest, which makes it difficult to give an adequate answer to the question. Moreover, the competitiveness of a given production system is correlated with its size, the management level applied, the current conditions of its production facilities and the overall conditions for milk production in the region in which the system is applied. Owing to this, it is very difficult, from empirical data, to assess the competitiveness of the different production systems and their vulnerability to price changes. These difficulties apply to both FADN data and to IFCN data.

FADN provide data from a representative group of farms in a given area, while IFCN data show results for typical farms based on information from national experts. The validity of FADN data is high; however, these data only exist at the regional level and they provide little specific information about the production systems applied; moreover, they are from 2009. Data from the IFCN are more up-to-date. They represent typical farms and provide more information about the production system applied. The validity is, however, lower as they may show results from farms where the management level applied differs, which in turn will distort the comparison of different production systems. Owing to the lower validity of the IFCN data, FADN data will, despite their limitations in regard to this purpose, be used to describe the competitiveness of different production systems and their vulnerability to changes in prices.

Information about the possible impact of the end of the quota system on milk prices is drawn from the descriptive chapter. EY refers to several studies and shows specific data from one of these studies. The results of this study are used in the answer to this question. The information is assumed to be of high validity. Other studies also predict decrease in milk prices, yet the size of the predicted decline varies between the studies. All of the studies are some years old and therefore the conclusions made may not apply to the current situation. Information from the descriptive chapter about the implementation of the Milk Package is also used in the answer to the question. Information on future commodity prices is drawn for the latest OECD-FAO report<sup>100</sup>.

### 3.3 Description of the method(s) used and an indication of its (their) limitations

Dairy farming in the EU is divided into regions which share some common geographical characteristics. The regions which may endeavour difficulties are discussed based on the information obtained when answering Questions I and II.

An overview of the different production systems seen in the different regions and a qualitative description of these are provided. Based on this, the competitiveness of the different systems and their vulnerability to the end of the quota system as well as to the future developments in prices on agricultural commodities is assessed and discussed, also taking into account the impact of the Milk Package. On this background, conclusions will be drawn and policy recommendations are made.

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<sup>100</sup> <http://www.oecd.org/site/oecd-faoagriculturaloutlook/> 17.05.2013

FADN data will be used to describe the competitiveness and vulnerability of different production systems used for milk production in the EU. This is done by using data from specialised dairy farms in the Member States or regions which are assumed to represent a given production system. The validity of the conclusions made, may be impacted by the indirect approach, used to answer the question.

The competitiveness and vulnerability of the different production systems are assessed and discussed on the basis of the total costs of production seen on farms in regions where this system is assumed to be common. The total costs of production include the costs associated with own capital and own labour. The costs of own capital is set to 4 percent for all farms regardless of the production system applied, and an hourly wage similar to the one achieved by the employees of these farms is used to calculate the costs of own labour. To assess the vulnerability of these systems to fluctuations in feed prices, the current feed costs per kilogram milk is shown. Feed costs relates here to costs of purchased feed i.e., the costs of home grown feed is not part of the feed costs.

### 3.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

Based on similarities in terms of geographical conditions for milk production, dairy farming in the EU may be divided into the following regions: Boreal, Coastal, Continental, Mountain, Mediterranean and EU10. **The Boreal region** encompasses all of Finland and most of Sweden except for the most southern parts. **The coastal region** encompasses the southern part of Sweden, Denmark, the Netherlands, Belgium, the UK, Ireland and coastal areas of Germany and of France. **The continental region** encompasses Germany and France except for the coastal areas in these Member States and except for the mountainous areas of France. Included in the Continental region are also Luxembourg and the eastern part of Austria. **The mountain region** encompasses the mountain areas of Austria, France, Italy and Spain. **The Mediterranean region** encompasses all of Spain, Portugal, Greece and the Roussillon Languedoc region of France, Italy except for the mountain areas as well as Malta and Cyprus. **The EU10 region** encompasses all of the EU12 Member States but Malta and Cyprus.

All of these regions may endeavour difficulties in the future but for different reasons.

Milk production in the **Boreal region** is challenged by the unfavourable conditions inherited by nature. The climate requires production systems which can house the cows in the wintertime when temperatures can be very low. The land structure of the farms is characterised by many small fields distributed over a large area. The infrastructure and logistic of these farms do not enable rational field work, which in turn results in higher costs on forage. The small farm sizes seen in the Finnish part of the area requires a higher input of labour per cow. In turn, both feed and labour costs are typically high on these farms and in order to obtain adequate earnings, they are highly dependent on financial support. The level of the net investments indicates up-to-date production facilities and a motivation among farmers to invest in the continuation of milk production. The value chain is dominated by strong farmer-owned cooperatives, which ensure that a high amount of the value, created in the chain, will be returned to the farmers. Owing to these characteristics, this region is not likely to endeavour difficulties as long as the current level of financial support is unchanged.

In the **Coastal region**, milk production is challenged by the environmental intensity characterising many of the areas of this region. The favourable conditions for milk production in these areas, the generally high levels of investments and in turn motivated farmers to continue with milk production, the good farm structure and in many cases the strong prevalence of farmer-owned cooperatives are all strong incentives for farmers to increase milk production, especially because the milk quota has limited milk production in many areas of this region. Owing to the current high environmental intensity and the farmers' desire to increase production, environmental regulations need to be in place in these areas in order to make further growth in milk production environmentally sustainable. These regulations already exist, yet the implementation of them may vary from Member State to Member State and due to this, the full impact of the regulations on milk production may not yet be seen in some areas.

The **Continental region** has not been described in detail when answering Questions I and II and therefore the main figures for this region is provided in Table 3.1.

**Table 3.1:** Characteristics of dairy farming in the Continental region<sup>101,102,103</sup>

	DE	FR	LU	AT*	
	South and West	East			
Percentage of permanent pasture of utilised agricultural area (UAA)	34%	19%	33%	52%	19%
<b>Characteristics of farms and milk production</b>					
Average farm size, number of cows	34	196	43	56	13
Percentage of cows on farms with more than 50 cows/ percentage of farms with more than 50 cows	76%/50%	99%/78%	75%/75%	98%/95%	31%/12%
<b>Net investment per cow, 1000 Euros</b>					
2005-2009	36	160	-25	383	
2000-2009	3	67	-7	324	
Farm net value added per AWU, Euros	29,533	31,683	23,277	38,360	
Farm net income per FWU, Euros	22,766	31,458	18,165	32,266	
Solvency ratio	87	61	65	84	

\*Economic data only exist at national level.

The Continental region is challenged by the farm structure and the low level of net investments seen in the western part of Germany and in the French areas of this region. The areas of this region are generally suitable for other types of farming than dairy farming, which in turn means that the competition from other types of farming is strong in many of these areas. Owing to the low levels of investments, many of the production facilities may be run down and as a consequence, the farmers' costs for switching to another type of farming are low. These areas may therefore see declines in milk production over time, especially the French areas due to the low levels of net investments and low income levels and due to the changes seen in milk production until now. Owing to the utilisation of the milk quota in this region, the quota systems may have prevented farmers from investing, either due to the price of quota or because it has been difficult for them to increase their quota. Either way, the end of the quota system may encourage a structural development in these areas. Yet, due to the stronger competition from other types of farming, farmers may also turn to these instead of investing in milk production, and as a consequence, milk production will decrease.

The **Mountain region** is like the Boreal region challenged by the conditions inherited by nature. Owing to the terrain, the fields are small, which prevent rational field work and results in higher forage costs. Owing to the small farm sizes, farms in this region are often labour intensive, which results in higher labour costs. These farms are, like the Boreal farms, very dependent on financial support to cover the extra costs of production and to enable adequate earnings. Within this region, milk production is more challenged in some areas than in others, due to low levels of investments, low incomes and competition from other types of farming. These characteristics fit the French areas of the Mountain region and to some extent also the Italian areas. Low levels of investments combined with an older generation of farmers may also in the longer term challenge milk production in the Spanish areas. The next generation of farmers may not want to take over the current facilities and continue with milk production when these are old and labour intensive. The Austrian areas are also characterised by small farms and medium income levels from farming, yet a significant part of the farmers may

<sup>101</sup> Eurostat. Production of cow's milk on farms by NUTS 2 regions (1 000 t) [agr\_r\_milkpr]; Livestock: number of farms and heads of animals by livestock units (LSU) of farm and NUTS 2 regions [ef\_olslsureg]

<sup>102</sup> FADN

<sup>103</sup> Land use: Number of farms and areas of different crops by agricultural size of farm (UAA) and NUTS 2 regions [ef\_oluaareg]

supplement their farm income with off farm activities. Judged by the positive levels of investments and the current utilisation of the milk quota, these farmers are motivated to continue with milk production and due to this, milk production seems to be less challenged in the Austrian areas as long as the level of financial support is unchanged. In the short term, milk deliveries in Austria are likely to increase in Austria as a result of the end of the quota system. In the other areas of the Mountain region, milk production is likely to decrease over time, unless the level of investments is increased.

Milk production in the **Mediterranean region** is dominated by the Spanish and Italian parts of this region, as milk production in the other areas of this region is very small. Milk production in the Spanish and Italian areas is challenged by an older generation of farmers and low levels of investments. Farm net income is generally high in these areas, but farmers do not seem motivated to develop their production facilities. This may challenge milk production in these areas in the longer term when the current farmers stop farming and the next generation takes over the farm. The future of milk production in these areas will therefore depend highly on the motivation of these young farmers not only to take over the farm but also to develop it. Italy as well as Spain are close to producing the milk quota, and the need for more quotas may have prevented farmers in these Member States from investing. The lack of investment among farmers may also be a result of a less strong value chain in which the position of the farmers is weak. If this should be the case, the end of the quota system may along with the implementation of the Milk Package open up for structural development in these areas, however, this is yet to be seen.

The **EU10 region** is characterised by a very fragmented farm structure as a result of the history of these Member States. The conditions inherent by nature are similar to those seen in the continental region. Owing to this, milk production in these areas is also challenged by strong competition from other types of farming. Moreover, except for the Baltic Member States, the level of investment is generally low in many areas of this region. In turn, this shows a lack of motivation among farmers to invest in the continuation of milk production. The end of the quota system is not going to encourage farmers to invest and increase production, as they, apart from Poland, can already do this without risking having to pay a penalty for exceeding their quota. Information about the market share of farmer-owned cooperatives is lacking for many of these Member States, yet judged by the information available<sup>104</sup>, the market share of farmer-owned cooperatives is low or relatively low, which in turn means that the position of farmers within the chain is likely to be weak. Owing to this, the implementation of the Milk Package is very important in these Member States, as it may strengthen the competitiveness of dairy farming compared to other types of farming and therefore also encourage investments among farmers, which are highly needed if the current negative development in milk production in many of these Member States is to change.

In conclusion, all regions may endeavour difficulties in the future but for different reasons. The regions which may endeavour difficulties in the nearer future are parts of the mountain region (the French and Italian areas), the Mediterranean region and the French parts of the Continental region. The difficulties do not arise as a consequence of the end of the quota system, but because over time, farmers in these areas have failed to invest at a level sufficient to ensure the continuation of milk production. As a consequence, the facilities on many farms are run down, and when alternative farming activities offer better earnings, farmers for natural reasons switch to these, but as a consequence, milk production declines. The end of the quota system and the implementation of the Milk Package may enable a necessary structural development in these regions, but it is still too early to determine whether or not this will be the case. If the aim is to ensure the continuation of milk production in most areas of the EU, then it will be important to follow up on the implementation of the Milk Package in order to make the necessary adjustments and to encourage investments in the areas which currently see low levels of investments.

Table 3.2 provides an overview of the production systems used for milk production in the EU and in which regions these can typically be seen. The overview is not complete, as production systems like the organic can be found in other regions than the Coastal and the Mountain regions, but the prevalence of the organic system is typically lower in these.

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<sup>104</sup> Descriptive chapter pp. 91-92.

Table 3.2 Overview of the different productions systems used for milk production in the EU.

	Boreal	Coastal	Continental	Mountain	Mediterranean	EU10
<b>Intensive production system<sup>105</sup></b>						
Specialised no land or very little land					X (ES, MT, CY, EL)	
Specialised, small land base (<0.6 ha per cow)		X (NL)		X (ES)	X (ES, IT)	
Specialised, medium land base (about 1 ha per cow)		X (DK, BE, DE, UK, IE)				
Specialised, larger land base (>1,3 ha per cow)	X (FI, SE)	X (FR, SE)	X (DE, FR)			X
Dual purpose breed				X		
<b>Grass-based system</b>						
		X (UK, IE)			X (PT, Azores)	
<b>Organic system</b>						
		x		X		
<b>Extensive production system</b>						
					X (IT)	
<b>Mixed farming</b>						
						X
<b>Subsistence farming</b>						
						X

Most of the milk in the EU is produced by intensive production systems, which typically vary in the amount of land they operate, the type of breed they use for milk production and the type of production facilities they apply. In addition, the type of forage grown on the farms may vary due to differences in climatic conditions.

Regardless of the production system applied, the farms share some common characteristics as they are typically family-owned farms of which many have been passed on from one generation to the next and where the family provides most of the labour applied on the farm. Because of the way farms change ownership, the solvency of the farms is typically high irrespective of the production system applied. There are a few exceptions to this and these will be discussed in connection with the description of the different systems.

**The intensive production system with no or very little land** is found in the Mediterranean region in Spain, Malta, Cyprus and Greece. These farms aim at a high milk yield per cow, the cows are of single purpose breeds and typically housed in loosing housing systems. Cows are housed in these facilities all year round as grazing is not possible. The production systems are characterised by buying in all of the feed needed in the production and they need contracts for the disposal of manure as they do not operate land or only a very small amount of land. Farms applying this production system are highly specialised in milk production and they rely on contracts for the disposal of manure.

Maltese and Andalucía farms may be representatives of farms applying this type of production system.

**The intensive production system with a small land base** is a variant of the intensive production system with no or very little land. This system is typical for the Netherlands, northern part of Italy (Lombardi) and for Spain, both in the Mountainous areas as well as in other areas of Spain. Farmers with this type of production system also aim at achieving high milk yields per cow, cows are also typically of single purpose breed and these are also typically housed in loosing systems. Some of these farmers will practice grazing, whereas others will not. In the Netherlands, processors encourage farmers to practice grazing by paying a supplement to the milk price when grazing takes place. Contrary to the production system with no or very little land, most farmers with this

<sup>105</sup> The classification is based on information from FADN and IFCN Result Database as well as by the experts' knowledge about this.

type of production system grow their own forage or at least a larger part of it. These systems are like the production systems without land or very little land in some cases, dependent on contracts for the handling of manure.

Farms in the Netherlands, Galicia (Spain) and Lombardy (Italy) may represent farms applying this production system.

**The intensive production system with a medium land base** is primarily found in the coastal region. This system differs from the above-mentioned system by the amount of land they operate. They will typically be self-sufficient in terms of roughage and some of these will, in addition to this, use a minor part of the land for cash crop production. Part of this or all of the grain produced will be used as fodder for milk production. On these farms, the land base is typically sufficient to handle the manure produced and they do therefore not rely on manure contracts although exceptions to this may be found. Similarly, to the production systems described above, farmers with this type of production system also aim at high milk yields per cow, although they differ in the feeding levels applied as some may use slightly less concentrated feed than others (typically the UK farms). In these systems, cows are also typically of single purpose breed and they are primarily housed in loose housing systems, yet on the smaller farms with older production facilities, tie stall barns may also be seen.

Belgium and German farms in the coastal areas of Germany may represent farms with this kind of production system.

#### **The intensive production system with a large land base**

The intensive systems with a large land base are seen in the Boreal region and in the coastal region (but only the southern part of Sweden) as well as in the continental region and in the EU10 region. The production systems seen in the Boreal region are similar to the production systems with a medium land base as they also use most of the land for forage production. They differ, however, by the number of crops they grow and the amount of concentrate they use. The number of crops that can be grown is limited and due to this, these farms typically use higher amounts of concentrate per kilogram milk they produce than the production systems with a medium land base.

In the other regions, farms with this production system use a reasonably large proportion of the land for production of cash crops. This allows them to better protect their margins against fluctuating feed prices as high feed prices can be balanced by increasing revenues from the production of cash crops. Especially, the farms in the EU10 region and in the eastern part of Germany and France are characterised by a relatively large proportion of the land being used for production of cash crops.

Farmers with this production system also aim at achieving high milk yields per cow. The cows are typically housed in loose housing systems or in tie stall barns; the latter is common on farms with older production facilities. Grazing is common on some farms with this production system.

Farms in the central part of France, the western and eastern part of Germany may represent farms with this production system.

The cows are of single purpose breed, though farms with dual purpose breeds may also be seen in the French areas and maybe also in the southern and western part of Germany. The East German and the French farms applying this system are characterised by slightly lower solvency ratios than seen on other farms (61 (East Germany) and 65 (French areas)).

#### **The intensive production system dual purpose breed**

The intensive production system with dual purpose breed is yet another variant of the intensive system and is typical for the Mountain region. Farmers with this production system aim at producing milk by cows, which are characterised by a longer longevity and which are also suitable for beef production. Compared to the other intensive systems, these production systems are less specialised in milk production as a greater part of their income stems from beef production. This in turn implies that farms with this production system are slightly less exposed to fluctuations in milk prices. Both loose housing systems and tie stall barns are seen on farms with this production system and grazing is common on farms with these systems.

The Austrian farms may represent farms with this type of production system.

**The grass-based production system** characterises milk production in Ireland and on the Azores (Portugal) and can also be seen in the UK. In this production system, grass is the main constituent. Milk production is often seasonal and compared to the intensive system, cows are fed at lower feeding levels, which results in lower amounts of concentrate. Owing to the lower feeding levels, milk yield per cow is also lower. Cows are kept outside for most of the year; however, because of the wet weather in some areas, the cows cannot be kept outside all year round as they otherwise will destroy the grass fields. The necessary housing facilities may nevertheless be rather simple and therefore much less capital intensive than the facilities characterising the intensive systems. The whole area on farms with this production system will typically be used for grass production.

Irish and Azores farms may represent farms applying this production system.

**The organic system** may be seen more or less in all regions, yet the prevalence of organic dairy farming is highest in Denmark and Austria. The organic systems are characterised by a high self-sufficiency as this is part of the idea of organic production. These farms will therefore typically produce a larger proportion of the amount of feed to be used in milk production and they will typically also be less intensive as they operate more land. Use of fertilisers and pesticides are not allowed, which typically results in lower crop yields. Grazing is compulsory but apart from this, the organic production systems may vary between the different regions due to differences in the national regulations for organic production. The same variation in terms of farm size, production intensity, cow breed used and housing facilities applied is seen between organic farms as is seen between conventional farms. No economic data exists for this type of production system, which prevents a further description of this system.

**Extensive production systems** are low cost systems. They may be based on grazing but not necessarily. They may be seen in the Mediterranean region in some areas of Italy judged by the very low levels of milk yields per cow seen here; however, the available data does not enable a more detailed description of these. **Mixed production systems** are seen in the EU10 regions. These systems are as the word says less specialised in milk production and therefore also less exposed to changes in milk prices. Mixed farming is a way to balance risk, but it has the negative effect that farmers cannot achieve the economic gains that are associated with a high degree of specialisation. Many of these are due to their small size likely to disappear over time and they will therefore not be described further. Subsistence farming is still common in many of the EU10 Member States; these systems are characterised by being very small and most of the products produced on the farm are also consumed on the farm. In line with the economic development, many of these farms will disappear over time.

The competitiveness of the different production systems is shown in Figure 3.1 for farms which are assumed to be representatives of the different production systems.



**Figure 3.1:** Total costs of production per 100 kg from 2007-2009 on farms representing different production systems used for milk production in the EU (Source FADN).

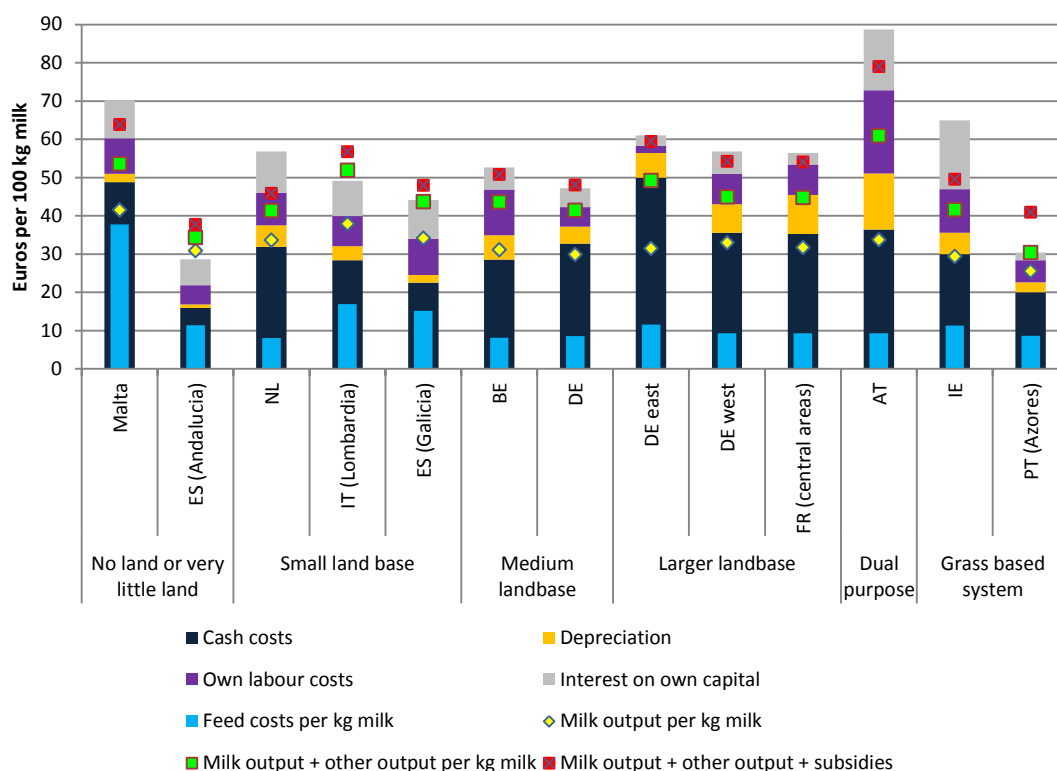


Figure 3.1 shows a very large variation in the costs of producing milk between the different systems and the variation seems in some cases to be even larger between farms applying the same production system (“no land or very little land” and “grass-based system”) than between farms applying different production systems. Regardless of the production system applied, most of the farms are not able to cover the total costs of production, as only the Andalucía, Lombardy, Galicia and Azores farms achieve a profit from milk production. Only the Andalucía farms and the Lombardy farms are able to cover all the costs of production without any subsidy.

It is, however, more or less impossible to assess the competitiveness of the different production systems as this is influenced by the size of these, the level of management applied, the conditions of the production facilities and the conditions of the region where these are applied.

Figure 3.1 gives, however, an impression of the vulnerability of the different systems in terms of a permanent decrease in milk price and in terms of the impact of fluctuations in prices on agricultural commodities. Some studies foresee a decrease in milk prices due to the end of the quota system. If milk prices should decrease as predicted by the study described in the descriptive chapter, this would mean a decrease in milk prices of 1-4 Euros per 100 kg milk<sup>106</sup>. Figure 3.1 shows that this is not likely to have devastating consequences for the different production systems as long as income from other products (typically cash crops and beef) remains at the level currently seen, and as long as subsidies are not changed. The systems most vulnerable to a decrease in milk prices are those where milk output make up a large share of the total output. According to Figure 3.1, these are the systems applied by the Andalucía farms and the Dutch farms. Farms with these production systems are also the most vulnerable to fluctuations in milk prices. However, due to the high solvency ratios, generally seen on all farms and therefore also on these farms, they are likely to obtain credit in times of negative cash flows.

OECD FAO foresees greater volatility in prices on agricultural commodities in the future. According to Figure 3.1, the production systems most vulnerable to such volatility are those where feed costs make up a large

<sup>106</sup> Descriptive chapter, Table 8 pp.15 and Table 25 pp. 58

share of the costs and especially the cash costs. These systems are the systems with no land or very little land. On these farms, feed costs make up a large share of the cash costs and also a considerable part of the total costs. Vulnerable to price fluctuations are also the farms with only a smaller land base and which, as a consequence, buy in a large part of the feed. These production systems are seen in Galicia and Lombardy. Owing to the high solvency ratios seen on these farms, they are however, well protected against temporary fluctuations in prices. Owing to the higher vulnerability, it is important for farms with this type of production system to be able to protect their margins by hedging both milk and feed prices. The contractual element of the Milk Package can provide farmers security in terms of milk price in the contractual period and therefore the implementation of the Milk Package is in particular important for the production systems which buy in most of the feed.

### 3.5 Conclusion and policy recommendations drawn directly from the analysis

All **regions** in the EU may endeavour difficulties but for different reasons. The regions which may endeavour difficulties in the nearer future are parts of the mountain region (the French and Italian areas), the Mediterranean region and the French parts of the Continental region. The difficulties do not arise as a consequence of the end of the quota system, but because over time, farmers in these areas have failed to invest at a level sufficient to ensure the continuation of milk production. As a consequence, the facilities on many farms are run down, and when alternative farming activities offer better earnings, farmers for natural reasons switch to these, but as a consequence milk production declines. The end of the quota system and the implementation of the Milk Package may enable a necessary structural development in these regions, but it is still too early to determine whether or not this will be the case. The very intensive regions in terms of milk production may also endeavour difficulties in the future if environmental regulations are not in place in this region.

Different **production systems** are used for milk production in the EU. However, the most common system is the intensive system and variations of it in terms of the amount of land the system operates. Very intensive systems with no or very little land are seen in the Mediterranean region. They buy in all the feed and they rely on contract for the disposal of manure. The systems are often specialised and in turn milk output makes up a large share of the total output on these farms. Owing to these characteristics, these systems are vulnerable to changes in prices on both milk and feed and especially in times of adverse price relations. The farms currently applying these systems are, however, also characterised by high solvency ratios, which should provide them protection in times of negative cash flows. However, if price relations remain adverse over a longer period of time, these systems may endeavour difficulties. More or less for the same reasons, production systems characterised by being specialised and by having only a small land base are also vulnerable to price fluctuations. Both of these systems are not only vulnerable to changes in prices, they are also vulnerable to the disposal of manure, and due to these characteristics, they may in the future endeavour difficulties because the risks associated with these systems are too high.

#### Political actions:

- A. **Encourage investments:** Up till now, farmers in some regions have invested at a level insufficient to ensure the continuation of milk production over time. The lack of investments may be a result of the quota system and the way it has been administered. Therefore, the end of the quota system may open up for a structural development in these areas. The implementation of the Milk Package may encourage farmers to invest, if the implementation of the Milk Package provides them with a stronger position in the chain and better conditions for their milk delivery. If the aim is to ensure the continuation of milk production in most areas of the EU, then it will be important **politically** to encourage on farm investments. The political actions, which could encourage investments are stated in the answer to Question 2 (see Page 213).
- B. **Avoid encouraging establishment of very intensive systems without land.** The very intensive systems without land are not only vulnerable to changes in milk and feed prices, but also to the disposal of manure. These characteristics make them less sustainable both from an economic and an environmental point of view. Owing to the lower sustainability of these production systems, political initiatives should in general not encourage the establishment of this type of system.

## **4. What actions could be envisaged with the view to secure that a sustainable balance between economic and territorial dimension of the milk sector?**

### **4.1 Interpretation and comprehension of the key terms of the evaluation question**

The key objective of this question is to suggest actions which could secure a sustainable balance between the economic and territorial dimensions of the milk sector

The term “sustainable balance” is assumed to mean a balance, which on the one hand allows milk production to increase in those areas most suited for milk production, while at the same time ensuring the continuation of milk production in areas less suited for milk production. It does not mean that the suggested actions should prevent any changes to the current situation; however, they should improve the competitiveness of milk production in areas less suited for milk production in order to mitigate negative changes likely to be seen following the termination of the milk quotas.

### **4.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used**

The answer to this question relies on the answers to the first three questions under Theme II.

Qualitative information obtained from those answers will be used when answering this question. The validity of the data used, is described in the answer to the three first questions.

### **4.3 Description of the method(s) used and an indication of its (their) limitations**

Based on the answers to Questions I, II and III, the risk of major changes in the current balance between the economic and the territorial dimension of the milk sector is assessed and discussed and the reasons underlying these potential changes are established. Based on this, relevant actions which may secure a sustainable balance between the territorial and economic dimensions of the milk sector will be presented.

### **4.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits**

Milk production in the EU is characterised by being very diverse. Part of this diversity can be ascribed to the conditions inherent by nature. In some areas, conditions are very favourable for milk production, while in other areas they are less favourable or even unfavourable.

For obvious reasons, milk production has moved into areas which are favourable for milk production and because of this, milk production has grown in these areas over time. This has in turn resulted in a high density of milk production and in some Member States – yet not all - created a strong culture in regard to dairy production. The culture encompasses the whole value chain and important input suppliers to the chain (e.g., banks, mortgage-credit institutes) as well as policy makers. The latter has resulted in political initiatives which have supported the development of the dairy sector.

In many of the areas characterised by high densities of milk production, farmers have formed farmer-owned cooperatives, which have enabled them to gain control over a significant part of the value chain. In turn, this has ensured them a fair distribution of the value created within the chain and an understanding of the functioning of the value chain. In addition to this, it has allowed farmers to adjust quickly and efficiently to changes in the marketplace due to a rapid and efficient transfer of knowledge and information between the parties within the chain.

In addition to the above, the areas characterised by a high density of milk production are often also characterised by extensive research and development and implementation of activities associated with the dairy value chain. Thus, new knowledge is efficiently turned into better practice on farms.

It is all of these factors combined which give these areas a competitive advantage and explain why farmers continue to invest, still produce their milk quota and are likely to increase milk production when the quota system ends in 2015. According to the answer to Question II, the areas which are likely to see a growth in milk production are the Netherlands, Ireland, Denmark, Belgium and possibly also the northern part of Germany. However, due to the environmental intensity of these areas, the common environmental regulations are expected to prevent a powerful and uncontrolled growth in milk production in these areas provided those regulations have been put in place in the respective Member States.

Nature-given favourable conditions do not themselves guarantee an increase in milk production. The UK is an example of this as milk production has decreased over time in spite of favourable natural conditions for milk production. Conversely, Austria is a Member State where milk production has increased even though the natural conditions for milk production are less favourable. Differences in terms of number of alternatives to dairy farming and in terms of the strength of the value chain are likely to explain why milk production decreased over time in the UK and increased in Austria. The same may also apply to Finland and Sweden and explain the relatively high levels of investment in these areas. In the answer to Question II, milk production is assumed to be relatively stable in these Member States primarily due to the higher levels of investment seen over the past five years.

Most of the EU12 Member States have seen declines in milk production over time and, apart from Poland, they are generally far from producing their milk quota. In these Member States, milk is produced in areas which are also suitable for other types of farming, which in turn means a stronger competition from other production branches than dairy farming. The farm structure in these Member States is very fragmented with many very small farms and some very large farms. Many of the very small farms have disappeared in conjunction with the economic development. The decline in milk production due to the number of farms exiting has partly been compensated by an increase in milk yield per cow on the remaining farms. The level of net investments has been very low and if this does not change, these Member States are likely to see further declines in milk production as was stated in the answer to Question II. The low levels of investments seen may be caused by stronger competition from other types of farming and a weak value chain. In addition to this, it may be difficult for farmers to obtain the credit necessary to carry out investments.

In the answer to Question II, a question mark was raised over one group of Member States (France, Spain, Italy and Portugal) with regard to the future development in milk production. In these Member States, some areas are very favourable for milk production, others are suitable for both dairy and other types of farming, and some may be mountainous areas characterised by fewer alternatives to dairy farming. The farm structure is not good as it is characterised by many small farms and by an older generation of farmers, except for France. Some of the farms currently achieve reasonable incomes or even good incomes; however some areas are also characterised by low incomes (France). Common for all these Member States is a very low level of investment, which is likely to be related to low income, the age structure of farmers and a relatively weak value chain. Regardless of the reasons, the development of the milk sector seems to have stagnated in these areas. In the answer to Question II, it was stressed that the current administration of the quota system could have repressed a structural development in these areas and because of this, the end of the quota system could open up for a structural development and, in turn, lead to an increase in milk production. In some Member States (Spain, Italy), the push for change was predicted to be low due to fewer alternatives to dairy farming, relatively good incomes, and an older generation of farmers. In these Member States, future development of milk production will depend on the desires of the next generation of farmers.

The Member States currently producing their milk quota may increase production right after the quota system is terminated because of the availability of spare capacity or because some of the produced milk is currently fed to calves. In order to achieve further increases, farms will have to invest in production facilities which along with environmental regulations will mitigate the rate at which production can increase. However, Ireland may be able to increase production relatively rapidly after the end of the quota system as no large investments are required. Apart from this, the risk of dramatic and rapid changes in the territorial balance of milk production is not likely. Current developments seen in milk production in the EU is likely to continue over time as areas characterised by low levels of investment are likely to see further declines in milk production if the current situation in terms of investment is not changed.

The low levels of investment is likely to be a result of a weak value chain and/or an older generation of farmers with relatively good incomes or a result of low incomes from dairy farming in combination with strong competition from other types of agricultural production. In some Member States, the low level of investment and development may also have been caused by the quota system which has prevented farmers from developing their farms. Another explanation could be that most of the farms are inherited farms passed on from one generation to the next. Owing to the lack of “new blood”, this may have led to a close and conservative culture with little tradition for change and development and, as long as income levels are sufficient to cover the living expenses, the need for change has been limited.

With the aim to ensure a sustainable balance between the economic and territorial dimensions of milk production, the EU should aim for actions which make the milk sector more sustainable both economically and environmentally. This will in turn also enable the milk sector in the EU to take advantage of a growing world market.

In order to make milk production in the EU more economically sustainable, the way dairy farming is supported should be re-addressed. Instead of focussing on income support, a necessary structural development of the dairy sector in the EU should be supported to a greater extent to promote a more economically viable milk sector. Actions and initiatives in relation to this could include:

- Adjustments and additional initiatives regarding the Milk Package
- Initiatives which enable farmers to manage risks associated with greater volatility in prices
- Initiatives which promote generational changes
- Initiatives which facilitate farmer investments in milk production
- Initiatives which enable economically viable milk production in areas less favourable for milk production when the aim is to keep milk production in these areas.

A key factor for the willingness of farmers to invest in the continuation of milk production is connected with the strength of the value chain and the farmers’ position in this. When the value chain is weak and the farmers’ position not very strong, farmers are generally less motivated or not at all motivated to invest in milk production. As a result, milk production will decrease over time.

The Milk Package provides tools which can strengthen farmers’ position in the chain and the Milk Package is, therefore, in many ways crucial for the farmers’ motivation to invest in milk production and therefore also for the continuation of milk production; especially in areas where farmers’ position in the chain is not very strong. Many Member States have implemented the Milk Package. Yet, the implementation does not itself guarantee better conditions for farmers in the chain as this relies on the farmers’ ability to form strong producer organisations which collectively can negotiate the most favourable terms concerning milk deliveries. The more milk the producer organisations account for, the more powerful they will be. Therefore, the ability of farmers to form strong producer organisations accounting for a large part of the milk is crucial if farmers shall reap the real benefits of the Milk Package. In the Member States where farmers have no or only little experience in forming such organisations, it is necessary to facilitate the formation of such organisations.

Currently, producer organisations can negotiate contracts for milk amounts not exceeding 3.5 percent of the EU milk production and a maximum of one-third of the milk produced in the Member State. Whether or not this is sufficient should be followed closely, as it corresponds to the bargaining power of farmers. In more general terms, it is important to follow up on the functioning of the Milk Package in order to be able to make the necessary adjustments.

Owing to the expected greater volatility in prices, it will be important for farmers to be able to protect their margins. In the answer to question II, it was concluded that a futures market provides better opportunities for farmers to protect their margins than a margin insurance system combined with a supply management system like the one proposed as part of the new Farm Bill in the US. It was also stated that availability of patient capital for investments in farming also allows farmers to better tackle temporary crises, whereas the implementation of the Milk Package provides security in terms of milk sales. Moreover, it was concluded that the best way to balance demand and supply is through negotiations between the processors and the farmers delivering milk to them.

Many of the farms in the EU are inherited farms. Because of this, it is difficult for young people to become farmers, unless they are born on a farm. In order to develop the sector and to achieve a sustainable territorial balance in terms of milk production, it would be advantageous if a greater proportion of change of ownerships took place outside the family. The EU cannot facilitate this alone as this also relates to national regulations, but in cooperation with the Member States, the EU could facilitate change of ownerships outside the family by establishing a loan fund which provides loans to such young farmers under favourable conditions. By establishing exit regimes, the EU may motivate the older generation to give up farming and transfer the farm to young farmers. In this way, the EU may enable a structural development which is important for the continuation of dairy farming. The current rural development programme contains such initiatives; however, judged by the current structure and the extent to which these work or are applied in the individual Member States, the initiatives seem to be insufficient to ensure the development of a viable and prosperous dairy sector in the longer term. A possible explanation could be that these initiatives require co-financing from the Member States.

Low levels of investment and a farm structure characterised by many small farms call for investments if milk production is to continue. In some cases, it may be very difficult for farmers to raise the necessary capital to carry out such investments, but the EU could facilitate investments by establishing a loan fund which could provide loans on favourable terms to farmers who want to invest. The current Rural Development Programme also supports investments. However, judged by the level of investment seen in many Member States, this seems to be insufficient to ensure a continuation of milk production in the longer term. The reason may also here be, that these initiatives require national co-financing.

Provided the EU want to keep milk production in areas not very favourable for milk production, it is necessary to provide financial support at a level which covers the extra costs associated with milk production in these areas. The financial support should be calculated based on objective criteria and be “dynamic” over time, allowing the support to be adjusted for productivity gains in order to encourage dairy farmers in these areas to improve their competitiveness.

The EU may also improve the competitiveness of dairy farming in the less favourable areas by promoting group farming. These may be set up in order to achieve economies of scale or in order to balance risk. In case of the latter, they would include other production branches as well as maybe also enterprises outside the agricultural sector, such as, for instance tourism. The establishment of group farming will not only make it possible to balance risk or to achieve efficiency gains and economies of scale, it may also improve the social life of farmers and make farming more attractive in these areas. More knowledge about group farming may be required but the real challenge will most likely be encouraging farmers to give up their current way of farming and share the rights in relation to management, leadership and ownership.

Investments in milk production not only enable economies of scale but also reduce the environmental impact of dairy farming as new and better technology is applied. In areas favourable for milk production, further growth is limited by the environmental intensity in these areas. In order to grow milk production and in turn take advantage of a growing world market, more research is needed on how to avoid or at least limit the environmental impact of an increase in milk production in these areas. This also includes more research on dairy production systems and how to improve the economic and environmental sustainability of these.

#### **4.5 Conclusion and policy recommendations drawn directly from the analysis**

Milk production will over time move to areas favourable for milk production (the Netherlands, Ireland, Denmark, Belgium and the northern part of Germany); however, growth in production in these areas is likely to be restrained by environmental regulations. Production may decrease in areas less favourable for milk production, yet milk production may also be kept unchanged (Austria, Finland and Sweden) due to a strong value chain and fewer alternatives to milk production. The current decline in milk production in the EU12 Member States, apart from Cyprus and Malta, is likely to continue due to strong competition from other types of farming and low levels of investments. Milk production may decline in Spain, Portugal, France and Italy, not as a result of the end of the quota system but because of strong competition from other types of farming in some areas and/or because farmers failed to invest at a level sufficient to ensure the continuation of milk production in these Member States. The end of the quota system may, however, also open up for structural development in these Member States if the quota system has repressed structural development.

In the short term, milk production may increase in the Member States that currently produce their milk quota as these Member States may have spare capacity and/or feed some of the produced milk to calves. Yet, apart from this and apart from in Ireland, it is not likely that the end of the quota system will cause dramatic changes in the balance between the economic and territorial balance of the milk sector.

Investment levels on dairy farms are low in many Member States as a result of several factors (the quota system, a weak value chain, an older generation of farmers with reasonable incomes, low incomes from dairy farming in combination with strong competition from other types of farming, the way farms change ownership). Regardless of the reasons, milk production is likely to decline in areas characterised by low levels of investment.

With the aim to secure a sustainable balance between the economic and territorial dimensions of milk production, the EU should aim at actions which make the milk sector more sustainable both economically and environmentally.

In order to secure a sustainable balance between economic and territorial dimensions, the following actions are envisaged:

**A. Actions which encourage structural development and investments**

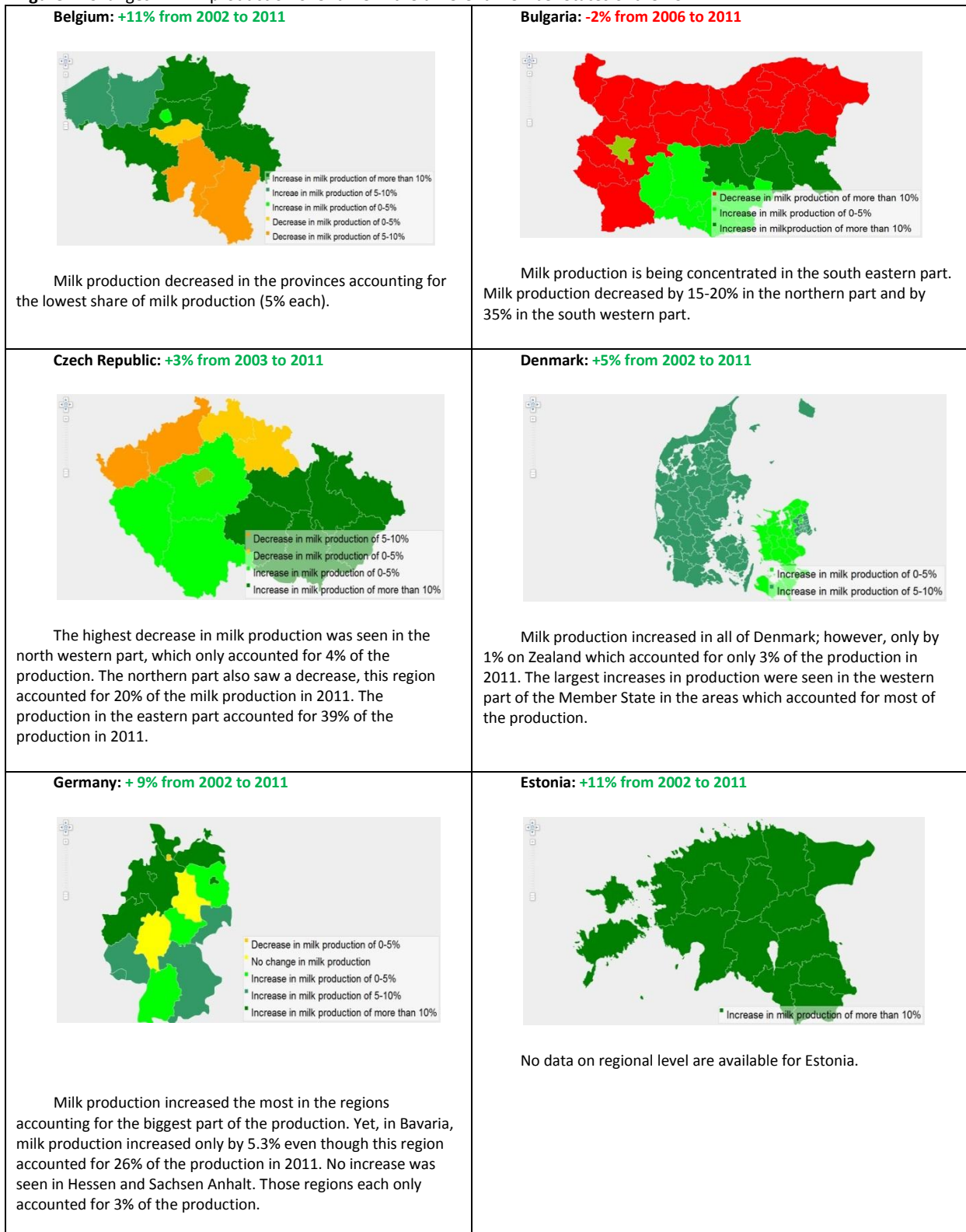
- a. **The Milk Package:** The implementation of the Milk Package is very important for farmers' motivation to invest. It is important to follow up on the implementation to see if it works as intended. It may be necessary to support farmers in forming and running producer organisations and it may be necessary to make adjustments concerning specific elements, such as the amount of milk an organisation can negotiate.
- b. **Access to capital on reasonable conditions:** Milk production in most parts of the EU is capital intensive and if farmers are to invest, they need access to capital on reasonable conditions. In some areas, it may be very difficult for farmers to raise capital and the capital might be associated with very high interest rates, which reduce the profitability of the investment. The EU could establish a loan fund for farmers in this respect or provide guaranties, which enable farmers to obtain loans through the normal routes of raising funds.
- c. **Reduce risks:** If farmers are to invest, they have to give up their currently very high solvency ratio. Farmers may be unwilling to do this if they deem the situation after the investment to be too risky. Political actions should therefore aim at reducing the risks associated with an investment, i.e., enable farmers to better protect their margins. As discussed earlier, the probably best way to do this would be to establish a futures market. However, to be effective this will in addition require substantial training and education of farmers in how to use such a market to protect their margins. While an insurance programme combined with a supply management programme may sound attractive, at least in theory, the applicability of such a system in practice is questionable. Moreover, the administration costs of such a system are deemed to be high and in any case it is difficult or even impossible to design a system which is attractive for most EU dairy farmers due to the heterogeneity of farms.
- d. **Encourage generational changes:** The EU cannot facilitate generational changes alone as this also relates to national regulations but in cooperation with the Member States, the EU could facilitate change of ownerships outside the family by establishing a loan fund, which provides loans to such young farmers under favourable conditions. By establishing exit regimes, the EU may motivate the older generation to give up farming and transfer the farm to young farmers. In this way, the EU may enable a structural development, which is important for the continuation of dairy farming. The current rural development programme does contain such initiatives; however, judged by the current structure and the extent to which they work or are applied in the individual Member States, the initiatives seem to be insufficient to ensure the development of a viable and prosperous dairy sector in the long term. One possible explanation could be that these initiatives require co-financing from Member States and therefore it is worth considering letting the EU finance these initiatives.


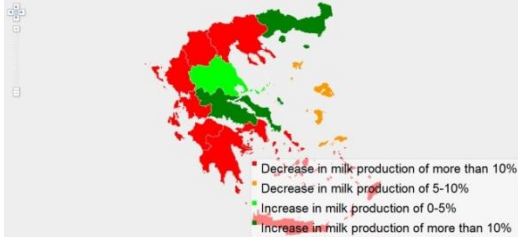
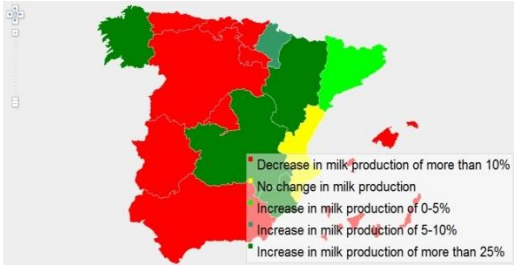
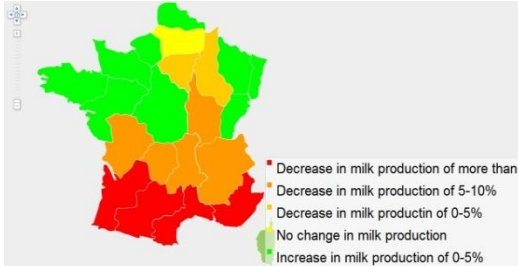
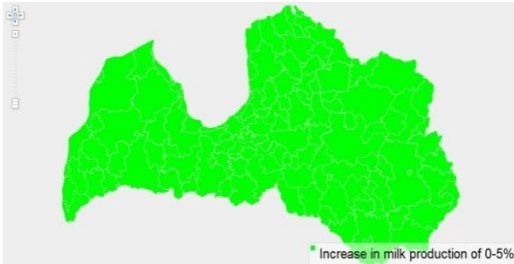

- e. **Education and training:** Thirty years with milk quotas has repressed structural development in some Member States and many farmers may not be well prepared for the changes which confront them due to both the end of the quota system but also greater volatility in prices. Training and education on how to tackle future challenges could be important, as well as training, knowledge and advisory services on how to operate larger farms for those farmers wanting to expand their current facilities. This could also include training and education of farmers across Member States or support of transnational discussion groups for farmers in order to transfer knowledge between Member States.
- B. Establishment of environmentally sustainable production systems for milk production:** In areas favourable for milk production, further growth is limited by the environmental intensity in these areas. In order to grow milk production and in turn take advantage of a growing world market, more research is needed on how to avoid or at least limit the environmental impact of an increase in milk production in these areas. This also includes more research on dairy production systems and how to improve the economic and environmental sustainability of these. Initiatives which support biogas production based on slurry could also be a way forward to achieve a better utilisation of nutrients.
- C. Actions which enable milk production in areas less favourable for milk production provided it is regarded important to keep milk production in these areas**
  - a. It is necessary to provide financial support and the support should be coupled to milk production if the aim is to keep milk production in these areas. The financial support should be calculated based on objective criteria and be “dynamic” over time allowing the support to be adjusted for productivity gains in order to encourage dairy farmers in these areas to improve their competitiveness.
  - b. Encourage group farming in order to achieve economies of scale when possible but also to improve the quality of life for farmers in these areas.
  - c. Support product innovation, promotion of niche products, etc. in order to enable farmers to achieve a high milk price to cover some of the extra costs and in turn also make milk production in these areas more economically sustainable.
  - d. The comments made under Point A also apply for these areas.

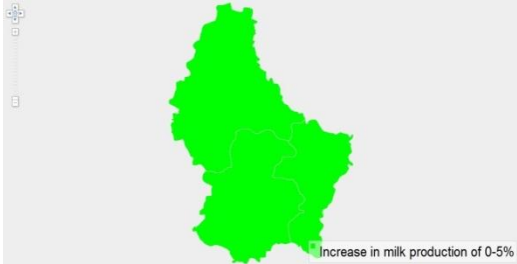
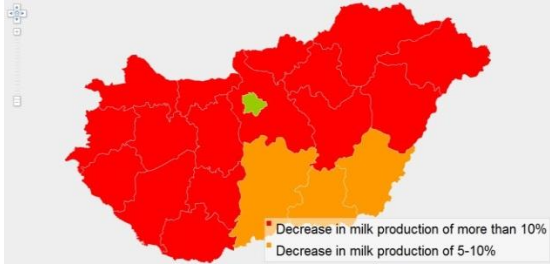
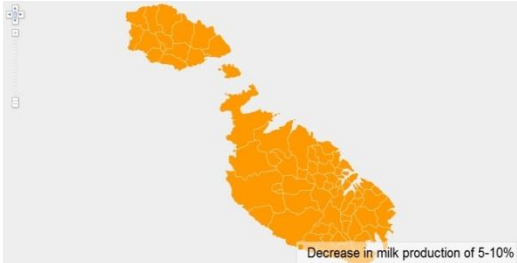
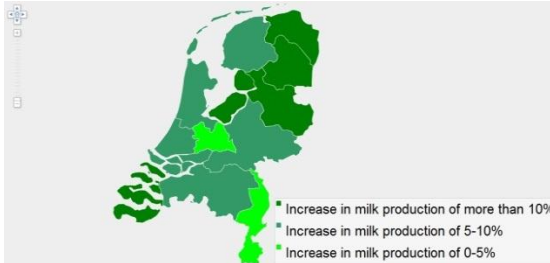
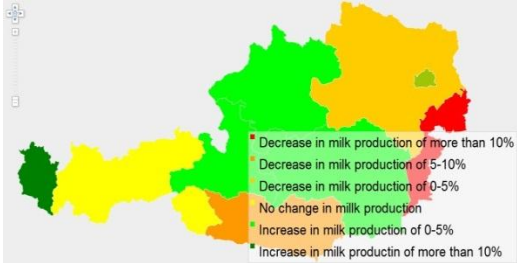
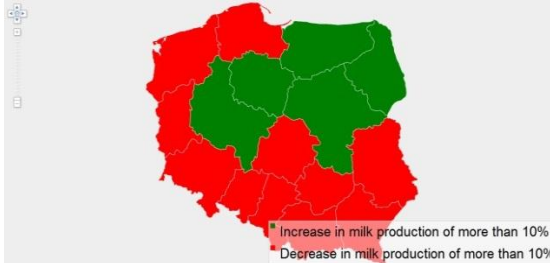


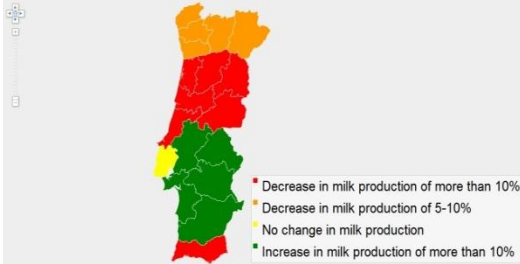
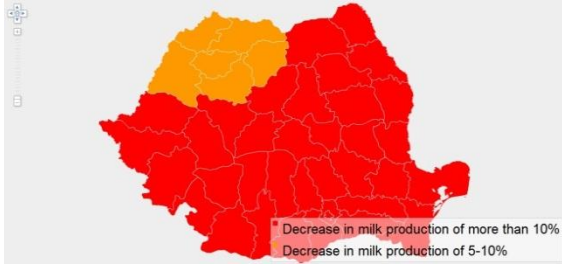


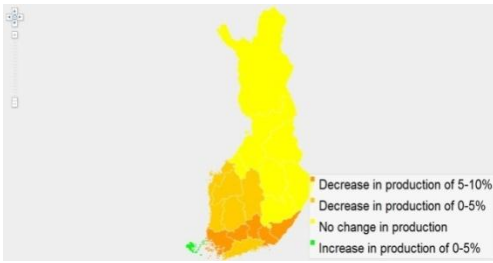
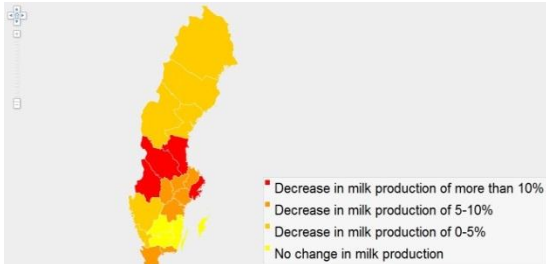
**Appendix 1**

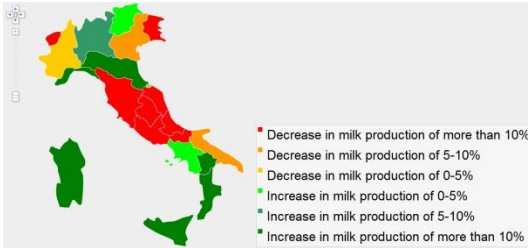
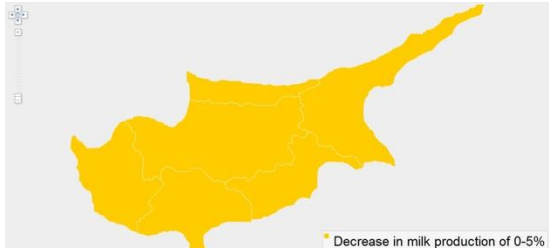
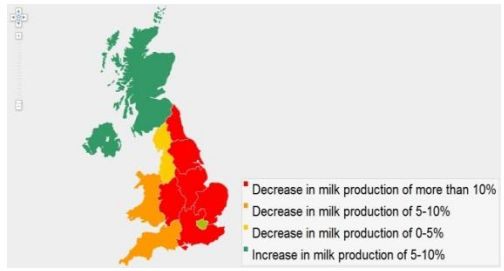
**Figure 1: Changes in milk production over time in the different Member States of the EU**



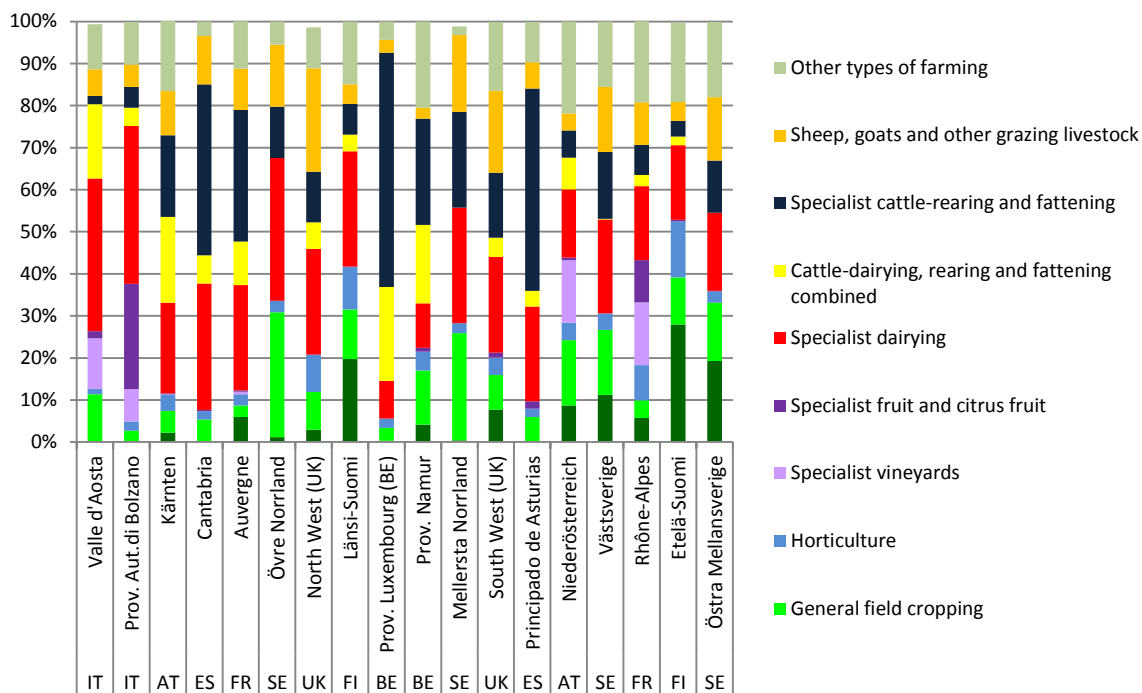
<p><b>Ireland: +9% from 2002 to 2011</b></p>  <p>Milk production decreased by more than 10% in the northern part. This region, however, only accounted for 20% of the milk production in 2011. Thus, milk production became even more concentrated in the southern part of the Member State.</p>	<p><b>Greece: -17% from 2003 to 2011</b></p>  <p>The biggest milk producing region in Greece is Central Macedonia, this region accounted for 48% of the milk production in Greece. This region saw, however, a decrease of 18%. Apparently production has moved to East Macedonia and Trace and the central part of Greece.</p>
<p><b>Spain: -2% from 2002-2011</b></p>  <p>Generally, milk production increased in the areas holding the highest share of the milk production in Spain, i.e., the north western part and the north eastern part of the Member State. Cantabria, Asturias and Andalucía each accounted for 7% to 9% of the production. All of these regions saw a decrease in production of 16% to 24%. Castilla Mancha and Murcia saw large increases in production of more than 30%; however, these regions only accounted for 3% and 1% of the production, respectively.</p>	<p><b>France: -1% from 2002 to 2011</b></p>  <p>Generally, milk production increased in the regions holding the highest share of the milk production in France. The regions which saw an increase in milk production accounted for 70% of the milk in 2011. A decrease was seen in the south western part of France - this area accounted for 7% of the production in 2011. The south eastern area holding 11% of the milk production saw a decrease of 8% in the time period. The Mediterranean area also saw a decrease in production; however, this area accounted for less than 1% of the production in 2011.</p>
<p><b>Latvia: +2% in milk production from 2002 to 2010</b></p>  <p>No data exists on a regional level.</p>	<p><b>Lithuania: -2% in milk production from 2002 to 2010</b></p>  <p>No data exists on a regional level.</p>

<p><b>Luxembourg: +5% in milk production from 2002 to 2009</b></p>  <p>Increase in milk production of 0-5%</p> <p>No data exists on a regional level.</p>	<p><b>Hungary: -16% in milk production from 2003 to 2011</b></p>  <p>Decrease in milk production of more than 10% Decrease in milk production of 5-10%</p> <p>Milk production decreased in all of Hungary. The decrease varied from 9% to 23%. The lowest decrease was seen in the southern part. This region accounted for 22% of the production.</p>
<p><b>Malta: - 6% in milk production from 2002 to 2008</b></p>  <p>Decrease in milk production of 5-10%</p> <p>No data exists on a regional level.</p>	<p><b>The Netherlands: +9% in milk production from 2002 to 2011</b></p>  <p>Increase in milk production of more than 10% Increase in milk production of 5-10% Increase in milk production of 0-5%</p> <p>Milk production increased in all regions; however, the largest increases in milk production were generally seen in the north eastern part of the Member State.</p>
<p><b>Austria: No change in milk production from 2002 to 2011</b></p>  <p>Decrease in milk production of more than 10% Decrease in milk production of 5-10% Decrease in milk production of 0-5% No change in milk production Increase in milk production of 0-5% Increase in milk production of more than 10%</p> <p>Milk production increased in the central part of the Member State in the regions Styria, Upper Austria and Salzburg. The provinces accounted for 57% of the milk production in 2011. Production decreased by 2% in Lower Austria; this region accounted for 20% of the production. Production also decreased in Burgenland; however, this region only accounted for 1% of the milk production. The largest increase was seen in Vorarlberg, which accounted for 5% of the milk production in 2011.</p>	<p><b>Poland: +5% in milk production from 2002 to 2011</b></p>  <p>Increase in milk production of more than 10% Decrease in milk production of more than 10%</p> <p>Milk production increased in the regions in the central and north eastern parts of the Member State. These regions accounted for about two-thirds of the milk production in Poland in 2011. The development over time shows that milk production is being concentrated in central and north eastern regions of Poland.</p>

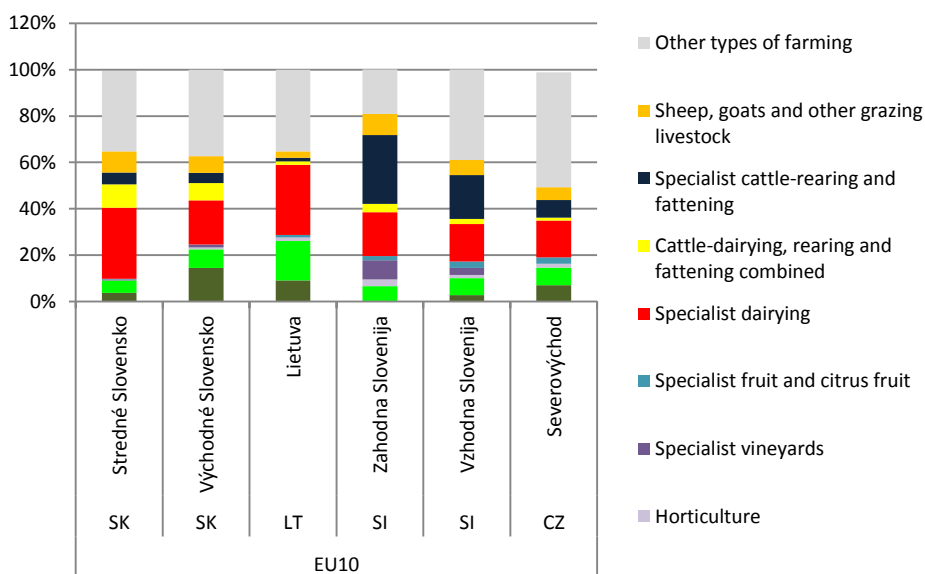
<p><b>Portugal: -9% in milk production from 2002 to 2011</b></p>  <p>The Azores (not shown on the map) accounted for 29% of the milk in 2011. Production on the Azores increased by 8% over the time period. The Norte region accounted for 39% of the milk. Production in this region decreased by a little more than 5%. Production in the Centro (PT) region decreased by 30%, while production in the Alentejo region increased by 90% and accounted for 12% of the milk in 2011. Thus, milk production has moved from the Northern and Central region to the Alentejo region.</p>	<p><b>Romania: -19% in milk production from 2004 to 2011</b></p>  <p>Milk production decreased in all of Romania. The decrease varied from 2% in the North West region to 34% in the Sud Montenia region.</p>
<p><b>Slovenia: -10% in milk production from 2007 to 2011</b></p>  <p>Milk production increased by almost 10% in both the eastern and western part of the Member State. The eastern part of the Member State accounted for almost two-thirds of the milk production in 2011.</p>	<p><b>Slovakia: -19% in milk production from 2003 to 2011</b></p>  <p>Milk production decreased by 14% in the Bratislava region and by 56% and by 26% in the central and eastern part of the Member State. At the same time, milk production increased by 39% in the western part of the Member State.</p>
<p><b>Finland: -7% from 2003 to 2011 and -2% from 2007 to 2011</b></p>  <p>Milk production generally decreased in the southern and central-western part of the country, whereas production remained unchanged in the western and northern part. The latter accounted for 55% of the milk production in 2011.</p>	<p><b>Sweden: -13% from 2002 to 2011 and 5% from 2007 to 2011</b></p>  <p>Milk production decreased in all regions but the Smaaland including the islands region. This region accounted for 29% of the milk production. The biggest decrease of 12% was seen in the central part of the northern middle part of Sweden. This region accounted for 6% of the production in 2011.</p>

<p><b>Italy: +5% from 2002 to 2011</b></p>  <p>More than 80% of the milk was produced in the north western and north eastern part of Italy. The central part accounted for 6% of the production and the southern part for 11% of the production. The decrease in production was most immediate in the Tuscany and Lazio region as production decreased by 46% and 31%; yet, these regions only accounted for 1% and 4% of the overall production, respectively.</p>	<p><b>Cyprus: -1% in milk production from 2002 to 2010</b></p>  <p>No data exists on a regional level.</p>
<p><b>UK: -5% from 2002 to 2011 and -7% from 2002 to 2010</b></p> 	<p>Milk production generally decreased in England, especially the eastern part of England. The regions seeing the most dramatic decreases; however, each only accounted for less than 5% of the milk production. Generally, milk production decreased less in the regions which accounted for most of the milk. Only Northern Ireland and Scotland saw increases in production. Those two regions accounted for 15% and 10% of the milk production, respectively. Milk production in Scotland is concentrated in the south western part of Scotland. This area accounted for 80% of the milk production in Scotland.</p> <p><i>* Data from 2011 are lagging for Northern Ireland and West Midlands; therefore, data from 2010 are used for these two regions</i></p>

**Figure 2:** The distribution of employment on farming activities in the regions which are dominated by dairy farming in terms of employment. Employment is measured by annual work units<sup>107</sup>



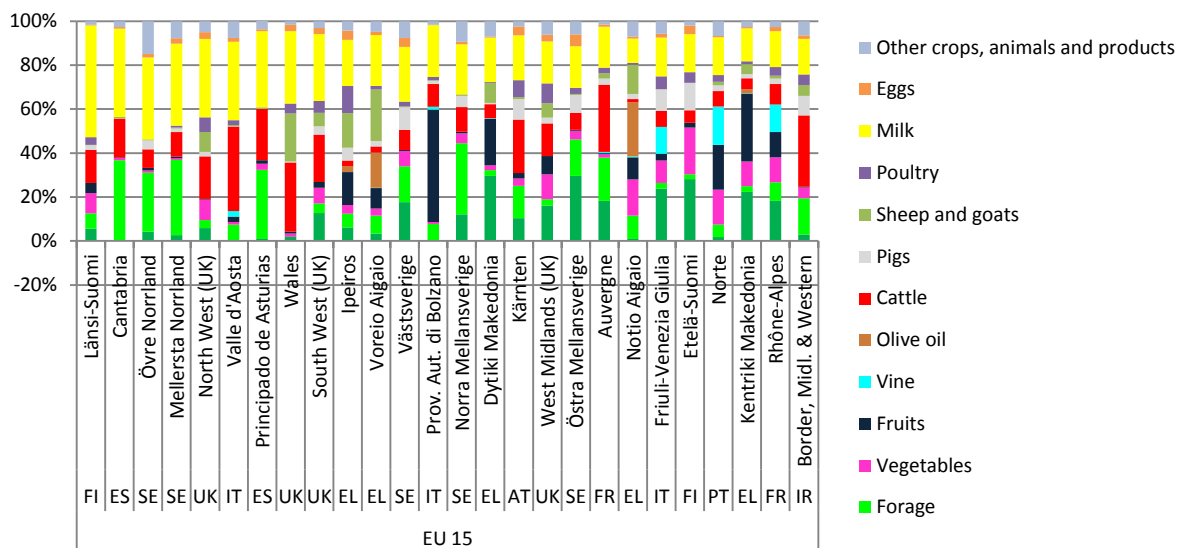
**Figure 3:** The distribution of employment on farming activities in the regions which are dominated by dairy farming in terms of employment. Employment is measured by annual work units<sup>108</sup>



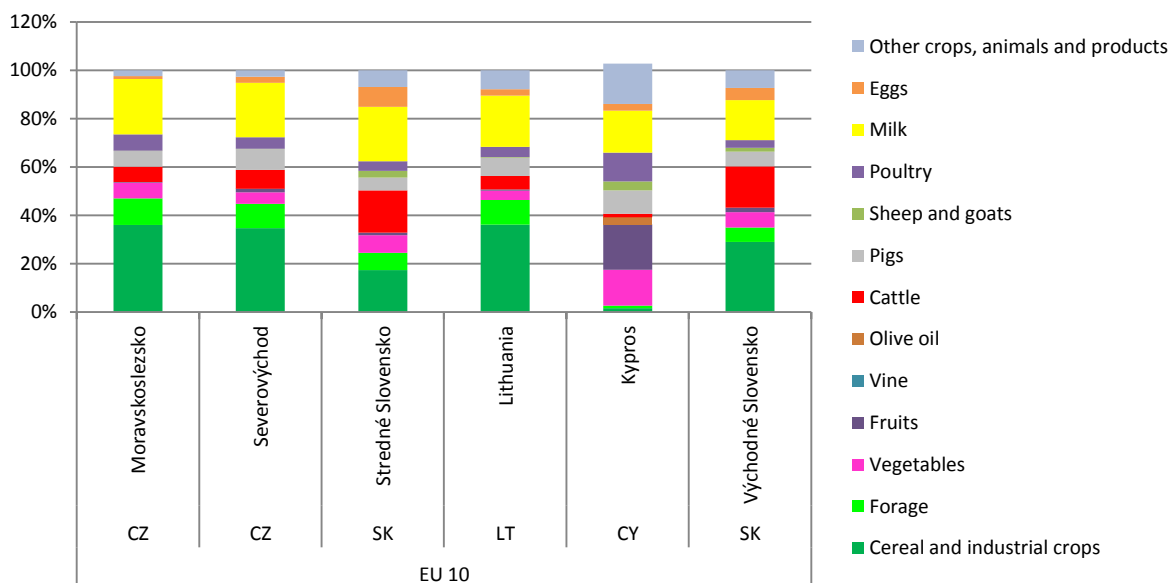
<sup>107</sup> Source: Eurostat Key variables: Area, livestock (LSU), labour force and standard output (SO) by type of farming (2-digit) and NUTS 2 regions [ef\_kvftreg]

<sup>108</sup> Source: Eurostat Key variables: Area, livestock (LSU), labour force and standard output (SO) by type of farming (2-digit) and NUTS 2 regions [ef\_kvftreg]

**Figure 4:** The composition of agricultural output in 2010 in the regions characterised by a high share of the output coming from milk products<sup>109</sup>

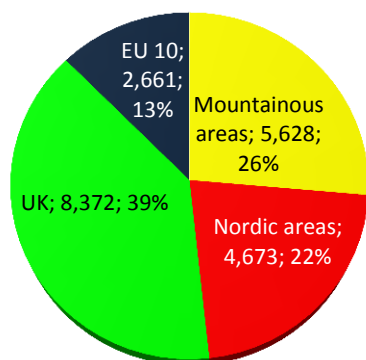


**Figure 5:** The composition of agricultural output in 2010 in the regions characterised by a high share of the output coming from milk products<sup>109</sup>

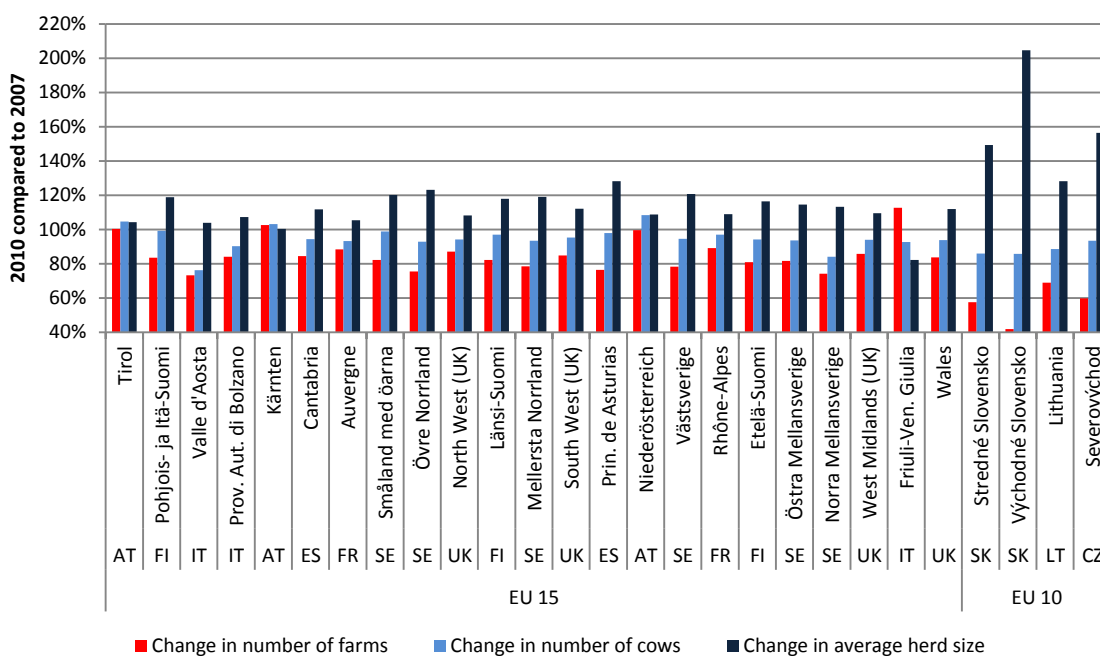


<sup>109</sup> Source: Eurostat: Eurostat: Agricultural accounts according to EAA 97 Rev.1.1 by NUTS 2 regions [agr\_r\_accts] & Economic accounts for agriculture - values at current prices [aact\_eaa01]

**Figure 6:** Milk production in 2011 in the areas dominated by dairy farming in terms of employment within the agricultural sector and in terms of milk output as share of the total agricultural good output<sup>110</sup>



**Figure 7:** Change in number of farms, number of cows and average herd size from 2007 to 2010<sup>111</sup>

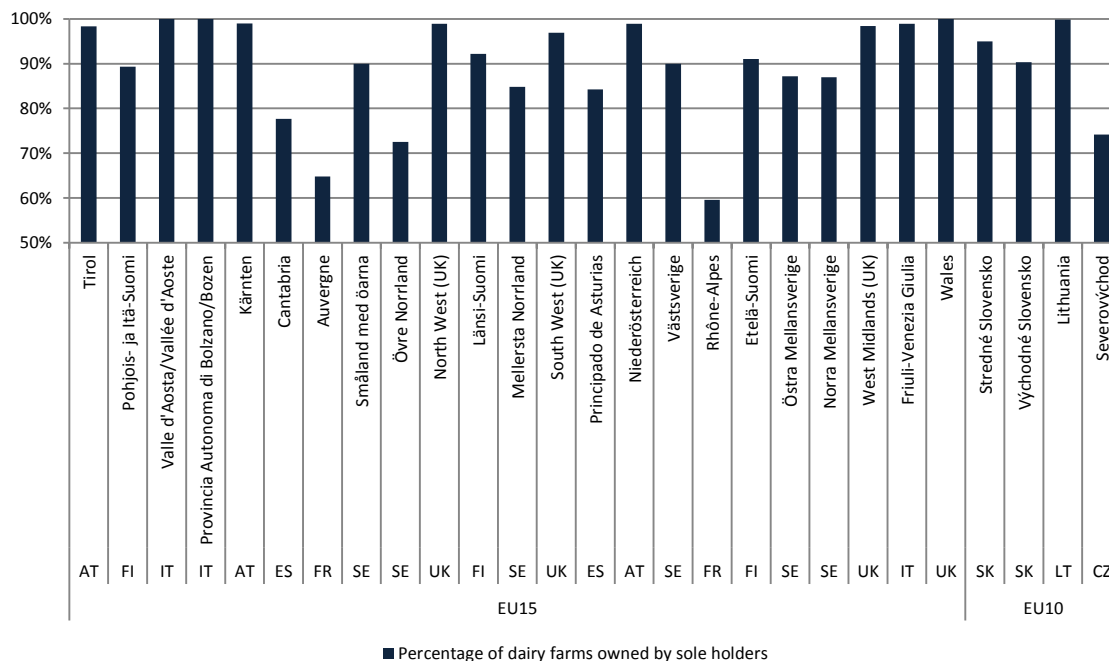


<sup>110</sup> Source: Eurostat: Production of cow's milk on farms by NUTS 2 regions (1 000 t) [agr\_r\_milkpr].

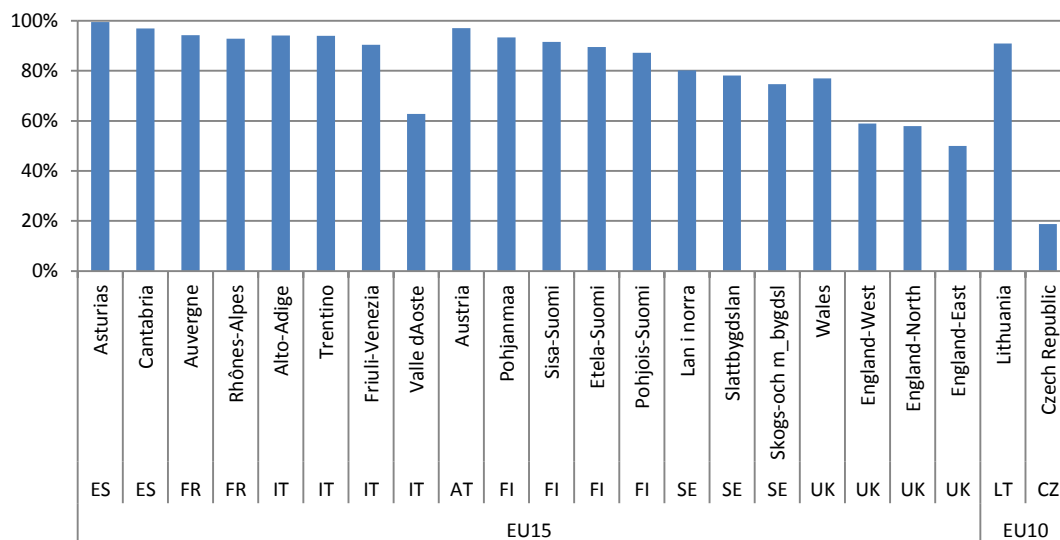
<sup>111</sup> Source: Eurostat. Livestock: Number of farms and heads of animals of different types by agricultural size of farm (UAA) and NUTS 2 regions [ef\_olsaareg]



**Figure 8:** Percentage of farms owned by sole holders<sup>112</sup>

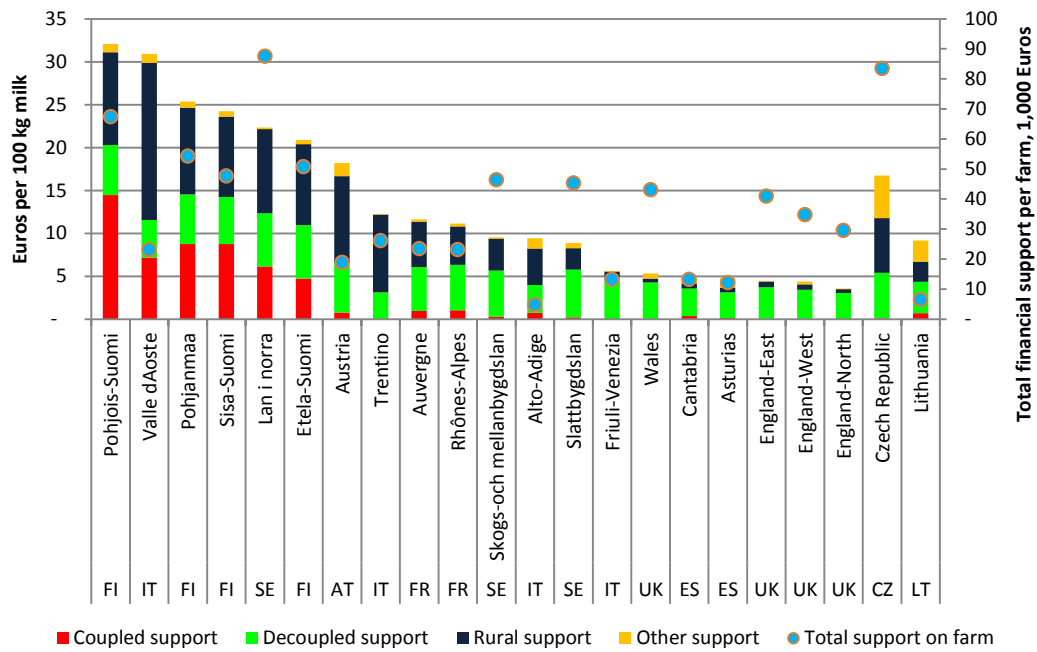


**Figure 9:** Proportion of family labour applied on the farms in 2009 out of total labour applied (Source: FADN)



<sup>112</sup> Key variables: area, livestock (LSU), labour force and standard output (SO) by type of farming (2-digit) and NUTS 2 regions [ef\_kvftreg]

**Figure 10:** Total financial support on farms and the composition of the support (Source: FADN)



**AGRI-2012-C4-04 - Analysis on future developments in the milk sector**

Prepared for European Commission - DG Agriculture and Rural Development

Opinion Report

Expert Name: Heikki Lehtonen

**Theme 2: Sustainable milk production including its territorial dimension**

## 1. Introduction

Agricultural economics and structural change dynamics points of view are emphasised in this report when answering the analysis questions. The opinions are primarily based (and biased) on research experience obtained in economic and policy analysis of northern European dairy sector. However, it is expected that at least a similar kind of reasoning is valid in most other parts of Europe as well. The role of economically viable and profitable dairy investments, implying changes in farm size distribution and farm level productivity development, as well as agglomeration economies with resource constraints in the context of region-specific opportunity cost of labour, are emphasised. These driving factors are assumed to be decisive also in terms of social and environmental dimensions of sustainability, which however, are not under as systematic analysis as the economic dimension. The resulting bias toward economic dimension of the sustainable milk production, at the expense of the environmental and social dimensions of sustainability, is also intentional in order to show another perspective on the results reported in the literature on the effect of milk quota abolition on European dairy sector, also summarised in theoretical analysis and the descriptive chapter.

The data, methods and reasoning related to each analysis question are presented below. Some highly relevant observations and outcomes from agricultural economics and rural development literature are also included in the analysis of the main questions. General findings are summarised in concluding each analysis question. However, the concluding chapters at the end of each question are also cumulative in the sense that the answers given for the first question become better explained in the answers given to the later questions. For this reason, the conclusion and policy recommendations presented after the last analysis question provides a short summary on the overall Theme 2 as well.

## 2. What will be the contribution of the milk sector to maintaining vibrant rural communities, especially in the most fragile areas?

### 2.1 Interpretation and comprehension of the key terms of the evaluation question

**Milk sector** is a value chain from dairy farms and their closest input suppliers, such as neighbouring farms or contract work suppliers (in manure spreading, feed production, etc.), up to dairy milk processing industry in a region. Detailed analysis of the retail sector is not attempted while observed consumer demand trends on e.g., organic or locally produced milk and dairy products, and shifts of demand between different groups of dairy products, are taken into account.

In evaluating the role of the milk sector in rural economy and the contribution of the milk sector to rural communities, it is useful to identify two main dimensions:

1. Milk sector competitiveness (relative to other domestic regions or internationally)
2. Strength of the rural economy (relative to other domestic regions)

The strength of the rural economy relative to other domestic rural regions is understood in terms of income level, employment and the risk of becoming unemployed. In other words, a strong rural economy is one with

relatively high levels of income and employment as well as a diversity of industries providing employment (contrary to thin and one-sided labour markets typical for weak peripheral rural economies).

Following the principles of Breman et al. (2010) one may construct four combinations of the two dimensions:

1. Areas of competitive milk sector and strong rural economy with high level of socio-economic dynamics
2. Areas of uncompetitive milk sector and strong rural economy with high level of socio-economic dynamics
3. Areas of competitive milk sector and weak rural economy and socio-economic dynamics
4. Areas of uncompetitive milk sector and fragile rural economy and socio-economic circumstances

This grouping, presented in Figure 1, is useful because the contribution of the milk sector on rural communities is fundamentally different in these four different cases.

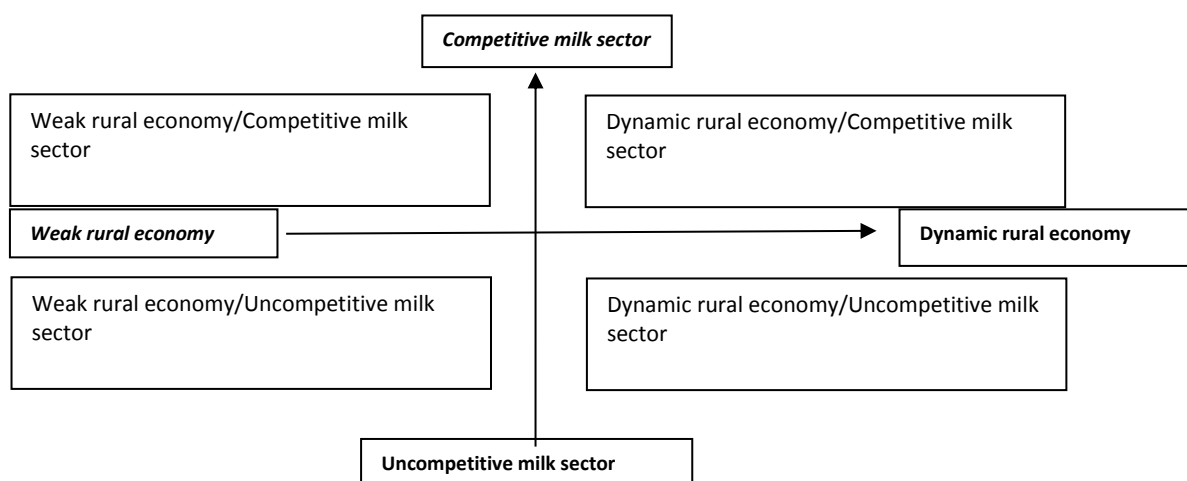


Figure 1. Agricultural competitiveness in the context of dynamic (strong) and weak (fragile) rural economies (following Breman et al. (2010)).

Let us give examples of the four different cases on the role of milk sector in the rural community. First, consider the case of a *weak rural economy and uncompetitive milk sector*. In such cases, poor competitiveness of milk sector has probably already negatively affected the rural community, which in turn weakens the rural infrastructure and further weakens the competitiveness of agricultural activities. Examples of such regions might be sparsely populated less favoured areas, distant from cities and dynamic economic areas, with aging population and outmigration of young people. On such regions, milk sector and farms are rather dependent on dairy market developments and agricultural policies, and especially on agricultural support (either in the form of high prices or production linked support payments) which keep farms in production and maintain raw milk supply for dairy processing industry in the region. Despite the low competitiveness and high production costs, farms in such regions may stay in production due to production-linked agricultural support payments as well as due to low opportunity cost of labour because of little or no alternatives for employment in the region. Sufficiently high dairy product and raw milk prices and the reasonable attainable farm income, made possible also by price premiums or agricultural policies, may maintain dairy production on uncompetitive regions and often on farmland of relatively low productivity in other agricultural use (except grassland). If some of these three components (high milk prices, production-linked agricultural support payments and poor employment opportunities outside agriculture) are no more valid, then milk production is easily ceased on many farms on such regions.

Second case, *strong and dynamic rural economy and uncompetitive milk sector* means that uncompetitive farms are most likely somewhat benefitting from local demand and infrastructure created and maintained by other industries. For example, local/national milk product brands may offer dairies and milk producers some price premium, providing some compensation for the high production costs due to low productivity and/or low yield level or other natural disadvantages. On the other hand, milk producers are also easily pulled out from milk production and even from agriculture altogether either by lucrative earnings in other industries, or by possibilities for pluriactivity, i.e., combined (non-livestock) farm activities with other professions. For example, rural tourism or maintenance of cultural landscapes in areas adjacent to towns and cities may provide such pluriactive opportunities.

Third case, *competitive milk sector and weak rural economy* could mean milk production areas with rapidly increasing farm size and productivity for decades, assisted by relatively low land prices due to decreasing development in other sectors of the economy. However, the competitive milk sector also means that relatively little labour is needed per quantity produced on specialised dairy farms, which are also dependent on production inputs imported outside the region. Hence, the rapid structural development and substitution of capital for labour has probably partly contributed to the decreasing employment in a weak rural economy. However, for the most part, the fragile rural economy has resulted from inability to launch viable economic activities utilizing rural resources or competence of the rural people (Kangasharju & Pekkala 2004, Lehtonen et al. 2012). Such regions could be even the ones that are located at a distance from cities offering employment, and hence young people migrate out of the region.

Areas representing the fourth case, competitive milk sector and strong rural economy, could be located in areas close to cities offering a multitude of industries for employment while favourable conditions and natural resources, such as good soils, or proximity to milk processing plants and customers, provide low costs of production and opportunities for dairy farms. However prices of land and labour are typically high in such regions. It also requires long-term competence building and good management of dairy farms to reach competitive farm incomes in such circumstances. Any sustained, significant decrease in profitability in milk production could easily push out some farmers from milk production because of good income prospects in other employment opportunities.

Eventually, based on this approach, one may define 'vibrant rural communities', in the context of evaluating the contribution of milk sector on rural communities, as follows:

**Vibrant rural communities** are here interpreted as rural economies where economic welfare and income levels as well as employment are on solid basis. Income level and employment (or employment rate) may be below but not very far away from the national averages. Hence such regions maintain their population and even a significant share of young professionals. Income level of such successful rural regions is relatively higher compared to average rural regions, or at least compared to the rural regions of the lowest income level.

There are however two kinds of 'vibrant' rural communities of specific interest in this study; however, (1) those where dairy milk production has a role to play in the development of income level and employment, and where dairy milk production has a non-negligible economic impact overall; (2) regions where milk production has a marginal role in a rural economy.

Income levels of farm households are often lower than the average national or regional average. This implies that regions which are significant dairy milk producers and where milk production has a non-negligible economic impact overall are likely to have a lower income level per capita than in cities and their neighbouring areas, or the national average. Still income level in these regions may be clearly higher than in most other rural regions.

Hence in the context of this study, regions where rural employment has been relatively stable, if not increasing, are understood as 'vibrant'. Many rural communities, both in Europe and in north America, even those where dairy production is developing favourably, are often losing the number of jobs and lagging behind in overall economic development already (Partridge et al. 2007, 2008; Kangasharju & Pekkala 2004). Gradual (not necessarily rapid) depopulation of rural regions is somewhat typical in many EU countries, even in regions which are important dairy milk suppliers. For this reason, rural regions which have a lower income level per capita than national average or some other rural regions (close to cities and benefiting from the job

opportunities and demand of the city areas) may still be called 'vibrant' if they have a solid employment, partly facilitated by competitive dairy milk production with reasonably good and stable prospects of income and employment.

**Most fragile areas**, on the other hand, are especially those where:

(1) There are few, if any, alternatives for profitable *agricultural production* except dairy (and related beef) production, i.e., due to natural handicaps, such as cold climate, poor soils, resulting low crop yields and high costs due to unfavourable topography and farm structure ("fragile agriculture"). In addition, certain socio-economic factors, such as long distances and poor infrastructure and poor possibilities for work division through sub-contracting, inhibit productivity growth even further.

(2) Dairy milk production which offers a significant income and employment in a region has already had difficulties to remain profitable, low prices have already seriously challenged the economic viability of many farms, the milk production in a region and is likely to have major difficulties to cope with decreasing real prices of milk (uncompetitive milk sector).

(3) Economic development is relatively most lagging behind other rural regions and employment opportunities outside agriculture are few and still shrinking, for example due to weak demand for locally produced products and services due to decreasing, aging and inactive population, or generally low income level (weak rural economy).

Potential fragile areas are those where a significant decrease in milk production has been observed already. Such regions, where milk production is vulnerable to negative market shocks, could be called fragile regions in terms of milk production. However, all regions with significant volumes of dairy production, at a risk of losing some production, are not necessarily 'fragile areas'. Some regions, of "rural dynamic" type, may recover well from decreasing milk production volumes due to other opportunities in agriculture, and in other sectors of the economy.

On *real fragile areas*, there are few, if any economically viable options for farm employment, in addition to milk production, inside and outside agriculture. Hence, the focus is on areas where dairy milk production is vulnerable but still has a significant and even crucial economic role. In fragile areas, economy and employment are already shrinking, while they are vulnerable to any significant reductions in milk production.

Fragile regions have a lot to lose if dairy milk prices decrease (at least in real terms) due to milk quota abolition and other developments in the dairy sector. Such developments may arise not only because of decreasing producer price of milk at the national or aggregate level but also due to increasing competition in specific key dairy products produced in fragile areas, or shifts of demand to those dairy products in which some fragile areas and their dairy processors are not competitive.

## 2.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

Previous definitions and the additional criteria given below are utilised in describing fragile areas in more detail. Pointing out the specific fragile regions in terms of milk production, according to the definitions above, is not done yet in this chapter, but is done later in Chapters 4 and 5.

Data showing the role of milk production in agriculture is provided in Figure 2 pointing out a number of countries where the share of milk in agricultural production (by value) is 20% or higher - the EU average in 2010 was 13.9%. Accounting for the value of milk only does however underestimate the role of milk production – at least dairy husbandry – if no meat (beef) production is taken into account. In reality, the economic value produced by dairy farms, out of the total value of agricultural production, is a few percentage points higher.

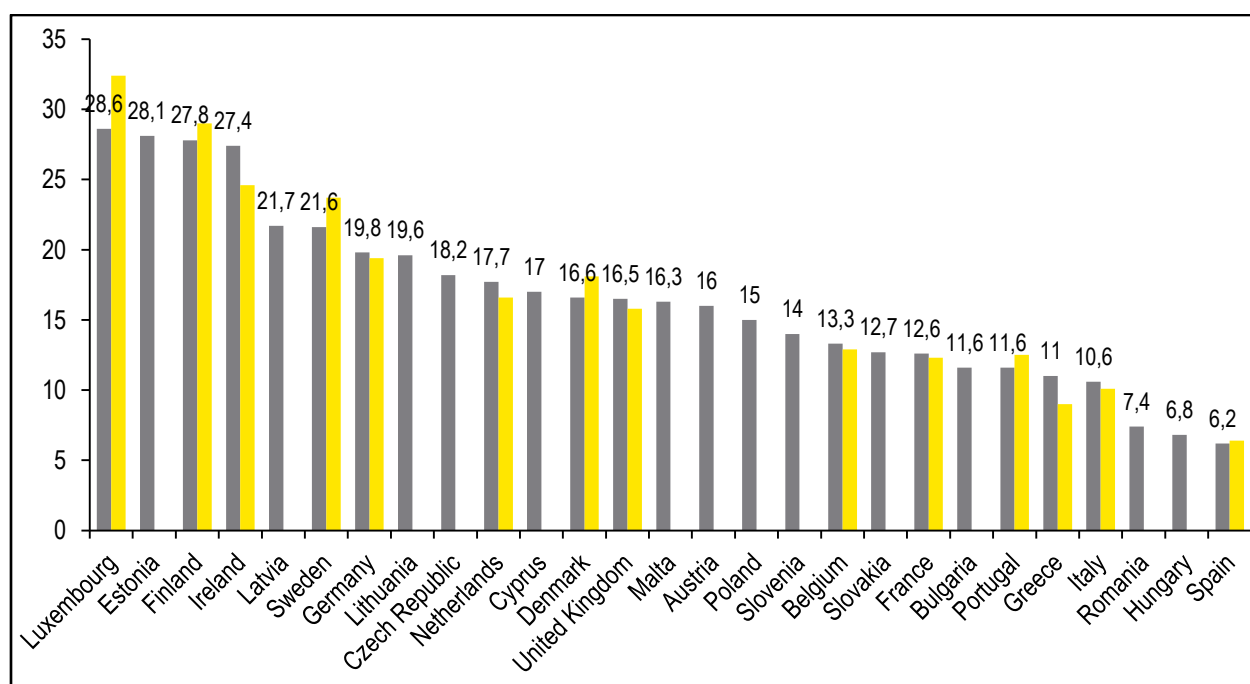


Figure 2. Share of milk in agricultural production (%) (grey bar-2011 situation; yellow bar-2000 situation – not visible in Member States integrated after 2000)

Especially in countries, such as Luxembourg, Estonia, Finland, Ireland, Latvia, Sweden, Germany (at least in mountain regions), Lithuania and Czech Republic, milk sector has been long a very important sub-sector in agriculture. In those countries, as well as in some others such as in Cyprus, UK and Austria, there are likely to be individual regions, with possibly less suited conditions (physical or economic production conditions) for other agricultural activities, where this share is considerably higher than 20 percent. On the other hand, it seems that in countries where the share of milk production is close to 10 percent or even less, other sub-sectors of agriculture are clearly more important than milk production. In those countries, some individual regions economically dependent on milk production may still be found but they are likely to be relatively few.

The number of dairy cows per farm is one indicator on the state of development of the dairy sector. The importance of economies of scale is likely to increase due to milk quota abolition and intensifying competition. Countries with large farms benefit from economies of scale and specialisation while countries producing most of their milk on small farms are likely to be relatively disadvantaged under increased competition and reduced prices of milk which also reduce gross margins and incentives and possibilities of farm expansion. Especially, if market developments lead to periods of very low prices (experienced 2008-2009), the profitability and liquidity situation on large recently invested dairy farms may become very challenging due to interest on borrowed capital. However, the level of production costs and initial gross margin before the intensified competition also affect profitability of farm enlargements, not only initial farm size. Farm size can be probably enlarged through profitable investments in areas where small farms may find reasonably priced land and other resources and are able to reach favourable gross margins after the investments. Nevertheless, the initial farm size and farm size structure is an important determinant of future prospects of the dairy farms. Large investments for farm enlargements necessary for viable and competitive production are also risky when based on borrowed capital. And it is also increased price volatility, not only the reduced expected real price of milk that is implied by the milk quota abolition.

Rapid structural change in dairy milk production, especially the farm size growth, exit of dairy farms and the resulting herd size distribution development, has led to a rapidly decreasing number of dairy farms in many countries and regions at the European scale including less favourable areas and remote rural areas (Zimmermann & Heckeley 2012). If the quantity of milk produced per farm doubles every 10 years (reached if the number of farms decrease at rate of 6.7 percent annually – which is not unusual in Europe 1995-2005, Zimmermann & Heckeley 2012), it implies rapidly decreasing rate of the number of dairy farmers and jobs in milk production. This is due to increased labour use efficiency, which results when labour-intensive production

techniques are replaced by capital intensive techniques. When farm size is rapidly increasing, labour input per litre of milk decreases very significantly even if increased contract work purchased outside farm is accounted for (Pyykkönen et al. 2010, 2013).

Table 1. Number of dairy cows per farm (Table 14 in the descriptive chapter)

	2000	2003	2005	2007	2010	2012 (*)
<b>Austria</b>	9	9	10	11	11	14
<b>Belgium</b>	34	35	36	39	46	45
<b>Bulgaria</b>	-	2	2	3	4	-
<b>Cyprus</b>	-	104	101	94	103	-
<b>Czech Republic</b>	-	55	65	74	123	171
<b>Denmark</b>	57	75	85	101	134	146
<b>Estonia</b>	-	10	13	18	27	-
<b>Finland</b>	15	17	19	21	24	28
<b>France</b>	-	36	37	41	45	50
<b>Germany</b>	31	36	38	40	46	48
<b>Greece</b>	13	15	17	20	23	-
<b>Hungary</b>	10	13	18	22	22	-
<b>Ireland</b>	37	41	45	50	58	58
<b>Italy</b>	23	28	30	30	35	36
<b>Latvia</b>	3	3	3	4	6	-
<b>Lithuania</b>	-	2	3	3	4	-
<b>Luxembourg</b>	37	39	41	37	56	51
<b>Malta</b>	-	45	40	43	48	-
<b>The Netherlands</b>	47	59	61	60	75	76
<b>Poland</b>	-	3	4	4	6	6
<b>Portugal</b>	11	12	18	20	27	-
<b>Romania</b>	-	1	1	2	2	-
<b>Slovakia</b>	13	15	14	15	24	-
<b>Slovenia</b>	5	8	7	6	10	-
<b>Spain</b>	16	21	24	26	31	26
<b>Sweden</b>	32	41	46	52	62	-
<b>United Kingdom</b>	73	78	78	69	78	123

Table 1 provides a view where dairy production has already been developed in terms of utilising economies of scale (not necessarily showing the competitive advantage of production, however). In such Member States, the number of dairy farms is already relatively low, as well as their use of labour. On the contrary, in Member States with a small dairy farm size, increased competition and decreasing price of milk probably accelerate the decrease in the number of farms in milk production, especially if total milk production will decrease as well. Hence, a small farm size is likely to imply significantly decreasing use of labour in dairy production. This will realise either (1) through increased pressure (due to decreased gross margins and profitability) to improve overall productivity and especially labour productivity on dairy farms; (2) decreasing production. Both ways decrease the use of labour in agriculture, and the more the higher the share of dairy production out of the total production value of agriculture.



### 2.3 Description of the method(s) used and an indication of its (their) limitations

A major limitation in the literature, from the viewpoint of this study, is that there are few earlier studies available where statistical information on the role of milk production (not only agriculture) in the entire rural economy would have been gathered consistently in different Member States. Hence the approach here concerning the contribution of the milk sector to maintaining vibrant rural communities relies mostly on (1) key references in rural development literature on the relationship between agricultural development, structural change and rural communities; (2) selected key statistical data presented above, showing the meaning of intensifying competition and probably increasing rate of structural change on dairy farming areas and communities.

The main elements on the relationship between milk sector (agriculture) and rural development selected into this study come out clearly in the recent rural development literature. The potential loss of dairy production and rural employment is seen not only from an agricultural perspective (such as evaluating viable alternatives for dairy production only inside agricultural sector). Instead, the likely impacts of milk quota abolition and intensifying competition in the milk sector are seen in the framework of longer term economic development in different rural regions, focusing on weak rural economies.

However, a full analysis of this issue would lead to a series of several rather context-specific case studies and detailed analyses on the various causes and effects of rural economic developments. Such analysis is too demanding for the volume and scope of this study. However, the main most obvious aspects on the changing contribution of the milk sector in maintaining economic activities in fragile rural areas are concluded here. Member state level data and the role of milk production in agriculture and rural regions are analysed in more detail in the following chapters.

### 2.4 Detailed description of the reasoning followed in the analysis, indicating in particular, the underlying hypotheses and validity limits

Milk production, under rapid structural change and increasing labour use productivity already without milk quota abolition, is losing its role as a rural economic backbone in a vast majority of rural region in Europe. This has happened already during the milk quota regime due to many driving forces, not least by technical change leading to rapidly increased labour use productivity, and by economic growth and diversification of employment on many sectors in the rural areas over decades.

However, the milk quota abolition and resulting intensified competition and decreasing real prices of milk can be expected to accelerate the decreasing development of labour use and farm income on many dairy farms. One might expect rural employment and also income to decrease in many rural regions dependent on milk production. The direction of this change is largely independent of future milk price and dairy product market development, while the extent and rate of this development is surely dependent on the development of real prices of milk. Large price reductions are likely to cause significant problems in most fragile regions where possibilities for profitable investments are fewer than in competitive dairy production areas. However, a strong demand and prices may realise in a way as suggested by Witzke et al. (2009), as an increase of milk production in most regions in the EU, and thus only a small fraction of regions (overall, only 17 percent of regions lose production, and only a fraction of them lose any significant part of their milk production (Witzke et al. 2009) . Kempen et al. (2011) provides very similar results.

According to Bremen et al. (2010), agricultural and rural dynamics do not always coincide. A productive agricultural sector does not always prevent rural areas from becoming marginalised and at the same time, the marginalisation of agriculture does not always lead to the abandonment of land or a decline of socio-economic dynamics since other activities to support rural dynamics might appear. For example, dairy milk production may decrease in areas where other agricultural sub-sectors and other sectors outside agriculture provide viable options for farmers.

Rapidly increasing farm size and increasing labour productivity in milk production may decrease the use of labour and use of inputs and resources within the region. Katajamäki (1991, 1999) studied both regional and rural marginalisation and the role of agriculture in the light of the structural transformation of the Finnish economy. His conclusion was that the specialisation of agriculture has led to the deepening of the regional division of labour, making many rural areas increasingly fragile, the most remote regions, in particular.

Farm size growth and increasing specialisation often imply that production factors purchased outside the region are increased and less region-specific inputs are used. As a result, less economic activity takes place in the region. Hence, a rapid structural change, where investments on farm enlargements of few farms compensate for a production forgone with a number of farms closing down production, may decrease the number of jobs and value added in the region.

Nevertheless, this does not mean that milk production development has little effect on rural economy and community. Decreasing milk production will of course be even more detrimental to rural employment and economy if little other entrepreneurial activity and employment emerge. Hence, the development of the milk production volume over time still has impacts on rural economy, even if the economic role of milk production has steadily decreased. For this reason, the development of the milk production volume as well as the number of farms and average farm size are still relevant indicators when evaluating impacts of milk production on rural agriculture and rural economy.

Various hypotheses on the drivers of structural change in agriculture and their validity in dairy sector structural development have been discussed and tested by Zimmermann & Heckelei (2012). In addition to farm and regional level agricultural structural change drivers frequently found in the literature (reviewed by Mosnier & Wieck 2010), the technology diffusion view is considered in this study: path dependencies and accumulated gains from earlier investments, and their meaning in fragile areas. Hence a structural change-based reasoning (based on microeconomic farm level analysis) is used in outlining the role of milk production in such regions in high and low milk price scenarios.

Based on this, the reasoning concerning the “fragile areas” in this study comprises the following: the role of milk production in (1) agriculture and (2) in rural economy. However, it is not easy to obtain quantitative information on the role of milk production in the regional economy. Even if available, such information on e.g., NUTS2-level is not likely to show much significance of the milk sector while the actual regions dependent on milk sector are likely to be of small scale, e.g., village or municipality level. The share of milk production value out of the total national economy at the Member State level or at NUTS2-level is practically useless information in any attempt to identify truly “fragile” regions. Hence, the “fragile areas” are most likely small individual regions, municipalities or villages.

Overall, the dairy sector development in rural regions may be poorly correlated to the overall economic development of the province or other aggregated rural region. This is because, the number of farms and dairy farms especially due to rapid labour productivity development, has decreased the number of jobs in dairy production, also in regions where dairy production itself has been stable and or even increasing. One such a region is, for example, Ostrobothnia region in Finland where agriculture and food sector are important employers and produce a significant, though a gradually decreasing part of economic value added in the region. Significant agricultural reforms may have significant impacts for the economic agents in the agriculture and food economy, but less significant and by no means any drastic effects on the overall economy on the region (Törmä & Lehtonen 2009). However, despite the many agricultural policy reforms since the 1990s, agricultural and food production have been at least stable and even increasing in the most competitive regions during the last decades. GDP per capita in competitive agricultural regions has been developing less favourably than the national average, or in neighbouring regions where the economic importance and also production volume of agriculture and food sector as a whole have been decreasing. This is because agriculture or food sector has not been engines of economic growth in recent decades. In fact, the vibrant agriculture and food production may keep part of the potential labour away from other industries which produce higher value-added per capita. This kind of development has been visible especially in periods of strong economic growth when the productivity and value added have developed significantly faster than in agriculture and food industry.

While dairy production has gradually but consistently decreased in large areas of southern Finland and Sweden - even very significantly in some individual regions - the implications for rural communities and rural economies

have not been significant due to other land use and farming options as well as due to other economic sectors offering employment opportunities. Milk production volume in Sweden 2012/2013 was estimated to reach a level of 23 percent under the quota (sources mentioned in Maaseudun Tulevaisuus 2013). In fact a gradual decline in milk production quantity has continued in recent years even if milk production sent to dairies in Sweden decreased by 14 percent already 2000-2011. This trend weakens milk availability for processing, causing problems especially for small-scale milk product processors in Sweden operating in local markets and producing value-added products under major local brands (Stenström 2012). Smaller scale processors of smaller quantities of raw milk are relatively more vulnerable to uncertainty and increased logistic costs of raw milk if decreasing local milk is replaced by milk over longer distances. Hence, the decreasing local milk supply seems to be a major nuisance and obstacle for growth and even for normal operations of small- and medium-scale dairy processors. This can be considered a pity for a dairy sector as a whole since the local and national demand for the local value-added products seems robust and could provide opportunities for farmers even at less favoured areas and inferior soils, which could otherwise be under the threat of abandonment or monocultural cultivation under cereals, yielding substantially lower biodiversity than grasslands.

Overall, however, the economic and employment development in dynamic economies in most of the southern parts of Sweden and Finland have been actually pulling young potential dairy farmers to other sectors in the economy. Thus, the decreasing milk production despite a strong structural change in such regions cannot be called a real threat or even any significant problem for the rural communities. The situation is exactly the opposite in northern latitudes of these countries where few other opportunities for employment are available especially in remote rural regions with very low population density overall.

It was already considered in the 1980s that rural employment is not possible to be maintained by high milk prices keeping many small dairy farms in production (Tervo 2005). Technological change has reduced labour input at farms and in various other rural industries (such as forestry) for decades. At the same time, the role of agriculture in national and rural economies has decreased significantly. Agriculture has not been an engine of economic growth and employment opportunities even in remote rural regions. Hence it can maintain a decreasing share of rural employment. If weak rural areas dependent on agriculture and milk sector are to be maintained as viable rural economies, it will be of increasing importance to create new business opportunities outside agriculture.

At least during the last 15 years, it is increasingly recognised in the European literature of rural development (Vihinen 2001) that the role of agriculture as a backbone for employment and as an income generator of rural areas has been decreasing significantly. In other words, the main drivers of economic growth also in rural regions have been increasingly outside agriculture. While (labour) productivity development has been relatively fast in dairy production, part of the benefits of this productivity development has also realised as decreasing real prices of food and also dairy products, which have been rather standardised products on the most part, under competition during the last decades. Consequently, a large part of the benefits of the productivity development in milk production do not stay within agriculture and rural regions but become diffused along the food chain. Milk production is thus one clear example on a case where investing in improving farm structure (fewer and larger farms) through investment aids and partly through agricultural policies and subsidies coupled to production rarely lead to a sustainable employment or value added in rural areas.

It has been widely observed that subsidizing agriculture is a rather inefficient strategy in maintaining rural areas and communities. The changed paradigm and focus on rural policy is also accounted for by OECD in the following summarizing conclusions (OECD 2006):

- A shift from an approach based on subsidizing declining sectors to one based on strategic investments to develop the area's most productive activities
- A focus on local specificities as a means of generating new competitive advantages, such as amenities (environmental or cultural) or local products (traditional or labelled)
- More attention to quasi public goods or "framework conditions" which support enterprise indirectly

- A shift from a sectoral to a territorial policy approach, including attempts to integrate the various sectoral policies at regional and local levels and to improve co-ordination of sectoral policies at the central government level
- Decentralisation of policy administration and, within limits, policy design to those levels
- Increased use of partnerships between public, private and voluntary sectors in the development and implementation of local and regional policies.

According to Breman et al. (2010), the political instruments should in the first place be directed to complementing and strengthening territorial potential for development and in looking for the specific components in sectoral policies that can support the particular kind of opportunities, functions and potentials. In some fragile agriculture/dynamic rural areas, an appropriate policy to support rural development may mean exiting from agricultural policies and concentrating instead on broader rural development, where farms may still be important as economic units, but no longer as engines of economic growth or even providers of agricultural raw materials.

## 2.4 Conclusion and policy recommendations drawn directly from the analysis

The changed paradigm and focus on rural policy, together with the rapidly decreased number of dairy farms in many EU countries, as well as a small average farm size still prevalent in many eastern European countries (major decrease in the number of farms and labour input expected), provides us already the following major conclusion:

*The contribution of milk sector in maintaining vibrant rural communities is becoming marginal at least in the dynamic rural areas (really 'vibrant') areas – most likely even if the production volumes in the region are relatively high.*

This is because milk quota abolition will further increase farm size, even very significantly since there is no quota cost or uncertainty related to it, and labour use efficiency. Also, milk processing industry will most likely decrease the number of processing plants due to intensifying competition.

This conclusion does not exclude negative effects of decreasing milk production on rural economy and environment even on vibrant areas, but it is increasingly likely that for dynamic rural economies, the loss of economic activity of dairy farms is becoming easier and easier to be compensated by other economic activities. For a great majority of dairy production in the EU, one may safely assume that its role in maintaining rural employment and rural economy is already marginal, or is becoming marginal in the next few years largely independent of market and policy development.

Hence milk sector's contribution to *maintain* rural communities is largely irrelevant but it is still relevant in some relatively few individual cases. Such cases, however, may be considered very important at the national level.

There is a reason to consider more closely a case of uncompetitive milk production in regions which cannot be called any 'vibrant' due to weak rural economy, aging population, remoteness, out-migration, etc. Milk production has been long considered an important source of income and employment in remote rural areas with weak employment and economy, mostly because of providing stable employment and regular income flows throughout the year - unlike some other production lines of agriculture, or other rural professions, such as rural tourism, which are often highly seasonal and uncertain in terms of income formation.

The conclusion concerning the uncompetitive and economically weak rural regions is that *milk production, even when continued at a decreasing number of farms, is still an important part of rural economy and employment in the most remote and weakest rural economies where job creation is weak*. Such regions are likely to be relatively few but they have not been identified systematically.

Fragile rural areas are often remote sparsely populated areas such as mountainous parts of many Member States (Germany, France, Czech Republic, Poland, etc.), and other sparsely populated less favoured areas characterised by significant natural disadvantages and weak job creation, such as northern parts of Sweden and Finland, Eastern Finland, as well as remote regions in the Baltic countries (Estonia, Latvia, Lithuania) and in Ireland where milk production is a dominant part of agriculture. Renwick et al. (2013) identify more or less the same regions but from the viewpoint of agricultural viability if pillar 1 payments of CAP were abolished.

In the most peripheral, often mountainous areas of Romania, Bulgaria and Poland as well as of Mediterranean countries, such as Portugal and Greece, milk production will also most likely remain an important source of rural livelihood (subsistence production) and income. However, in the Mediterranean countries, rural communities' dependence on milk production is generally rare except in few regions where overall economic development has been particularly weak for long while (dairy, sheep and goat) milk production is often the only viable production line in agriculture due to natural conditions.

Farmland abandonment is a true risk in such most vulnerable regions with few, if any, viable options for economic land use. In the northern and eastern parts of Europe, neglected farmlands are slowly but gradually converted to forest land, with some biodiversity loss in areas in abundance of forests and very few farmlands, while in the Mediterranean context, the implications of land abandonment may be even severe for the environment and the society because of increased risk of desertification and forest fires (Breman et al. 2010). Nevertheless, it is questionable if subsidizing milk sector or other agriculture should be the principal means of avoiding the forest fire risk, or biodiversity loss, since other options may be clearly more cost effective (as pointed out e.g., Renwick et al. 2013).

The main policy recommendation at this point is the following: *Identify carefully the weak rural areas with uncompetitive milk production where rural community would most likely lose a very significant part of employment due to a cease of milk production.*

This is needed since any policy measures adopted in mitigating the negative consequences on the weakest regions are likely to have little effect (maintaining milk sector and surrounding rural community) if the rural region does not fall into a category of the weakest rural economies with uncompetitive milk sector. The desired effect of any policy measure, at least those subsidizing the milk sector, is not guaranteed even under these necessary conditions – the sufficient conditions leading most likely to desired effects are discussed and concluded in Chapter 5.

### **3. How will the balance between the territorial and economic dimension of milk production evolve over time?**

Sustainable development in rural areas, decent farmer income and agricultural production competitiveness are central objectives of the EU agricultural policy. They are affected by changes in farm level productivity, spatial production structure and structural change within the regions. Spatial shifts of milk production toward the most competitive farms and regions through enlargement of the most competitive farms are usually found to decrease production costs and, consequently, to increase competitiveness of agricultural production (McDonald et al. 2007). In the context of northern Europe, a rapid structural change is even seen as a primary means of attaining competitive and sustainable agriculture and milk production (MTT & SLI 2007). Other subsidies (e.g., Nordic Aid scheme and a support scheme for livestock production in southern Finland – see e.g., Niemi et al. 2012) could be paid only if public investment aids are effectively utilised.

Since farm size and productivity cannot be increased equally easily in all regions even using investment aids and other structural aids, production tends to concentrate on relatively most feasible regions (not necessarily to most productive farmlands). Both farm and spatial level developments are thus important for the competitiveness and long-term economic viability of the European dairy sector. However, such developments can also deteriorate rural livelihoods. They may also cause significant pollution and nuisance for local inhabitants in regions where production is highly concentrated (Boehlje 1999). Concentration of livestock production may also lead to obsolete sector- and industry-specific infrastructure, alter the local economic

viability, and change the use of farmland and other natural resources in regions. One consequence might also be biodiversity loss where pasture and grasslands disappear. The issue is then to assess if the quota removal is likely to concentrate even more dairy production on a fewer number of farms and a fewer number of locations and if least favoured areas (LFAs) would lose dairy production significantly. Estimating how these changes would affect competitiveness of European dairy production is an important research question. In particular, there is a reason to study what is the value of increased competitiveness in the long run, if uncompetitive and weak rural areas become irreversibly depopulated and farmland abandoned, while negative environmental externalities increase in areas of concentration. A relevant question for decision makers is: *If competitiveness of European (not only EU since EU as a dominant player sets the rules of competition for other European countries as well) dairy sector will increase through structural adjustments following milk quota abolition, is it worth the cost - very large dairy production units with likely negative externalities and resulting societal costs in some few hot spot areas, and many abandoned traditional, extensive dairy production areas in many less favoured areas, offering little alternative employment.*

### 3.1 Interpretation and comprehension of the key terms of the evaluation question

**Territorial dimension of milk production:** Spatial allocation of milk production over different Member States and regions within the Member States. Territorial dimension includes farm milk production as well as milk processing since that has also a major influence on rural economy. However, the number of dairy processing plants has already been decreasing in many parts of Europe. The role of farmland as an input is relatively more important in milk production than in many other agricultural production lines (such as pigmeat, poultry meat, horticulture). Land use changes due to changing milk production have important consequences inside and outside agriculture.

**Economic dimension of milk production:** Profitability of dairy farms, economic value of milk production and its role in rural economy. For example, the value of milk produced or annual cash flow of dairy farms compared to the overall farm revenues within the region/Member State. Labour employed in milk production and its changes are relevant as such since employment itself is often an important policy target in rural areas.

The balance between the two dimensions basically mean how agricultural employment and income develop in regions over time, and how strong differing directions of change will be. Land use implications are mainly linked to environmental sustainability issues.

### 3.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

First, recent trends in milk production in Member State or regional level are analysed. In theory, the entire economic sustainability at the farm level should be analysed: sustainable farm economy – profitability, solvency and liquidity; how they are likely to develop in different farm types typical in fragile areas? Such a full-scale farm level analysis of these economic sustainability criteria, at least in terms of numerical analysis, is however out of the scope of this study due to the large body of farm level data required.

It is concluded at this point that time series data showing directions of milk production developments provides already highly indicative information on the capacity of the dairy sectors in different countries and regions to adjust to intensifying competition, demand changes and price volatility observed. The focus is on milk production sent for processing because of the most likely continuing urbanisation, leading to decreasing direct sales and own consumption of milk in rural communities often of ageing population, in eastern European countries. Hence the self-subsistence production or direct sales are considered of decreasing importance and not much explicitly considered here since their role is decreasing. There may be exceptions to this hypothesis, however, on some individual areas of long traditions of self-subsistence production and direct sales. The lack of more detailed analysis of such areas, which would require more data and knowledge on factors driving self-subsistence production and direct sales, can be considered as one weakness of this study, however.

There have been both relatively good years and challenging years for milk sector after 2000. During 2004-2007, a good demand development in Europe and globally offered relatively stable prices. Thus, one might expect

positive or at least stable development of production and profitability on many regions except on the most uncompetitive ones. On the other hand, high prices of feed and decreasing prices of milk were experienced at the same time in 2008-2009. These years were challenging ones and even 'milk crisis' was used as a word describing the situation of low prices and their meaning for dairy producers when feed and other production costs still increased.

It is useful to list regions where milk production and dairy farms have had difficulties already while dairy production has been increasing in some other regions, despite periods of low milk prices or unfavourable milk/feed price ratio. It is likely that Member States, where milk production has been consistently and significantly decreasing after 2000 (highlighted in Table 2) could include at least some uncompetitive regions, possibly with rural economies fragile for any sustained reductions in the real price of milk.

Zimmermann & Heckeley (2012) provides already a good overview of the development of dairy farms and dairy cows at NUTS2 level for 1995-2005. Here, national and NUTS2 level data on milk production volumes is analysed, in terms of change in production for 2000-2010.

Milk quota abolition does not necessarily lead to any drastic changes in milk prices, at least in the short run, as shown in a number of studies (main results collected in the descriptive chapter). Strong world and EU demand may imply that production and prices realise in a way as suggested in Witzke et al. (2009), as an increase of milk production in most regions in the EU, and thus only a small fraction of regions (overall, only 17 percent of regions lose production, and only a fraction of them lose any significant part of their milk production (Witzke et al. 2009). Kempen et al. (2011) provides very similar results. Contrary to the relatively large changes in Member State level milk production in 2000-2011, presented in Table 2, the large-scale equilibrium models simulate relatively small changes in production in the case of fundamental market changes, such as milk quota abolition.

There has been a continuous and steady decline in the number of dairy cows in Eastern European Member States since 1990. Recently, production figures are stable, however, or even growing in Member States, such as Czech Republic, Lithuania, Bulgaria, Romania and Slovenia.

Nevertheless, the increased volumes of production have been rather modest in terms of production volumes, but a very rapid growth observed within some short time periods reveal some dynamic development potential of the dairy sectors in those countries.

Table 2. Development of milk sent to dairies (1000 tons) 2000-2011. Source: Eurostat.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	%- change
<b>Belgium</b>	3 124	3 088	2 895	2 829	2 845	2 868	2 837	2 879	2 849	2 954	3 067	3 101	-1
<b>Bulgaria</b>	719	697	751	816	798	803	839	746	705	600	565	549	-24
<b>Czech Rep.</b>	2 561	2 580	2 592	2 599	2 563	2 543	2 393	2 446	2 433	2 354	2 312	2 366	-8
<b>Denmark</b>	4 519	4 418	4 455	4 524	4 433	4 451	4 492	4 484	4 581	4 734	4 830	4 800	6
<b>Germany</b>	26 984	26 883	26 583	27 320	27 113	27 380	26 876	27 321	27 466	27 461	29 076	29764	10
<b>Estonia</b>	409	428	495	485	536	571	606	593	606	612	621	642	57
<b>Ireland</b>	5 160	5 338	5 189	5 355	5 268	5 061	5 234	5 225	5 090	4 944	5 327	5 536	7
<b>Greece</b>	670	706	678	661	687	660	670	716	706	685	673	639	-5
<b>Spain</b>	5 413	5 763	5 933	5 874	5 880	5 899	5 824	5 729	5 834	5 742	5 877	5 838	8
<b>France</b>	23 303	23 222	23 635	23 119	22 915	23 388	22 896	22 970	23 793	22 905	23 576	24651	6
<b>Italy</b>	10 084	10 006	9 985	9 992	9 994	10	10 216	10 193	10 489	10 500	10 500	10480	4
<b>Cyprus</b>	135	131	142	150	140	145	139	144	152	152	151	153	13

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	%- change
<b>Latvia</b>	398	403	385	436	478	502	592	631	634	595	625	662	66
<b>Lithuania</b>	947	982	970	1 026	1 140	1 200	1 296	1 347	1 376	1 274	1 278	1 317	39
<b>Luxembourg</b>	256	261	261	257	258	258	255	259	265	271	282	281	10
<b>Hungary</b>	1 830	1 960	1 904	1 717	1 542	1 518	1 448	1 448	1 425	1 407	1 322	1 308	-29
<b>Malta</b>	45	45	43	40	41	42	41	41	40	:	:	:	-12
<b>Netherlands</b>	10 721	10 828	10 357	10 696	10 561	10 479	10 657	10 799	11 295	11 469	11 626	11 642	9
<b>Austria</b>	2 661	2 654	2 649	2 644	2 617	2 621	2 674	2 661	2 717	2 716	2 771	2 896	9
<b>Poland</b>	6 781	7 236	7 436	7 535	8 151	8 825	8 826	8 744	8 893	9 140	9 002	9 309	37
<b>Portugal</b>	1 893	1 823	1 932	1 820	1 873	1 921	1 851	1 837	1 886	1 868	1 829	1 842	-3
<b>Romania</b>	:	:	:	845	1 019	1 109	1 133	1 136	1 051	992	904	897	6
<b>Slovenia</b>	451	462	482	499	503	508	511	530	524	517	520	526	17
<b>Slovakia</b>	930	981	1 002	973	937	968	962	964	946	852	800	812	-13
<b>Finland</b>	2 442	2 449	2 447	2 393	2 373	2 362	2 348	2 293	2 254	2 281	2 289	2 255	-8
<b>Sweden</b>	3 297	3 290	3 226	3 206	3 229	3 163	3 130	2 985	2 987	2 933	2 862	2 850	-14
<b>UK</b>	13 932	14 156	14 359	14 554	14 114	14 038	13 920	13 647	13 350	13 237	13 582	13 805	-1

For example, in Romania, milk production delivered to dairies increased rapidly partly due to foreign direct investments (FDI). The dairy section of the food industry in Romania has been dominated by La Dorna, a company with Swiss capital, by the French consortium Danone, by the Dutch producers Campina and Friesland and by the German group Hochland, which owns two plants in Sighisoara and Sovata, in central Romania. In addition, Albalact, a company registered in the Romanian stock exchange RASDAQ, has 3,500 individual owners. The US investment fund SigmaBleyzer acquired a majority stake in the operations of Covalact in 2007 (Jansik 2013).

In Romania, the top dairy producers have invested heavily in production technology and marketing over the past years. Total sales of the dairy industry have increased sharply from €320 million in 2001 to €781 million in 2006 (Jansik 2013). There is a large scope for expansion since in 2010 only 20 percent of milk produced was sent to dairies. In Bulgaria, 50 percent of milk was sent to dairies, while in most other eastern European Member States integrated after 2003, approximately 75 percent of milk is sent to dairies, in Estonia, even 92 percent (Table 15 in the descriptive chapter). Hence, it seems that increasing income level and urbanisation lead to gradually increasing share of milk processed in dairies.

The dairy farm structure can be summarised as follows. Poland, Romania and Bulgaria: high share of small farms. Czech Republic and Slovakia: high share of large farms. Hungary: high share of milk produced at large farms in plain areas and growing exports of raw milk, while decreasing number of small farms and milk production volume in mountain/less favoured areas. Slovenia: medium-scale dairy farms and well-established procurement channels. Changes and realignment in the dairy sectors have been very significant in many eastern European Member States after the EU enlargement. The biggest winner has been the Polish dairy industry, which has been rapidly developing in many respects, while the biggest loser has been the Hungarian dairy industry (Jansik 2013). In Hungary, production volumes of milk have clearly decreased during the last 10 years. After acquiring the biggest local dairy processing factories in Hungary, some multi-national companies invested heavily in operations in neighbouring countries, such as Poland, Romania and Bulgaria, and closed down the processing plants in Hungary. This has been discouraging for Hungarian dairy producers who have



started large-scale exports of raw dairy milk to northern Italy, which has turned out to be profitable despite significant logistic costs. While most of the milk supply in Hungary is produced at relatively efficient and competitive large dairy farms in plain areas, Hungary was not found as attractive for multi-national dairy companies which found more lucrative options and opportunities outside Hungary.

While many large dairy cattle houses have been built in all the above-mentioned eastern European Member States, the average farm size is still generally low (Table 1 in Chapter 2–Table 15 in the descriptive chapter). In Poland, Romania, Latvia and Lithuania, the average farm size was 2010 clearly less than 10 cows per farm, mainly due to subsistence milk production. While the average milk yield per cow reached 6.68 tons per cow in Estonia and 6.32 tons per cow in the Czech Republic in 2010, the average milk yields per cow are close to 4 tons per cow in Latvia and Lithuania, and as little as 1.79 tons per cow in Bulgaria and only 0.78 tons per cow in Romania. Such figures show that there is a very large productivity potential available in these countries when production shifts gradually from subsistence farming to specialised dairy milk production. Gradually increasing demand for processed dairy products (e.g., Table 29 in the descriptive chapter) requires capital, knowledge on specialised dairy production and sufficient gross margins on specialised farms for profitable investments.

### 3.3 Description of the method(s) used and an indication of its (their) limitations

Balanced analysis of the statistical data and time series development of the selected indicators above is performed. The indicator time series are grouped in tables so that various thematic issues can be efficiently discussed and transparent reasoning is shown. Summarizing findings based on data and of recent literature – both farm and sector level developments. Data time series on the many above mentioned indicators are interpreted utilizing the concepts given below.

The possibility of a large drop in milk prices in the EU (given recently in a sensitivity analysis of Kempen et al. 2011) and a significant spatial allocation, after emerging integrated very large-scale farm level and processing factory operations. Some arguments are provided why a very significant reduction of milk production may take place in many rural areas under low prices (even if for a restricted time period only). It is discussed and evaluated under which specific assumptions milk prices may decrease very significantly, due to fast agglomeration and increase of dairy production in the current strong and competitive areas. That would also mean that other agricultural and land use activities give way for milk production. In that case also impacts for fragile rural economies can be very significant, even devastating in most fragile cases.

### 3.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

Here, economic analysis and reasoning is given particular emphasis since this question is in pivotal role in Theme 2. The analysis is based on the view on the overall structural change dynamics of the milk sector, which in turn is based on the concepts presented below. The view on the territorial development of milk sector comprises a synthesis between (1) the traditional neo-classical axioms in economics and (2) more recent models and theorizing on technological change as diffusion process with possible path dependencies and temporary increasing economies of scale (due to learning, work division, etc.), also prevalent in theory of economic agglomeration. The former point of view emphasises rationality of farm level decision making and the role of markets while the latter is more inclined to provide models and theorizing capable of explaining observed development paths in agriculture, often showing patterns of regional agglomeration in production, including possible path dependencies, e.g., differing directions of change in neighbouring regions even from seemingly similar starting points. This approach and view on territorial developments of the milk sector and reasoning combined with some selected key statistical facts, may be exhausting for a reader at first; however, this approach also facilitates quite concrete conclusions and policy recommendations.

*Utility maximisation* (including profit maximisation and risk averse behaviour of farmers and other economic agents) - utility of farmers, for example may come from different sources, such as (money) income, leisure, savings for future consumption (pensions).

*Technology diffusion* concept (“snowball” effect): Best performing management practices and technologies become gradually wider spread in the population of farmers – not immediately due to (1) fixed factors and

recent investments inhibit sudden changes in capital stocks and machinery and (2) farmers have limited knowledge on the functioning of new solutions and their risks, and not perfect access to all techniques and practices if no such examples in the region, i.e., it takes time for farmers to really familiarise with the new management schemes and thus be able to make long-term irreversible investments. However a “snowball effect” arises when increasing number of farmers increase their profit/utility when using new technique (for example, by using automatic milking “milking robots” – that gives more time for other business/improving animal health and cost savings).

This technology diffusion concept (‘snowball effect’) behind the structural change (change in the dairy farm size distribution over time) is consistent to observed reality of farm size growth in agriculture, which seems to be somewhat slow and not realizing rapidly in dairy-dominated rural regions. The sluggish reactions of dairy farm size structure to sudden short-term profitability shocks are due to long time span of farm investments, sunk costs and uncertainty. Sluggish changes in farm assets may, however, become significantly more rapid over time if the incentives for farm level investments remain and show consistently to the same direction. Over time, a larger share of farmers may invest in more profitable production techniques and enlarge their farm size. Such investments also generate profits to be used in further investments. Also, the accumulation of knowledge and human capital related to bigger farm size. More efficient production techniques facilitate increasing rate of investments and structural change especially in regions with additional land and capital available and which have already been relatively competitive. This is called as ‘**path dependency**’ or ‘sensitivity on initial conditions’. Hence, it is important to identify which reasons lie behind when dairy farm productivity and structural change develop slowly in some regions. On the basis of those reasons, one may conclude relevant policy measures.

This sunk cost and uncertainty rationalisation of the classic ‘**asset fixity theory**’ (AFT) (Johnson 1982) has been stated by Chavas (1994) who shows that seemingly unresponsive and even irrational farm (non) investment behaviour is indeed a result of dynamic stochastic optimisation under sunk costs and uncertainty. When the marginal value of production equipment (highly dependent on expected milk prices), in terms of explicit expected profit maximisation, is between the acquisition price and the salvage value, there is no incentive for producers either to expand or contract their operations. Thus, in the case of uncertainty and sunk costs, the assets once purchased are “trapped” into their current use. This results from purely neo-classical profit maximisation of net present value embedded with uncertainty and sunk costs. It is remarkable that both uncertainty of future revenues and sunk costs are necessary in order to derive production trap from a behaviour of a neoclassical profit maximising agent.

**Theory of economic concentration and agglomeration** to specific regions (which may be already strong in milk production), driven by centripetal and centrifugal forces of agglomeration. Centripetal forces drive the concentration on most competitive locations through possible increasing returns to scale, such as improved and optimised production arrangements, which provide additional economies of scale and specialisation. They could be also explained by learning by doing, accumulation of farmers’ skills e.g., in organisational management of the production system as well efficient work division. After learning well the large-scale operations, further investments are easier and probably more profitable than the earlier ones, thus leading to accumulative gains (“snowball effect”). Some centripetal forces of agglomeration also realise outside the farm, e.g., good infrastructure offered by other economic sectors in the regions, thus supporting and re-enforcing the agglomeration pattern. Eventually, the downsides of agglomeration (the centrifugal forces), such as high land prices and rents, increased logistic costs plus other expenses due to resource scarcity plus degradation in environmental quality and its societal costs and eventual extra costs for a farm.

**Public goods** provided by milk production: for example, grazing cattle provides utility to consumers when they see grazing cattle in the landscape, and this may increase social acceptance of dairy production and even willingness to pay for dairy products. Equivalently, improved animal welfare, if documented and used in dairy product branding, may increase willingness to pay some consumer groups. Also, farmers’ commitments for water and biodiversity protection/climate change mitigation may convince at least local consumers to choose local/national dairy products instead.

**Competitive advantage** between regions is realised largely through the drivers mentioned above. Production gradually increases in relatively most competitive regions despite some frictions and adjustment costs. It is also

up to national legislation (such as definition-sensitive agricultural regions, implying different marginal costs of production expansion) to what extent production may expand in competitive regions.

But what is the view on the main development and its drivers of milk sector development, based on the concepts presented above? Since this is by no means any new paradigm in agricultural economics, let us describe the synthesis of the theoretical concepts above by following the view and reasoning of e.g., Mosnier & Wieck (2010). They, after reviewing a broad range of papers, summarise and discuss key drivers of spatial dynamics in dairy production. First, they conclude that analysing comparative (competitive) advantage of the different regions is crucial to explain production location and production change. Among production factors (land, labour, machinery and buildings, and variable inputs) land characteristics appeared to be the most important. Dairy production and farm enlargement are usually more important in regions where land prices are relatively lower than in other regions. However, it is concluded that farm enlargements are more likely on plain areas and on better soil qualities. Intensification seems to be an easy way of increasing milk production at a farm, and provides probably sufficient output per land unit to compete with other agricultural production orientations. Labour markets and dairy farm labour mobility are concluded as important factors for dairy farm expansion, as well as wage rate, unemployment rate, per capita average income, farmer's age and part time farming represent the most studied criteria and appear significant in most of the studies. This calls for a consideration of the local economic environment beyond farming when analysing and simulating dairy production evolution. Sunk costs linked to irreversible investments in buildings and equipments (discussed in asset fixity theory above) constrain spatial dynamics. Owing to biological constraints and lags, such as time needed for heifer growing and insemination before calving and eventual milk production, it also takes time to adjust herd sizes. Technological progress reduces traditional constraints e.g., in manure management. On the other hand, technological progress leads to higher specialisation and higher reliance on suppliers and purchasers in individual farm development.

According to Mosnier and Wieck, production increases on farms and regions having rather intensive production systems with advanced technology. Dairy production and dairy farm density are spatially correlated, which supports the idea of agglomeration economies: dairy production benefits from shared infrastructures, technical services and specific industries. External economies stemming from other activities, such as non-dairy cattle seem to have a positive influence. The downside with the large cattle houses and high intensity of production is that logistic costs related to feed and manure increase, which acts as a counterbalancing centrifugal force to agglomeration.

Concerning spatial production structures in a large scale, transportation costs of milk and the perishable nature of milk as an ingredient for processed dairy products (some of which may be much less perishable than raw milk) also play a role. This gives possibilities in spatial differentiation, which can also result from differentiated products that are linked to a location by geographical indication. Transport costs and possibilities of product differentiation could take into account price differentiation resulting from imperfect competition.

Public policies (not only CAP policy systems but also national and regional legislation) modify the production environment of farmers and dairy processors by the means of market supports (such as EU import tariffs), farm subsidies and regulations. Output prices, production costs and farmer income, farm level decisions for entry and exit are relevant factors that can be affected by policy. This can create spatial heterogeneity when the policy itself varies across space or when the policy targets production characteristics that are spatially heterogeneous. The quota system has especially strong implications on average price, price variability and spatial dynamics. High differences in quota rents across EU regions facilitated important spatial reorganisation. Local and macroeconomic factors influence both structural change and regional production change.

Let us utilise this overall view on dairy sector development in analysing the evolution of the balance between territorial and economic dimension of milk production. Studies on the effects of milk quota abolition on milk production and prices in different Member States and regions in the EU, listed in the theoretical chapter, are typically based on large-scale models comprising many regions, trade flows between the regions, and rely on relatively simple supply specifications and production functions representing the production technology. Such simplifications are necessary, not only for empirical (lack data or resources for vast data work needed for more realistic supply specifications) reasons but also because of the fact that equilibrium models require model specifications to follow certain regularity conditions in order to find unique equilibrium. Given the large datasets on average costs and large research resources invested in calculating marginal costs, such models

provide valuable and most likely consistent and robust results for short run market developments in Europe as a whole and even in main production regions. Such models however inevitably lack regional detail on production technology, farm size distribution and topography (e.g., field parcel structure implying logistic costs for dairy operations) and soil characteristics. Large-scale models do not attempt to model structural change and implied changes in production technology over time. They also lack important properties of agglomeration economics, which play a role in the case of significant policy and market changes, such as milk quota abolition.

For example, increasing returns to scale may appear temporarily due to technical and organisational reasons also in the dairy sector, related to milk quota removal. On the other hand, such phenomena may be only temporary and they may become dominated by centrifugal forces of agglomeration, which inhibit spatial concentration of production through land prices, logistic costs of manure and feed, societal costs related to food safety, animal health, manure management, etc. The relative balance between such forces are highly context-specific, but it is important to recognise that such developments take place in reality, both at the farm level and dairy processing level in the milk sector. Hence, it may be deceptive to believe that such developments are surely excluded from existence as they are in large-scale equilibrium models, which mainly assume decreasing returns to scale already from the beginning. It is possible that milk production concentration will be much stronger, due to emerging synergies and technological innovations often realizing in building up new kind of production concepts, in regional scales in Member States with competitive milk sectors. It is possible that all environmental and social repercussions cannot be anticipated in advance and they may become under public dispute relatively soon after the first very large truly integrated farm-processing factory production conglomerates are built, imposing also very large-scale logistic operations of feed and manure transportations.

### 3.5 Conclusion and policy recommendations drawn directly from the analysis

First conclusion is that despite the removal of milk quotas in 2015, large changes in milk production in different Member States and regions are unlikely *in the short run*. Indeed, it is well argued in the papers abstracted in Theoretical analysis that the EU dairy sector and production of milk in different Member States will most likely develop according to the results of Kempen et al. (2011) and Witzke et al. (2009) *in the short run* (period of 5 years, maximum 10 years). Hence, drastic changes seem unlikely. However, this does not mean any “no change”-situation, since gradual changes in production and significant changes over time, are going on in a number of regions. Despite the gradually strengthening supply and intensifying competition, the same kind of developments will continue in different parts of the EU as observed in 2000-2010.

Already at this point it is evident; however, that milk production development in uncompetitive milk production areas, in particular, is highly dependent on milk price development, which in turn is dependent on global economic growth, as well as on EU level economic development. If these factors lead to low milk prices, even temporarily, investments in milk production are likely to cease in the least competitive less favoured areas. This is even more likely if only a fraction of production is produced on large farms, which may be capable of making profitable investments even at low prices, and if a significant share of dairy farmers need to decide on farm enlargement investments to maintain economic viability. High price of cereals and hectare-based agricultural subsidies decrease profitability of milk production and inhibit dairy investments.

As a main conclusion, *many uncompetitive fragile rural areas can be expected to lose production in the case of sustained low milk prices*. Such areas are likely to be found in Member States, such as Hungary, Bulgaria, Slovakia and Sweden, where milk production has been clearly decreasing since 2000 (more analysis on the specific regions as “fragile areas” will follow in later chapters). Even if the sustained very low milk prices may be unlikely during the next five years, the possibility for exceptionally low milk prices already experienced in 2009 is an indication of expanding price fluctuation, which is effectively inhibiting investments in more productive milk production systems necessary for decreasing production cost of milk, especially in fragile areas. The territorial balance is most likely to develop more evenly in scenarios of high milk price than in low price scenarios.

Low price scenarios, however, are much dependent on the possibilities of strong competitive dairy production areas for farm expansion. Such possibilities may appear if very large integrated farm-processing production units will be constructed, aiming for considerable economies of scale (even for increasing economies of scale) and synergies not yet materialised in earlier quota-restricted conditions. Such possibilities, however are very

significantly affected by environmental regulations which are decided at the national level and regionally. Hence, the real development of the milk sector is not only in the hands of the EU Commission but is also influenced by the national and regional economic agents and administration. There is a great dispersion between countries in the principles and practices used in controlling milk production expansion and land use. Very significant production expansion however requires more land, which may be expensive and scarce already inside agriculture in some regions. From this point of view, very large production units and production expansions seem unlikely in regions where environmental legislation is efficiently restricting farm enlargements already. However, large production units with low production costs could be attempted in areas of low land prices and little environmental regulation. If realised, major negative environmental and societal impacts and risks will emerge. It is noteworthy at this point that multi-national dairy companies have been in a key role in supporting and even setting up, not only dairy processing plants but also large-scale farms in eastern European countries.

*One major conclusion is also that if sustained low milk prices realise, together with thin profit margins and large volatility of milk and feed prices, it will lead to a clearly more pronounced re-allocation of production in Europe than anticipated, toward Member States and regions where production has been increasing already. Most efficient producers in competitive milk production regions which have been increasing production in 2000-2010 despite temporary periods of unfavourable input and output prices and uncertainties are the most likely ones capable to make profitable investments even in periods of decreased profitability. Such regions and Member States have been already identified by Kempen et al. (2011). However, if real prices of milk decrease significantly due to strengthening supply, the number of Member States and regions showing increasing production will decrease.*

Dairy sectors in less favoured regions are not likely to maintain their production in circumstances with decreased profit margin and increased risks at the same time. Such regions are at a risk of very significant decline in production since there are few, if any, efficient farms capable of making profitable dairy investments in the case of sustained low prices and increased fluctuations of input prices. This conclusion also results from “snowball effect” and agglomeration economics reasoning since they seem to play a significant role in dairy production.

*The main policy recommendation is that if the low price scenario realises, there will be a high need for direct payments, coupled to production, to dairy farms with high production costs implied by significant natural handicaps, for maintaining production, or avoiding large reductions in production. Direct payments largely decoupled from production are most likely not going to maintain milk production in less favoured areas especially if real prices of milk decrease considerably. Hence provision of coupled payments for dairy farms is needed if agriculture is to be maintained even in less favoured areas where milk production is one of the few viable options for farming.*

*Also dairy farms under severe difficulties due to high debt are likely to claim temporary aids/long-term loans to mitigate solvency problems even at traditional competitive areas. Considering the high sunk costs of large dairy farms, as well as their high asset values, production potential and competence, it may be socially better to provide temporary aids, such as loans for such farms. Similar measures could be demanded due to environmental regulations which are possibly tightening (not expected by all farms) in areas with increasing and already intensive production.*

*An implied policy recommendation is that despite the relatively steady development paths observed recently, the possibility for production expansion requires preparing common rules and environmental regulations and other conditions for large industrialised, possibly integrated farm level - processing level production units, rarely owned or operated by individual farmers. Environmental permits and other procedures may increase administrative burden of local officials considerably.*

## 4. What are the regions and production systems which could face difficulties?

### 4.1 Interpretation and comprehension of the key terms of the evaluation question

**Production systems:** Value chains close to the dairy farms in a region, such as contractor services concerning farm work (manure spreading, feed production), major input suppliers, often increasingly specialised in providing high quality service (veterinary services, suppliers of crop protection chemicals and services, seed and fertiliser suppliers), as well as dairy milk processing companies using the milk produced in a region. It is worth noting that milk production systems, with specialised input suppliers, are specializing and are increasingly dependent on off-farm sources of inputs. They are also often purchased outside the region.

**Difficulties:** Economic problems at the farm level, arising from poor profitability, solvency and liquidity. They are three basic pillars necessary for economically sustainable farm level production both at the short run and long run. Enlarging fluctuations of input and output prices, together with sustained periods of low milk prices may endanger the three pillars for sustainable farm economy very seriously, especially if the profit (gross) margin at a farm is already very low (allowing little or no own capital for investment), and if debt relative to the annual turnover is high, implying high interests for the borrowed capital. In both the cases, such farms are likely to be vulnerable.

Rapidly decreasing number of farms and milk production volumes imply decreasing economic activity, income flow and employment in rural regions dependent on dairy production. Rural decline, in terms of employment and money flows (including taxable income) in the region, may also cause gradual but significant deterioration of rural infrastructure, such as road network. Also more insecure electricity supply may be a consequence due to decreasing number of farms (dairy farms are often significant users of electricity), number of households, population density, through reduced profits of electricity suppliers, which may downsize their service operations considerably. Such implied changes, which have been observed to follow rural decline, increase costs of remaining dairy farms as well, and may cause major risks for remaining economic activities and households.

There is an apparent risk of exacerbating existing environmental problems (due to nutrient leaching, surface and groundwater quality, biodiversity loss) if production increases further in intensive production regions. As Mosnier & Wieck (2010) point out, the most common observed strategy to increase dairy farm size (in terms of herd size and quantity of milk produced) is intensification. In a free of quota situation, the avoided quota costs can be at least partly spent on extra costs of intensification which, however may be larger than anticipated. Since 70 percent of both key nutrients for eutrophication, nitrogen and phosphorous in feed, are excreted from the cattle animals, strong milk production agglomeration and intensification is likely to lead to severe nutrient problems. Considerable increases of production in existing hot spot regions of dairy production is likely to increase nutrient surplus and/or manure logistic costs (also feed costs), which may reduce the economic gains of production agglomeration even considerably.

Difficulties may arise due to reduced environmental quality, which even result in significant economic losses due to significantly reduced surface and groundwater quality, imposing costs for local residents, losses for tourism and recreational value of watercourses.

Some loss of biodiversity may occur in less favoured areas with extensive land use due to decreasing milk and beef production (Acs et al. 2012).

### 4.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

First, we analyse the development of farm net value added per annual working unit (AWU) in 2000-2009 (Table 3). What is remarkable concerning the farm net value added per AWU is that dairy farms in EU-10 countries reach all relatively low values. This could be linked to the relatively recent investments in large-scale dairy

facilities where often not all gains from economies of scale and specialisation are reached. Use of labour in recently built large-scale cattle houses may not be as efficient as in the ones which have been operated already long. Most importantly, however the low levels of farm net value added per AWU are likely to be driven by relatively low prices of milk in EU-10, compared to the average of EU-27. In many countries, there is a remarkable reduction in farm net value added per AWU from 2008-2009. For example, in Denmark and in Sweden, this indicator reduced by 50 percent in 2008-2009 while in EU-10, the change was clearly smaller, except in Slovakia. Let us look at the development of gross margins (eur/ton) which also take into account costs of purchased labour.

The development of gross margins (Table 4) tells a rather different story on the profitability compared to the farm net value added per AWU. The gross margins in EU-10 are now close to the EU average – probably due to lower labour prices compared to EU-15 - with the exceptions of Hungary, Latvia and Slovakia, where dairy farms have reached alarmingly low levels of gross margins in 2009. Together with low farm net value added per AWU, these countries could be strong candidates to “fragile” milk production areas, at least considering the farm level gross margins which seem to be rather low and also vulnerable to price shocks. However, considerable reduction in gross margins took place also in Denmark, Estonia, Germany, Ireland and Sweden in 2009. In all these countries, a very large part of milk is produced in large-scale cattle houses, probably somewhat dependent on purchased feed. Such farms are efficient in terms of labour use but however somewhat vulnerable to price shocks.

Farm net value added per AWU, or gross margin per ton of milk produced is, however, only a good start in profitability analysis since it does not take into account increasing share of capital inputs employed. Since major risks and vulnerabilities of large-scale dairy farms especially realise through the costs of capital, the profitability coefficient is looked as well (calculated by Economydoctor –service of MTT for EU Member States). This profitability measure “*profitability ratio*” (PR) is defined as follows. The profitability ratio is calculated by dividing family farm income (FFI) by the sum of costs for family factors, i.e., the wage claim and the interest claim of agriculture (opportunity costs of family labour and equity).  $PR = FFI / (\text{wage claim} + \text{interest on own capital})$ .

When the profitability ratio is 1.0, all production costs including costs of family factors (opportunity costs) have been covered and the entrepreneur's profit is zero. As a relative concept, profitability ratio is well suited for comparisons between different years as well as farms representing different size classes and production sectors.

The family farm income (FFI) can be divided proportionately into the returns to the family factors, i.e., own labour and capital by the profitability ratio. When the hourly wage claim and the interest claim (%) are multiplied by the profitability ratio, we get the actually earned returns on the factors measured per working hour and interest rate. In this method, labour and capital are considered to be equal as production factors.

Table 3. Farm net value added per AWU (annual working unit)(EUR/AWU), on specialised dairy farms, for members states (Descriptive chapter Table 37, repeated here, with own calculations)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Aver.	Position	Pos. 2009
<b>Austria</b>	14	16	16	14	16	17	20	22	24	18	18		
<b>Belgium</b>	37	42	38	42	39	42	45	56	43	34	42	3	5
<b>Bulgaria</b>	-	-	-	-	-	-	-	3	4	7	5		
<b>Cyprus</b>	-	-	-	-	-	-	-	-	-	31	31	7	7
<b>Czech Republic</b>	-	-	-	-	9	10	11	13	13	10	11		
<b>Denmark</b>	45	41	48	50	54	58	70	88	81	41	58	1	3
<b>Estonia</b>	-	-	-	-	8	9	9	13	13	10	10		
<b>Finland</b>	16	17	19	19	19	19	17	21	25	27	20		9
<b>France</b>	22	22	23	21	23	24	24	29	28	19	24		
<b>Germany</b>	27	27	26	24	29	31	34	46	29	27	30	8	9
<b>Greece</b>	13	11	14	-	-	-	13	-	-	33	17		6

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Aver.	Position	Pos. 2009
<b>Hungary</b>	-	-	-	-	10	11	13	13	17	11	13		
<b>Ireland</b>	24	27	26	30	31	33	30	41	36	23	30	8	
<b>Italy</b>	23	27	30	31	31	34	39	41	48	44	35	5	1
<b>Latvia</b>	-	-	-	-	5	5	7	6	6	8	6		
<b>Lithuania</b>	-	-	-	-	7	7	6	9	9	10	8		
<b>Luxembourg</b>	30	35	32	36	33	35	37	46	46	23	35	5	
<b>Malta</b>	-	-	-	-	21	18	20	22	24	19	21		
<b>Netherlands</b>	49	48	46	47	49	54	56	69	58	42	52	2	2
<b>Poland</b>	-	-	-	-	5	6	8	10	8	7	7		
<b>Portugal</b>	8	9	10	10	12	12	13	14	18	14	12		
<b>Romania</b>	-	-	-	-	-	-	-	2	5	8	5		
<b>Slovakia</b>	-	-	-	-	1	6	-2	5	7	-1	3		
<b>Slovenia</b>	-	-	-	-	2	4	4	7	7	9	6		
<b>Spain</b>	17	22	24	23	29	33	31	34	42	31	29	10	7
<b>Sweden</b>	23	19	22	22	22	25	26	34	41	22	26		
<b>UK</b>	30	39	34	35	37	38	38	50	43	35	38	4	4
<b>EU average</b>	25	27	27	29	21	23	24	28	27	21	22		

Table 4. Gross margin over operating costs in 2000-2010 (EUR/ton), with coupled EU and national payments (Descriptive chapter Table 39, with own calculations).

	2000	2002	2004	2005	2006	2007	2008	2009e	2010e	Average		
										2000- 2010	Position	Pos. 2010
<b>Austria</b>	140	155	128	131	143	132	159	90	103	133	7	
<b>Bulgaria</b>	-	-	-	-	-	116	122	95	95	107		
<b>Cyprus</b>	-	-	-	-	-	-	-	-	-	-		
<b>Czech Republic</b>	-	-	81	89	79	78	75	15	57	68		
<b>Denmark</b>	150	147	137	116	110	136	146	73	115	129	8	
<b>Estonia</b>	-	-	102	89	93	96	89	40	85	85		
<b>Finland</b>	189	199	206	174	145	159	200	187	173	184	2	3
<b>France</b>	139	137	132	138	99	118	121	91	105	123	10	9
<b>Germany</b>	148	129	126	104	106	158	91	25	85	113		
<b>Greece</b>	139	132	-	-	42	-	-	-	-	108		
<b>Hungary</b>	-	-	58	86	96	64	75	-2	29	58		
<b>Ireland</b>	151	135	142	119	107	157	142	53	128	130	9	6
<b>Italy</b>	190	229	198	202	189	199	212	165	189	197	1	1
<b>Latvia</b>	-	-	81	92	102	87	77	16	72	75		
<b>Lithuania</b>	-	-	114	124	114	136	122	80	147	120		4
<b>Luxembourg</b>	163	169	166	140	132	179	180	102	130	155	4	5
<b>Malta</b>	-	-	98	59	106	85	122	54	76	86		
<b>Netherlands</b>	171	163	157	166	162	169	146	87	128	153	6	6
<b>Poland</b>	-	-	103	117	117	139	123	74	114	112		9
<b>Portugal</b>	117	129	137	130	135	124	155	117	130	128	10	5
<b>Romania</b>	-	-	-	-	-	206	209	144	178	184	2	2



	2000	2002	2004	2005	2006	2007	2008	2009e	2010e	Average		
											2000-2010	Position
<b>Slovakia</b>	-	-	49	54	18	83	19	-37	14	29		
<b>Slovenia</b>	-	-	109	129	146	111	124	83	86	113		
<b>Spain</b>	144	144	170	175	148	184	174	127	112	154	5	10
<b>Sweden</b>	145	119	123	110	100	89	100	36	88	105		
<b>UK</b>	118	108	117	101	88	120	108	84	90	107		
<b>EU average</b>	150	150	124	121	113	130	130	76	105	119		

Source: FADN EU Dairy farms report 2011  
 e: 2009 and 2010 data are based on estimates

Unfortunately, the full time series of profitability coefficient starting from 2000 could be calculated only for a subset of EU Member States, which however, are among the largest dairy milk producers and exporters of dairy products. In these countries (with an exception of Finland where only 34 percent of milk was produced on farms with more than 50 cows in 2012), dairy products are typically produced in large cattle houses with relatively little labour input and with the reliance of capital intensive techniques. Here, we see a slightly improving development in dairy farm profitability up to 2006, a clearly improved profitability in 2007, and then a sudden decrease in profitability in 2008 and 2009. It is striking that the profitability in an efficient producer country, such as Denmark drops even to negative levels in terms of profitability coefficient, which take also into account capital costs and capital employed in the production system, including farmland. The high debt of Danish dairy farms contributes to very low profitability coefficient in 2008-2009.

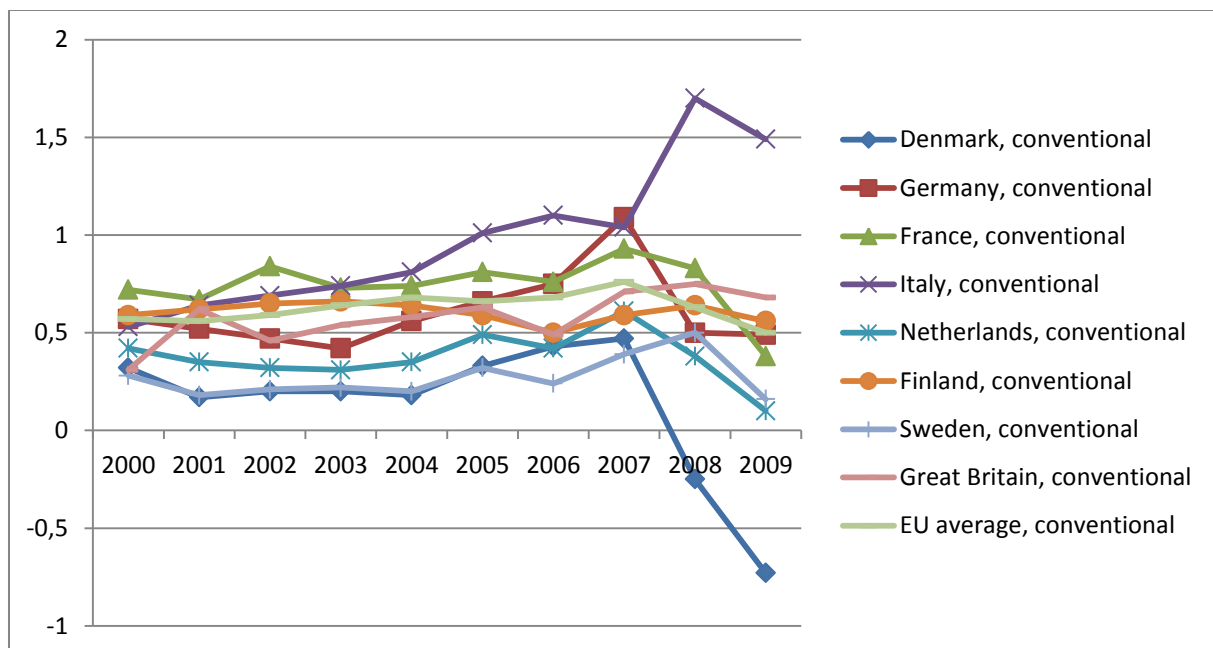


Figure 3. Profitability of conventional dairy farming in 2000-2009, from EU FADN database. Source of data: Reporting system and advanced results: MTT Economic Research, Finland ([www.mtt.fi/eufadn-adv](http://www.mtt.fi/eufadn-adv)). Basic data Source: FADN-EC-DG

Hence, there is a reason to consider Denmark as vulnerable region in dairy production, but not really a “most fragile” region since in normal and good years also, the profitability coefficient is approaching the level 0.5 (the level reached by the Netherlands at good years). In addition, milk production volume in Denmark has been on the increase by several percents since 2000. Also, Sweden and the Netherlands seem to be somewhat vulnerable to price shocks since their dairy farms reach the level of 0.1-0.2 in terms of profitability coefficient in

2009. It is also remarkable that the profitability coefficient is clearly below the average value. In Finland, which is all considered as a less favoured area, dairy farms reach a profitability coefficient value of 0.5 even at a year of difficult dairy markets in 2009, while the indicator hardly reaches values above 0.6 even at years of favourable market conditions. This is due to the lower gross margin (because of high production costs) compared to other countries analysed here, as well as relatively stable milk producer prices.

#### 4.3 Description of the method(s) used and an indication of its (their) limitations

Balanced set of statistical time series data is used in identifying regions which are most likely under risk of significant worsening of farm level and sector (processor) level economy, under the derived milk price scenarios. The selected statistical information include, in particular:

- (1) Time series data on national level milk production volume, especially relevant if milk production volume has already shown significant decreasing trends – identify Member States with decreasing production.
- (2) Identify some NUTS2 regions with clearly decreasing milk production development – identify NUTS2 regions with decreasing production.
- (3) On these regions, look at the time series data on dairy farm level (FADN) profitability – not only identify Member States and regions of decreasing production.
- (4) Summarise the findings of Kempen et al. and Witzke et al. (2009). Together with that, use the data of descriptive chapter on the utilisation of milk quota in different Member States, or cross-sectional data on milk quota prices in Member States/NUTS2-level - identify Member States and regions of decreasing or already zero milk quota prices.

The lack of resources to evaluate the individual NUTS2 regions in more detail, however implies that one needs to be careful in making generalisations. For example, national policy developments concerning environmental legislation and related uncertainties may have increased the costs of investments, led to a decreased profitability, delayed investments and thus inhibited investments in milk production. Hence, in such cases the applied profitability measures and decreasing production development may be less reliable indicators in identifying regions already in economic difficulties.

#### 4.4 Detailed description of the reasoning followed in the analysis, indicating in particular, the underlying hypotheses and validity limits

Using the data mentioned above, let us identify Member States and regions likely to be in a vulnerable position if real prices of milk decrease (as a consequence of milk quota abolition). The relevant choices in this identification is (1) choice of individual indicators and (2) weighting the indicators, i.e., giving a particular emphasis on some indicators that may predict even more or less directly the capability of a farm type or a region to adjust to lower milk prices.

The most relevant indicators, concerning the regions and production systems most likely under difficulties, are already presented above, i.e., the profitability indicators. However, in this chapter we look at the development of milk production over the last approximately 5-10 years (depending on the availability of data) at the regional (NUTS2) level. A third indicator, having a significant emphasis in the identification, is farm size, and especially the share of large farms in the production. These three main indicators are emphasised because they are considered to convey a large part of the information needed by the theoretical set up of structural change dynamics, explained in Chapter 3.4.

The weakness of this study is that the analysis on rural economies and their dependence on agriculture and especially on milk production has not been done systematically based on large samples of data on small regions (smaller than NUTS2). Such analysis is seen too challenging and large effort in this study. However, a likely rural economy status can be indirectly inferred, from the overall economic development at a Member State level. In fact, the knowledge on the strength of the rural economies at NUTS2 or other aggregation level, available for this identification exercise, is rather thin and concerns mainly the Nordic countries and Baltic countries. Some expert knowledge has been briefly consulted in the case of Hungarian and other eastern European rural areas (Jansik 2013). Nevertheless, it must be stressed that this evaluation and identification, in terms of weak rural

areas dependent on milk production is a weak part of this study, which is actually a suggestion how an evaluation could be made, concerning the theme “the regions and production systems which could endeavour difficulties”. The outcome of this evaluation is inevitably dependent on the extent of the knowledge and information of the rural economy status available at regions where severe problems at the farm level are identified. Hence, the combination of the rural economy status and most severe farm level problems identify the fragile areas, as already defined in Chapter 2.

Utilizing statistical material in “Descriptive chapter” and elsewhere in publicly available sources, the “fragile” areas in terms of economic vulnerability of milk production and risk of losing competitiveness and production are selected

- Outline likely Member States and even regions (inside some Member States) where agriculture and, possibly even rural economic development, is clearly dependent on milk production
- Clarify the drivers and causes of economic and production impacts of certain dairy milk price scenarios on different farm types which are especially common in fragile areas

Using the data mentioned above, identify implications of different milk price scenarios for fragile regional economies - compare the findings with other studies on the development of milk production in different regions (Kempen et al. 2011; Witzke et al. 2009).

Select some illustrative cases (1-2), utilizing also existing studies and reports of the regions. Collect especially the reported structural change challenges for dairy farms in empirical literature (such as, Pyykkönen et al. 2013) and evaluate how they become more severe/difficult considering decreasing real price of milk.

Clarify the drivers and causes of economic and production impacts of certain dairy milk price scenarios on different farm types and (especially in fragile) regions. Which farm types seem to face most severe problems (purchased feeds and compounds vs domestic feed, etc.)

Based on the farm type and region-specific results, write argued reasoning what is likely to happen especially in “fragile” regions most vulnerable to reductions in milk prices (low and high price scenarios), what are the likely impacts in production concentration, extent of milk production reduction, implications for regional economies and environment.

Limitations of the results and approaches are as follows.

-Selection of the “representative” fragile areas is probably dependent on numerical criteria available. One cannot exclude the possibility of slightly changed selection of fragile regions if additional information is made available (such as land prices, regional milk quota prices, etc.)

- Model based studies may not be able to account all the relevant obstacles and uncertainties related to dairy farm investments. Hence, the changes in production may become unrealistically large in the case of scenarios with large changes in milk prices/other incentives of production. Also, major land use changes as a means reaching new economic equilibrium, if such results derived from analytical models, may be context specific, neglect some important frictions in land use change, availability of resources from other sectors of the economy, and hence provide a picture of too large adjustments in regional production volumes. On the other hand, neglecting accumulation of knowledge and skills and other drivers of agglomeration, may significantly underestimate regional changes in production.

Fragile regions have a lot to lose if dairy milk prices decrease (at least in real terms) due to milk quota abolition and other developments in the dairy sector. Such developments may arise not only because of decreasing real price of milk at the national or aggregate level but also due to increasing competition in specific dairy products produced in fragile areas, or shifts of demand to those dairy products in which some fragile areas and their dairy processors are not competitive.

For example, small-scale dairy processors producing relatively standard products for local consumption may not have resources for expanding their product portfolio in value-added dairy products which require considerable development efforts but whose demand is rapidly increasing. Such products are efficiently produced and marketed often by multinational companies utilizing economies of scale and specialisation. Hence, small-scale processors start losing market shares and have difficulties in adjusting to the reduced

demand of their traditional products. This already observed trend and decreasing prices for the standard products due to expected and realizing milk quota removal may seriously challenge economic viability of milk processing in small-scale dairies and milk production in the surrounding area. Cases where intensified competition leads to drastically reduced profit margins in small-scale dairies can be found already (Suomen Kuvalehti 2013).

It seems likely that dairy milk production will gradually decrease in many fragile rural areas, i.e., on those which already have problems in maintaining income levels and employment and where milk production is in an important role despite a decreasing trend in milk supply. Such regions are as follows:

The following regions in Hungary: Észak-Magyarország and Észak-Alföld. These regions are located in the north-east corner of Hungary, partly in the mountainous regions with little viable alternatives for dairy production. The dairy farms in these regions are often small and many small farms have already exit production. Similar regions in smaller scale can be found in a number of LFA areas all over the country. Even if most part of dairy milk production in Hungary is produced on large dairy farms in central plains, milk production delivered to dairies decreased by 29 percent during 2000-2011 (-16 percent in terms of overall milk production according to NUTS2-classification – Table 5). However, the share of milk production out of the production value of overall agriculture is fairly low in Hungary while agricultural production lines utilizing better soils in plain areas are more important. However, Hungarian economy has not been steadily improving and hence it is likely that some rural regions of relatively poor soils and less dynamic rural economies may already suffer from reduced money flows and labour use due to decreased milk production. Any decrease in real prices of milk will further exacerbate the problem, since dairy farm size in the most fragile regions in Hungary is lower and requires investments in larger and more efficient farms.

Sweden - northern regions with few if any viable alternatives for dairy milk production – 14 percent decline in Swedish milk production volume in 2000-2011 and 5 percent decline in 2007-2011 (Table 6). In northern regions, a -9 percent reduction in production has been realised in 2007-2011. Despite a very rapid structural change and farm size growth, the tendency of decreasing dairy investments and production continues. At the same time, countries such as Germany have increased their dairy production considerably. However, the Swedish economy has been among the strongest in Europe and economic development has been positive also in rural areas in southern Sweden. Hence, southern Sweden, with viable alternatives for dairy production in agriculture and in other professions in the rural areas, cannot be termed a fragile area.

Table 5. Development in milk production (1000 tons) in Hungary in 2003-2011. Source: Eurostat

	2003	2004	2005	2006	2007	2008	2009	2010	2011	%, 2003-2011
<b>Hungary</b>	2 031	1 895	1 929	1 844	1 842	1 840	1 758	1 685	1 712	-16
<b>Közép-Magyarország</b>	148	134	139	:	131	125	111	117	123	-17
<b>Közép-Magyarország</b>	148	134	139	141	131	125	111	117	:	-21
<b>Dunántúl</b>	847	797	782	:	748	757	712	680	688	-19
<b>Közép-Dunántúl</b>	284	263	254	246	246	259	243	243	245	-14
<b>Nyugat-Dunántúl</b>	288	275	275	261	274	278	270	250	250	-13
<b>Dél-Dunántúl</b>	276	259	253	232	229	220	199	186	194	-30
<b>Alföld és Észak</b>	1 035	964	1 008	:	962	959	935	888	901	-13
<b>Észak-Magyarország</b>	163	160	148	139	148	150	148	139	126	-23
<b>Észak-Alföld</b>	453	414	467	460	426	435	420	394	393	-13
<b>Dél-Alföld</b>	420	390	393	365	388	374	367	355	382	-9

Table 6. Development in milk production (1000 tons) in Sweden in 2000-2011. Source: Eurostat

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	%, 2007- 2011
<b>Sweden</b>	3 348	3339	3 274	3 253	3 275	3 206	:	2 986	2 987	2 933	2 862	2 850	-5
<b>Östra Sverige</b>	:	:	:	:	:	:	:	522	506	509	492	484	-7
<b>Stockholm</b>	:	:	:	:	:	:	:	35	35	33	31	31	-13
<b>Östra Mellansverige</b>	48	52	52	43	40	39	:	487	471	475	460	454	-7
<b>Södra Sverige</b>	:	:	:	:	:	:	:	1 952	1 976	1 944	1 902	1 893	-3
<b>Småland med öarna</b>	184	171	182	185	188	181	:	820	837	844	824	817	0
<b>Sydsverige</b>	579	573	548	551	553	536	:	388	394	373	361	365	-6
<b>Västsverige</b>	854	869	851	862	873	873	:	745	744	726	717	711	-5
<b>Norra Sverige</b>	:	:	:	:	:	:	:	517	504	480	468	473	-9
<b>Norra Mellansverige</b>	452	438	412	418	420	412	:	205	204	190	176	182	-12
<b>Mellersta Norrland</b>	263	251	247	246	238	233	:	134	131	124	128	127	-5
<b>Övre Norrland</b>	163	161	154	154	154	145	:	173	170	166	164	164	-5

Slovakia – Decrease of milk production by 13 percent in 2000-2011. Includes also mountainous areas where there are few alternatives for dairy production.

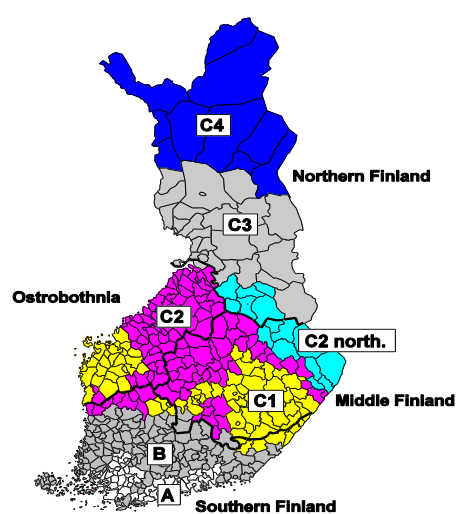
Finland – Decrease of milk production by 8 percent in 2000-2011. Continuous decline in production in southern Finland where, however other production lines of agriculture and other opportunities of employment in various sectors of the economy have pulled out young potential farmers from dairy production. Since national support payments for milk (approximately 3 cents/litre) are uncertain while permanent national payments are paid in the middle and northern parts of the country, gross margins and profitability are lower in southern Finland (Niemi et al. (2012)). There is decreasing production also in the northernmost and eastern parts of Finland despite permanent significant national payments (> 8 cents/litre) along with patterns of regional agglomeration of dairy production and land scarcity in the western and middle part of the country. However, the declining dairy production hits remote rural regions of severe natural disadvantages (also due to topography and small field parcels, not only harsh climate) where dairy is the only viable option of agriculture. Also, there are few, if any, alternative employment outside agriculture. Finland's widely differing regional patterns of dairy production development and their drivers provide clear examples for how even extended policy measures seem inadequate to prevent regional concentration of production and maintain milk production in fragile disadvantaged areas.

Table 7. Development in milk production (1,000 tons) in various national support regions in Finland in 2000-2011. Source: Tike ([www.mmmtike.fi](http://www.mmmtike.fi))

	2000/2 001	2001/2 002	2002/2 003	2003/2 004	2004/2 005	2005/2 006	2006/2 007	2007/2 008	2008/2 009	2009/2 010	2010/2 011	%-chng 2000-2011
<b>A</b>	123	125	124	122	117	115	114	107	108	107	104	-15
<b>B1</b>	417	418	412	408	392	387	383	367	358	358	351	-16
<b>B2</b>	12	12	12	12	12	11	11	11	11	12	12	5
<b>BS</b>	4	4	4	4	5	5	3	3	3	4	4	3
<b>C1</b>	512	520	506	497	487	487	498	482	469	468	467	-9
<b>C2</b>	992	1017	1002	997	987	1002	992	971	973	1004	1012	2
<b>C2 P</b>	102	105	104	104	100	102	90	88	89	94	95	-7

	2000/2 001	2001/2 002	2002/2 003	2003/2 004	2004/2 005	2005/2 006	2006/2 007	2007/2 008	2008/2 009	2009/2 010	2010/2 011	%-chng 2000-2011
C3 P1	13	14	14	14	13	14	14	14	14	14	15	9
C3 P2	59	61	62	60	58	59	59	57	56	58	57	-3
C3 P3	66	68	69	68	66	66	64	63	62	62	62	-7
C3 P4	29	29	28	28	27	26	25	24	23	23	23	-20
C4 P4	18	19	19	18	16	16	16	16	16	16	16	-14
C4 P5	4	4	4	4	4	4	3	3	3	3	3	-13
<b>Tot al</b>	<b>2352</b>	<b>2395</b>	<b>2361</b>	<b>2336</b>	<b>2283</b>	<b>2294</b>	<b>2273</b>	<b>2205</b>	<b>2186</b>	<b>2223</b>	<b>2222</b>	<b>-6</b>

### Main areas and support regions



Map 1. Agricultural support regions in Finland.

These fragile regions, however, are not the only regions where milk production is likely to decrease when real milk prices begin to deteriorate. The fragile regions are the ones where the decline in milk production seems most likely, may be more significant than anticipated in the summary of studies mentioned in the descriptive chapter (e.g., by Kempen et al. (2011) or Witzke et al. (2009)) and not without significant losses in terms of money flows and employment for local rural economies. If there are any larger milk price reductions than 10 percent in real terms, milk production is also likely to decrease in some eastern European countries, such as Latvia, Czech Republic and Bulgaria, where gross margins are relatively low (Table 39 in the descriptive chapter). Any larger decrease in real price of milk will also jeopardise the necessary modernisation in Lithuania, Poland and Romania, where the average farm size in 2010 was clearly less than 10 cows per farm. Deteriorating profitability of dairy farm investments would cease positive on-going development of investments and productivity growth, which requires time to realise as well as sufficient stability in terms of prices. The main message from Dremfia model simulations performed in MTT (Lehtonen 2004, 2008b) is that any major disruptions in profitability of investments (due to price shocks, etc.) may significantly delay necessary investments in efficient dairy production techniques in uncompetitive areas. However, a continued process of investments in dairy farm enlargements, if sustained for a sufficient period of time, becomes self-enforcing and more robust over time.

Eventually, initially less competitive regions may reach a farm size structure and level of productivity growth that is sufficient to overcome decreasing real prices of milk. These observations have been made through a model utilizing technology diffusion schemes in simulating structural change and realisation of economies of

scale endogenously coupled with national level markets and import competition. Main empirical observation from Finnish dairy production regions (Pyykkönen et al. 2013) is that economies of agglomeration also play a role since farm size growth often requires division of farm work through sub-contractor services, which are not easy to find in remote sparsely populated rural regions. Hence, the self-enforcing patterns of dairy development tend to concentrate production in most competitive regions even in countries and areas of abundance of farmland. Hence improving the structure of dairy production may also lead to land abandonment in finer territorial scales, e.g., larger scale production can be better maintained as a result of farm size growth and concentration of production in most competitive regions, but most likely some land abandonment may realise in some least competitive locations.

A major finding from earlier Finnish studies related to milk quota abolition (Lehtonen et al. 2007, Lehtonen 2008a) is that due to the improved productivity and use of resources (especially labour), the most competitive regions - inside less competitive countries - may be able to adapt to decreased real prices of milk better than anticipated by large-scale equilibrium models. This means that Finnish dairy production was predicted to recover more or less fully in terms of production volume from price scenarios where EU prices decreased 10-15 percent. Any greater decrease in real prices of milk, however, would result in significantly decreased volumes of milk production, since gross margins and profitability of investments will decrease too much on any known farm type and technology option in Nordic conditions in the case of large price reductions.

Result of Kempen et al. (2011) showing a 3 percent reduction in Finnish dairy production following milk quota abolition and EU price change of -10 percent is in fact too pessimistic on possible adaptation and the production volume of the Finnish dairy sector. On the other, however, if the same logic of endogenous structural change and self-enforcing patterns of productivity growth could be transferred to large-scale equilibrium models, they would most likely show increasing rate of productivity growth and faster adaptations also in the current competitive regions. That, in turn, would imply stronger supply response to milk abolition (and implied extra costs of milk quotas avoided) and further reductions in equilibrium prices.

#### 4.5 Conclusion and policy recommendations drawn directly from the analysis

Based on the statistical material and reasoning based on the literature, the following regions were identified as “most fragile”, vulnerable regions (uncompetitive milk sector, few alternatives to dairy production in agriculture, poor or at least restricted opportunities for employment outside agriculture) as defined in Chapter 2:

- Hungary: Észak-Magyarország, Észak-Alföld
- Northern Sweden
- Slovakia, especially mountain regions
- Finland, remote regions in northern and eastern parts of the country

These example regions were selected as clear cases where realised milk production development has been clearly negative. It is likely that rural economies in these example regions are also weak and provide poor employment opportunities. However, it is possible that few individual rural economies are strong even in these cases, e.g. there may be small scale regions where rural economy is more dynamic and employment opportunities are better (e.g. individual municipalities with emerging mining industry in northern Finland and Sweden, for example) than in most other remote sparsely populated regions. Hence, there is some uncertainty related to this identification of most fragile regions, since there is wide variation in rural economies even in neighbouring areas. Some individual less favoured areas in the mountain and upland areas in Europe could fit the definition of “most fragile region” as well, but such identification of such region from a large set of potential candidate regions would require another study. Strong candidate regions for most fragile regions could be e.g., eastern parts of Latvia and Estonia, individual mountain areas in Alpine region, and some areas in mountains of southern Poland. Milk processing industry plays a role in region-specific milk production development and its impact on rural areas as well, not only farm level and rural economy characteristics. A good indication of this is the case of Hungary (with a low share of milk production out of all agricultural production at the national level) where aggregate milk production has decreased very significantly due to the exit of large milk processing companies. This has led to a decrease of milk production especially in less favoured areas while many large farms in plain areas have maintained their production through exports of raw milk. Similar kind of regional developments dependent on the decisions of milk processing companies may also take

place in Romania where a large part of milk production is under re-structuring due to gradually increasing share of milk sent to dairies. Hence, individual fragile areas (smaller than NUTS2 level) with few viable options in agriculture, vulnerable to milk production reductions, can be found in varying contexts in a number of Member States.

*The main conclusion and policy recommendation here is that identification of such regions is important for further actions and measures (related or not related to agricultural subsidies) if negative effects are to be avoided. Most probably, the identification of such regions also requires more careful analysis and selection of the indicators that was possible in this study.*

*Another main outcome of the reasoning presented above is that large-scale equilibrium models are likely to underestimate the dynamics and extent of adaptation following milk quota abolition. Since dairy is somewhat slow in reacting to new opportunities through investments (larger farms, increased economies of scale, improved milk yields per cow through animal breeding and optimised feedstuffs, etc.) it is likely that only a fraction of the changes following from the milk quota expansion and further abolition has been experienced yet. The real impact of milk quota removal is uncertain and largely conditional on overall economic development in Europe and global market developments.*

## 5. What actions could be envisaged with the view to secure a sustainable balance between economic and territorial dimension of the milk sector?

### 5.1 Interpretation and comprehension of the key terms of the evaluation question

Sustainable balance between the economic and territorial dimension: Maintaining milk production in at least most parts of the current less favoured areas, where milk production has a significant role in agriculture and regional economies, without losing competitiveness of milk and dairy product production at the EU (or Member State) level.

For example, milk production may still be concentrating on the most competitive regions within the EU and thus the competitiveness of the EU level may increase, while simultaneously maintaining milk production, or at least most part of the current production in areas where milk production has an important role in agriculture and rural economy (demand and price development, examined in recent literature and Theme 1 of this project, most likely determines if such a development is possible). This would actually mean that milk production would decrease most in regions where milk production is not in a dominant role in agriculture and does not have any significant role in the regional economy (also such regions need to be identified, not only the “fragile” areas).

“Sustainable milk production” well presented in the Theme 2 title is not mentioned explicitly in terms of environmental sustainability on the questions of Theme 2. Hence, one could interpret “sustainable” in Theme 2 only in terms of “balance between economic and territorial dimension” and exclude all explicit and concrete links to environmental quality. However, since intensive dairy production results in increasing nutrient balances, nitrogen and phosphorous leaching and also biodiversity loss in intensive milk production regions within the EU, it might be worthwhile to spend a paragraph or two for the environmental sustainability. On the other hand, “fragile” and “vibrant” rural regions mentioned may well include already some link to social implications through regional economy (e.g., employment).

### 5.2 Indication of the analysis criteria allowing to answer the question; validity of the quantitative and qualitative information used

Production and farm level profitability development per nation and region (data already listed above in earlier chapters) are used as primary information.

In addition, attention is paid on the developments of dairy product exports per Member State (in descriptive chapter): those countries with significant exports of dairy products have demonstrated the ability to produce demanded dairy products at a reasonable cost. This also implies that gradually built brands, competence, skills and networks necessary for profitable exports can be further improved and utilised under intensifying



competition. On the contrary, those companies and cooperatives with little competence and experience in export activities may face increased difficulties in launching exports, which however, may become vital for maintaining regional production volumes and structures. This is because the domestic price level is often vital for successful dairy operations and sufficient producer price of milk. This is even more so in the future if e.g., income level in Eastern European countries and rural regions increase, which implies decreased responsiveness of domestic consumers to prices, i.e., the price elasticity of demand decreases in absolute terms and any oversupply at the domestic markets will most likely lead to significantly deteriorating prices and profitability. Hence the role of exports and various competences of dairy companies in maintaining the brands and markets, as well as in finding new export opportunities (markets, products, logistic chains), will most likely increase due to milk quota abolition.

Outputs of the following on-going research projects are used. SOLID (Sustainable Organic and Low Input Dairying) [www.solidairy.eu](http://www.solidairy.eu) (WP 6: socio-economic evaluation - competitiveness of organic and low input dairy production as strategic choice, compared to the on-going trend of intensifying dairy production in the EU) – Recent report (Latvala et al. (2012) say that consumers prioritise animal welfare as a most preferred direction of development, while processors prefer feed quality and efficiency; however, processors consider animal welfare important as well. This provides opportunities for local brands and producers over imported ones, since local producers may easily verify animal welfare standards to local customers.

Baltic Manure [www.balticmanure.eu](http://www.balticmanure.eu) - WP 3 Identifying innovative technologies for handling and processing manure in an environmentally-friendly way on large farms in the BSR (e.g., slurry separation profitability calculations at the farm level). This is because more stringent environmental conditions impose challenges and costs to enlarging dairy farms. They need applicable solutions for manure management. Recent economic calculations (soon to be published) show some opportunities (even profitable) in manure processing and nutrient recycling in the case of pig farms, while there are challenges and problems which inhibit similar advantages of manure processing, such as slurry separation to realise in dairy production. For example, excess kalium may become a risk for animal health if large volumes of liquid fraction are utilised at the same field parcels close to a farm. Given that logistic costs of feed and manure are relatively higher in dairy production than in pig production, the obstacles and problems in manure management decrease the possibilities for further agglomeration and possible implied benefits for dairy production. Most likely, environmental problems cannot be avoided if current intensive dairy production regions are further intensified.

### 5.3 Description of the method(s) used and an indication of its (their) limitations

A balanced view on the specific problems and solutions in profitability problems in dairy production is constructed based on selected statistical data and results of earlier research results concerning less favoured areas. Different existing studies, such as Witzke et al. (2009), are used in specifying the likely extent of production decrease in the future. In other words, it needs to be estimated what is the likely share of regions (out from NUTS2 regions, for example) where milk production is likely to decrease due to milk quota abolition and other developments.

In the case of Finland, scenarios of dairy product prices have already been included in *Dremfia* sector model (Lehtonen 2001, 2004, Lehtonen et al. 2007) based on spatial price competition, 18 different dairy products with processing activities and Armington-assumption in foreign trade (imports competing with domestic production assuming imperfect substitution) utilizing technology diffusion modelling of the structural change of dairy farms. Based on the published results, the likely consequences of reduced milk prices on farm structure and production in less favoured areas are evaluated, including mountainous regions which suffer from similar problems as less favoured areas in Finland such as cold climate, low temperature sum, short grazing period and various other natural handicaps in milk production, such as unfavourable topography. Such regions, significantly less competitive compared to the most feasible ones, can be found in many Member States as well. In fact, Finland, despite its northernmost location in the EU, is not very different in this respect – the relative competitiveness matters in regional production development.

The limitation of this kind of approach is that it relies on generalisations. The reasons which maintain milk production in less favoured areas are often different in different countries which support the milk production in less favoured regions in various ways. Also milk prices vary a lot inside Europe and even within Member States. However, prices are usually in relation to domestic demand patterns and production costs, and what is

common is that milk produced in less favoured areas is usually not used in most competed dairy products, such as butter and milk powders. Hence, the domestic markets are often the most important ones of milk producers, with high production costs, in less favoured areas. In this sense, the logic used in Dremfia model may yield results and generalisations to be considered with respect to some other less favoured areas in Europe as well.

Problems and possible remedies for fragile areas are outlined, taking also into account milk sector-specific measures and also structural aid policies based on the observed successful examples on dairy production development. It is concluded which type of measures (from the available ones) are needed, for influencing negative development of milk production in fragile areas, predicted by existing studies (such as Witzke et al 2009), or were identified as risk areas on the basis of the farm and regional level indicators of farm economy, production development and other criteria.

#### 5.4 Detailed description of the reasoning followed in the analysis, indicating in particular the underlying hypotheses and validity limits

One important opportunity for dairy sector is organic dairy market. Let us discuss and analyse this opportunity in more detail, due to the opportunities to create value-added in dairy supply chain. Such opportunities, providing price mark-ups for farms for compensation of high production costs, are especially important for farms located in regions where production costs are high, e.g., less favoured areas. Since organic dairy production requires more land area than conventional dairy production, organic dairy milk production could act as a counter-balancing force in a common trend of intensifying dairy milk production. Hence, we evaluate could organic dairy production provide opportunities for “fragile areas”, and could some policy measures promote realizing such opportunities.

Austria and Denmark have a significant organic dairy market. Expanding organic milk production has also contributed to relatively good gross margins and possibly even increased production of milk. Considering the difficult debt crisis of Danish agriculture and dairy farming in particular, organic dairy production, utilizing also economies of scale, is an interesting topic.

According to Lebensministerium (2013), in 2010, Austria recorded the highest share of organic dairy cow farms with delivery milk quotas of all countries evaluated. In Austria, almost every fifth farm with delivery milk quotas is under organic farming. Denmark and Latvia had a share of organic dairy farms of about 10 percent. With 6,846 dairy farms with a delivery milk quota, Austria had also in absolute figures the highest number of organic dairy farms. In Poland, about 2,000 dairy farms with delivery milk quotas were under organic farming, in France there were about 1,200 organic dairy farms.

In comparison to the average milk deliveries per farm, it has turned out that organic dairy farms were in most countries smaller than the average of all holdings. In Sweden, Greece, Finland and Latvia, however, organic farms were larger than the average of holdings with delivery milk quotas.

Danish organic dairy cow farms showed very large structures. The 422 Danish dairy farms delivered more organic milk than the 6,846 Austrian organic dairy farms in 2010. The average organic milk deliveries per farm were accordingly high in Denmark, amounting to 1,132t per holding. In Ireland, there were large-scale holdings as well; however, there were only few organic farms in Ireland.

With a quantity of almost 600,000t delivered, Germany was the largest producer of organic milk followed by Denmark (478,000t) and Austria (431,000t). The share of organic milk deliveries (total quantity of milk with and without price mark-up for organic products) was the highest in Austria amounting to 15.5 percent of the milk deliveries. In Denmark and Sweden, a share of about 10 percent of the delivered milk was processed according to organic standards. Latvia had also a relatively high percentage of organic milk in the total quantity of milk delivered; however, only a small share of it was also marketed as organic milk. Even though high quantities of organic milk were delivered in Germany and France, the quantity of organic milk delivered made up only a small share of the total quantity of milk delivered.

In most countries, the price mark-up for organic milk amounted in 2005-2010 between 10 percent and 50 percent of the conventional milk price, with a rising tendency in the course of the years. The highest price mark-up for organic milk on a percentage basis was paid in 2009 (in particular in DE, SE and NL). The high price mark-ups for organic milk on a percentage basis in 2009 indicate that the price mark-ups for organic milk did not decrease to the same extent as the conventional milk prices. The milk price (organic as well as conventional) was the highest in Greece and Sweden. The lowest milk prices were paid in the Baltic States of Lithuania and Latvia. In 2010, dairy farms in Greece, Sweden, Latvia and France received the highest price mark-ups for organic products in relation to the conventional milk price. In 2010, the price premium for organic milk products was the highest in France; there organic milk, organic butter and organic cheese were on average 50 percent more expensive than comparable conventional products. In Denmark, organic milk cost about 25 percent more than conventional milk; yoghurt was about 11 percent more expensive. In Austria, organic milk products were with a price premium of 9 percent for milk and a price premium of 1 percent for yoghurt - very cheap in comparison to other countries.

These observations suggest that the price mark-ups have been the lowest in Austria and Denmark, with most organic milk production relative to the total milk production. Since Austria is considered rather competitive in milk production (probably partly due to the strong organic market), and farms are very large and efficient in Denmark (especially the organic dairy farm), one may conclude that organic milk production, highly dependent on demand developments, is not likely to be a quick remedy against milk production decline and rural decline in "fragile regions". The only clear exception might be northern Sweden since organic dairy demand is significant in Sweden. However, policy measures to significantly promote organic dairy milk demand are few. Let us come back to this issue in conclusions. Before that, there is a reason to look at the profitability development of organic dairy milk production in some Member States (the same already analysed in the context of conventional milk production). The profitability ratio is calculated as described in chapter 4.2.

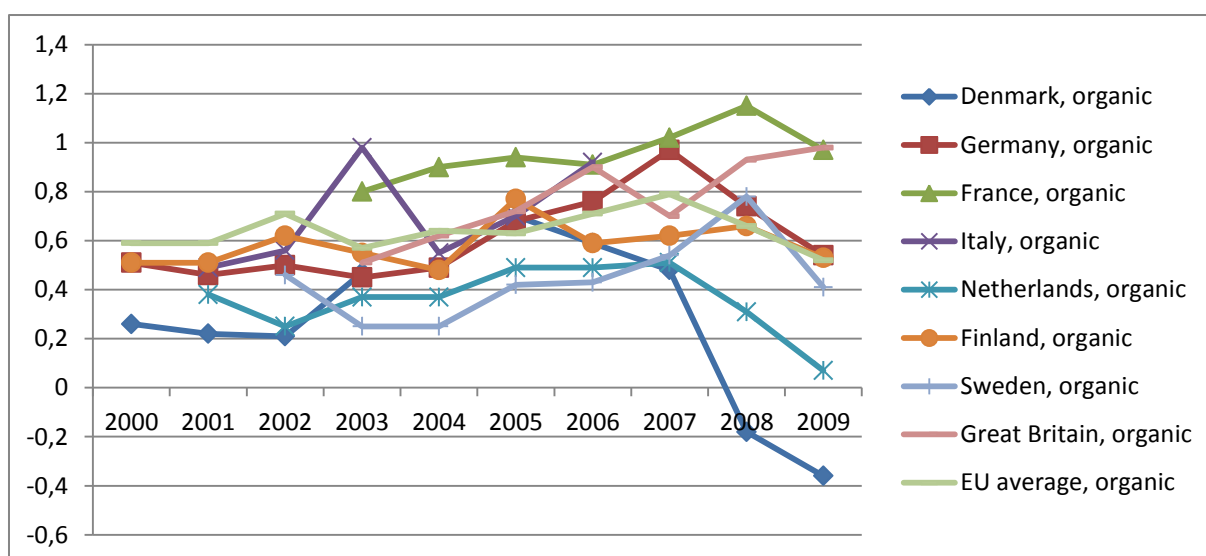


Figure 4. Profitability of organic dairy farming in 2000-2009, from EU FADN database. Source of the data: Reporting system and advanced results: MTT Economic Research, Finland ([www.mtt.fi/eufadn-adv](http://www.mtt.fi/eufadn-adv)). Basic data Source: FADN-EC-DG

Here in Figure 4 we see a slightly improving development in dairy farm profitability up to 2006, a clearly improved profitability in 2007, and then a sudden decrease in profitability already in 2008 in Germany, the Netherlands and Denmark. Profitability of organic dairy milk production increased in France, Finland and Sweden still in 2008 and turned into a decline only 2009. However, in Great Britain there was no decline in the profitability of organic dairy milk production in 2009. Comparing to the profitability development of conventional dairy farms (presented in the previous chapter) one can conclude that 1) the upward trend in profitability of organic dairy milk production is clear compared to the only slightly improving profitability of conventional dairy milk production; and 2) organic dairy milk production seems to be somewhat less vulnerable on sudden market changes and price drops than conventional dairy milk production, at least in the circumstances of a large scale European 'milk crisis' experienced 2008-2009.

It is striking that the profitability in an efficient producer country (also in organic dairy milk production) such as Denmark drop even to negative levels in terms of profitability coefficient, which take also into account capital costs and capital employed in the production system, including farmland. It is most probably the high debt of Danish organic dairy farms which result in very low profitability coefficient in 2008-2009. Hence there is a reason to consider Denmark as vulnerable region in dairy production, but not a fragile region since in normal and good years also the profitability coefficient is approaching the level 0.7. Also the Netherlands seem to be somewhat vulnerable to price shocks since their organic dairy farms reach the level of 0.1 in terms of profitability coefficient in 2009. It is also remarkable that the profitability coefficient of Dutch dairy farms is clearly below the average value at all years. In Finland, which is all considered as a less favoured area, dairy farms reach a profitability coefficient value 0.5 even at a year of difficult dairy markets in 2009, while the indicator hardly reaches values above 0.6 even at years of favourable market conditions. However the difference in profitability of the Finnish conventional and organic dairy farms seems to be small. This is due to the fact that approx 50 percent of organic milk produced in Finland is sold as conventional milk, due to limited demand which has developed at a slow rate compared neighbouring countries such as Sweden and Denmark.

The development of the number of certified dairy cows in organic production is presented in Table 8. Countries with most developed organic milk and milk product markets are Austria, Denmark and Sweden, where a substantial number of dairy cows are certified in organic production, and in these countries also, the share of the cows producing organic milk out of the all dairy cows is relatively high. In these countries, the markets of organic milk and milk products is rather developed and the regular volume of production and trade is high, facilitating even some economies of scale. On the contrary, in new Member States, the numbers of cows producing organic milk are low, and the demand for organic milk and milk products is mostly weak. However, there are some signals and examples in the new Member States (for example, in Estonia) that organic milk production and organic dairy milk processing is rapidly increasing. For example in Estonia, there are small-scale organic dairy milk processors, some of which export two-thirds of their production to Finland and Russia, while the domestic sales are also expanding (Jansik 2013).

Table 8. Certified dairy cows in organic milk production (heads) in different countries (note - some countries, such as Germany are excluded)

GEO/TIME	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	% chng 09-011
<b>Belgium</b>	7 451	9 275	8 989	7 894	7 993	4 673	8 297	7 730	8 308	11 348	12 680	13 513	19
<b>Bulgaria</b>							72			172			
<b>Czech Republic</b>					2 865		4 322	4 484	4 952	2 614	4 303	5 686	118
<b>Denmark</b>	66 009	64 359	61 541	56 430	53 115	52 030	53 125	:	56 559	62 124	62 407	63 158	2
<b>Estonia</b>						2 576	3 230	2 679	2 723	3 054	2 456	2 639	-14
<b>Ireland</b>						750	850	1 000	1 100	1 400			
<b>Greece</b>			551	400	480	:	312	1 275	1 395	16 528	2 362	2 231	-87
<b>Spain</b>					2 278	2 525		2 792			4 390	3 543	
<b>France</b>		46 563	55 196	58 939	62 489	66 123	59 731	59 182	61 386	62 582	64 966	79 388	27
<b>Italy</b>			30 971	40 754	38 284	57 090	58 443	59 402	47 522	44 310	42 854	41 144	-7
<b>Cyprus</b>													
<b>Latvia</b>					3 447	7 588	3 136	3 786	4 463	5 468	13 350	15 782	189
<b>Lithuania</b>					3 048	1 788	6 273	7 961	9 398	8 308	8 892		
<b>Luxembourg</b>			243							444			
<b>Hungary</b>										3 441	2 850	2 278	-34
<b>Malta</b>													
<b>Netherlands</b>	16 974	17 184	16 505	15 894	15 629	15 898	16 182	17 467	18 548	24 000	24 000	21 750	-9
<b>Austria</b>					86 896	81 045	81 377	81 557	85 107	91 037			

GEO/TIME	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	% chng 09-011
<b>Poland</b>									12 776	19 409	23 583	19 149	-1
<b>Portugal</b>													
<b>Romania</b>							8 236	4 889	4 297	4 303	2 332	3 599	-16
<b>Slovenia</b>					1 004	967	920	1 229	1 086	1 172	1 424		
<b>Slovakia</b>				1 269	1 550	3 075	4 999	4 999	4 418	4 411	6 189	3 170	-28
<b>Finland</b>	3 654	3 557	4 541	4 990	5 052	4 595	4 621	4 764	5 040	4 892	4 809	5 776	18
<b>Sweden</b>				22	21	22	24			34 115	39 559	44 133	29
				218	892	321	141						
<b>United Kingdom</b>				90	83	58	10		7 505	145	150	146	1
				143	253	578				101	751	137	

Figure 5. Overall milk production (mill kg), organic milk production (mill kg) and share of organic milk out of all milk (right axis) ex farm in Denmark. Source: Statistical office of Denmark.

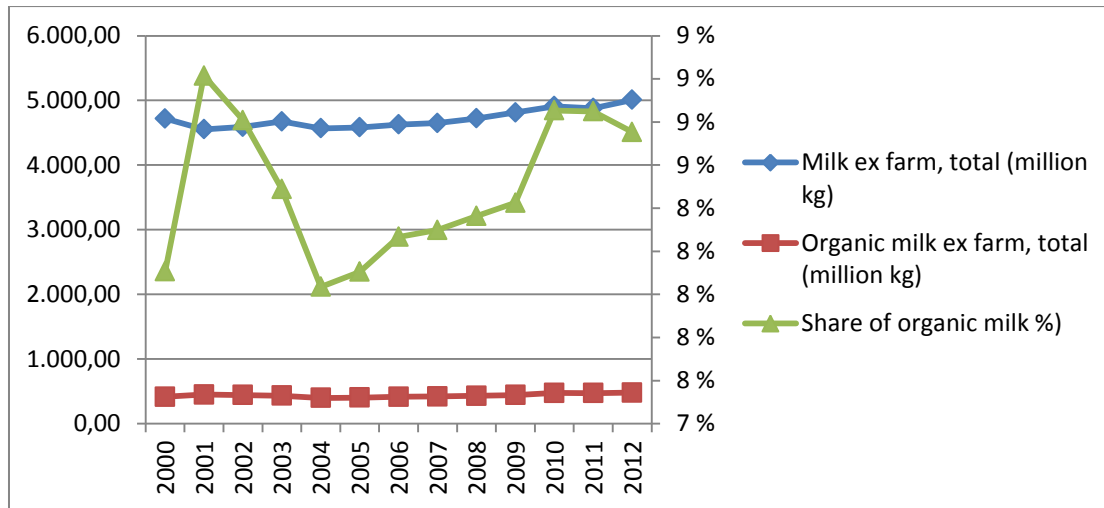
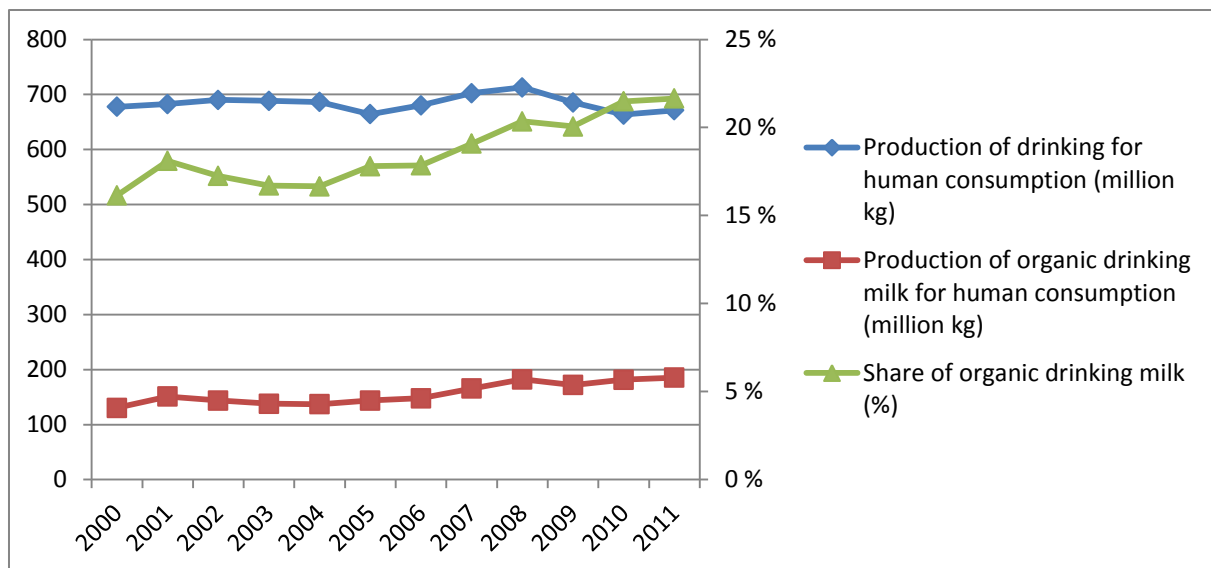


Figure 6. Overall drinking milk production (mill kg), organic drinking milk production (mill kg) and share of organic drinking milk consumed (right axis) in Denmark. Source: Statistical office of Denmark.



It is important to look at the most potential policy measures that could make a significant contribution to the milk production development in uncompetitive, possibly “fragile” rural regions.

In northern Europe, coupled subsidies, “Nordic Aids” have been paid per litre of milk and per head of cattle animals, in order to maintain production (MTT & SLI 2007). Farmers’ motivation for dairy production however has decreased in recent years due to increasing feed and cereals prices as well as due to decoupling CAP pillar 1 direct payments, increasingly paid per hectare and less per animal. Let us analyse the role of coupled payments in such conditions.

In a study of Niemi et al. (2012), the regional sector model for Finnish agriculture DREMFA developed at the MTT was used to analyse the impacts of the CAP and national agricultural policy measures on the agricultural production volumes and agricultural income in area AB in southern Finland. The sector model comprises the main production sectors of Finnish agriculture, with 18 different production regions and a detailed description of support policy (Lehtonen 2001, 2004).

Based on the results, one could evaluate the likely consequences in other regions, such as mountainous regions, which suffer from cold climate and various other natural handicaps in milk production such as unfavourable topography. Such regions can be found in many Member States (in fact, Finland despite its northernmost location in the EU, is not very different in this respect).

Using Dremfia and Finnish multi-regional case as an example, the role of production-linked support payments is evaluated below. National support payments for milk in southern Finland (regions A and B) have been at the level of approximately 3 cents/litre, i.e., approximately 7 percent of the milk price level (43 cents/litre in 2011). In a recent study of Niemi et al. (2012), the influence of this payment for the milk production in AB region was evaluated. This kind of subsidy, paid per litre of milk, is comparable to other types of coupled support payments, such as article 68 CAP payments per head of dairy cows or other bovine animals. In fact, the Dremfia model simulation reported in greater detail in Niemi et al. (2012) assume the dairy cow premium based on CAP article 68 to be paid (unchanged) per a head of dairy cow in support regions AB at a level of 150 EUR/head.

The results show a continuous decline in production in the baseline, which is in line with the observed development. The endogenous structural change in the Dremfia model, i.e., the share of cows kept at farm size groups of (1) less than 20 cows; (2) 20-49 cows; and (3) more than 50 cows per farm was calibrated to the observed level reported in farm structure statistics. The simulated production level does not fully match the annual milk production levels; however, due to large annual fluctuations in the quality and protein content of silage (such fluctuations are typical in northern conditions) which have significant effects on milk yields in a grassland roughage-based diet.

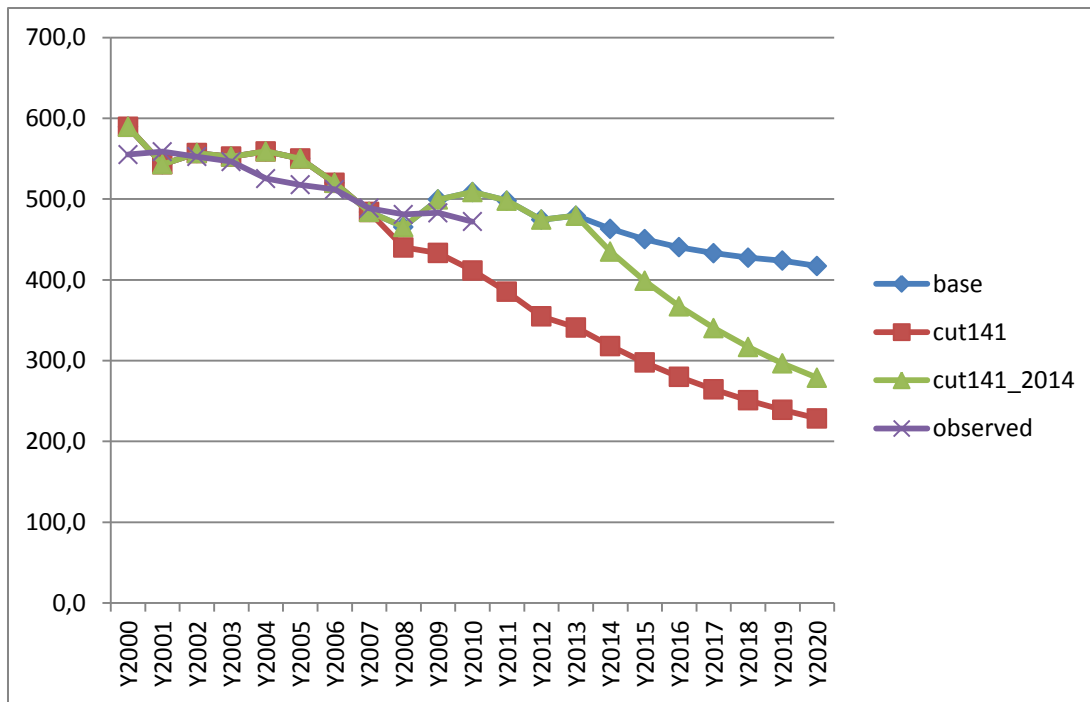
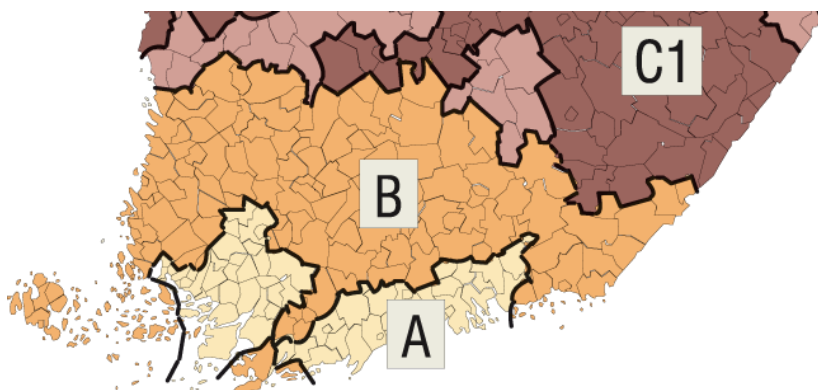


Figure 7. Milk (mill litres) production in Southern Finland (in support regions A and B) in baseline and in two national subsidy elimination scenarios starting at 2008 and 2014 (cut141, cut141\_2014, respectively). Source: Niemi et al. (2012).



Map 2. Areas AB in southern Finland.

The Dremfia model, in addition to a baseline scenario, was solved also for scenarios “cut\_141” (where national payments per litre of milk in support region AB ceased completely already in 2008) and scenario “cut\_141\_2014” (where national payments per litre of milk in support region AB will cease completely in 2014).

Contrary to expectations, the primary response of the dairy milk development is the same in both scenarios. It was initially expected that cutting off national payments per litre of milk in 2014 would have a smaller negative effect on milk production volume, compared to a counter-factual scenario where such payments are ceased already in 2008. Taking into account the impact of the milk payments on investments in large (more than 50 cows which are in the minority in Finland) dairy farms, the early abolition of the payments leads to decreased productivity development, compared to the later abolition of the payments. However, the results do not show any clear difference in the decreasing pattern of milk production development after the abolition. This was a

surprise since different patterns of milk production development were simulated for the dairy production regions in middle and northern Finland.

According to earlier studies (Lehtonen 2004, Lehtonen et al. 2007), coupled payments clearly promote farm size growth at least in relatively less competitive circumstances, in terms of natural handicaps, in middle and northern parts of the country. Such coupled payments have been necessary aids, providing incentives for investments especially in situations when many, even a significant share of farms in a less favoured region are in the need of increasing their size and efficiency. As indicated in Table 7, milk production development has been rather stable in main production areas of milk, while significant decline has taken place in southern and northern part of the country. But why are the coupled payments less effective in maintaining production in the south than in the middle parts of the country?

A recent closer analysis made in the case of southern Finland (Niemi et al. 2012) revealed that payments per hectare and cereals prices have a role to play in this question. It seems that better profitability of cereals farming, as a way to keep land in good condition and receive decoupled CAP payments, together with higher decoupled payments and higher land prices in southern Finland effectively de-motivate farmers in making dairy investments. Increased payments per hectare influence relative profitability of milk production also the effectiveness coupled payments. Considering new Member States, some of which are in need of farm size enlargement, increased payments per hectare, and high cereals prices, may inhibit dairy investments effectively.

One conclusion from such studies is also that avoiding the negative development in production in already relatively uncompetitive dairy production areas is not easy using the CAP instruments since market demand and competition play an increasing role. Any small incentives provided for dairy investments are not likely to have much impact on production in less favoured areas. Accumulative gains tend to strengthen the regions already competitive, while uncompetitive regions are likely to face increasing challenges due to increasing competition. For example, updating the product portfolio of dairy companies as well as cost efficiency of production at the farm level require most often investments in production capital and human capital, and high debt to assets ratio may not allow such investments. Hence, it seems that farms and processors already in difficulties are not easy to be aided by public dairy policy measures. However, the coming years before and after the full abolition of the milk quotas may be profitable even for inefficient producers due to strong global and EU demand. Some time and money may still be available for rationalisation of both farms and processors. Earlier studies show however that significant shifts in farm size structure, even helped by accumulative gains, are vulnerable to any negative price shocks (Lehtonen 2004, 2008).

Let us take another look at the territorial development of milk production. Price volatility is likely to increase and also low price periods may become longer due to increased milk production volume and increasing income of consumers globally and due to implied reduction in price elasticity of income (only small recovery of marketed volumes due to large price reductions) (Martin et al. 2008).

However, a strong demand and prices may realise in a way as suggested by Kempen et al. (2011) and Witzke et al. (2009), as an increase of milk production in most regions in the EU, and thus only a small fraction of regions would lose dairy production significantly. Arguments favouring such a relatively balanced view of development without drastically decreasing production in almost any Member State, are the following: (1) dairy production expansion is restricted by the land (roughage and manure spreading) requirements of dairy production – this means that any major expansion of dairy production has to be more profitable than competing agricultural activities, which are often more profitable than dairy at least at good soils: hence dairy expansion may be rather limited in favoured production regions of good soils, (2) negative environmental externalities implying rapidly increasing costs (of manure spreading and other logistic costs partly due to environmental restrictions) and (3) in dynamic rural regions even developed dairy farms and value chains may face increasing prices of land, labour and even capital (at least if the same kind of capital equipment such as buildings and machinery is demanded in large quantities at the same time) inputs. This last one refers to general equilibrium reasoning, which assumes decreasing relative profitability of additional production, utilising scarce resources.

These above-mentioned three main issues act as counter-arguments for the following micro-economic arguments for a rapid and efficient adaptation of the dairy sector through: (1) farm level accelerated productivity growth (including learning, increased benefits of specialisation and economies of scale previously



limited by quota costs) as long as main capacity limits are not exceeded; (2) positive agglomeration externalities through more efficient work division between input suppliers and contract working companies. Increased concentration leads to better availability of efficient sub-contractors and additional productivity growth – rural infrastructure may improve.

However, at this point, it is difficult to evaluate what the EU level model results might be if the positive and negative externalities of agglomeration as well as farm level accelerated productivity (under certain constraints) were taken into account. Without a large-scale model working under such (more realistic) premises, the overall spatial milk production development resulting from the ‘snowball’ effects and agglomeration externalities are difficult to be quantified.

Any significant production expansion in most competitive areas requires more land, which may be expensive and scarce already in some regions. Also environmental constraints remain in a key role in intensive production areas (as noted by Kempen et al. 2011). From literature, it can be concluded that dairy production is dependent on high quality forage production. Improved forage production operations and utilisation of manure nutrients seem increasingly important. The development in most competitive regions is however important for the EU dairy sector competitiveness and hence, new and novel approaches (utilizing accumulated gains of productivity and production efficiency) are needed to find socially accepted ways of expanding milk production in competitive areas.

Some examples, i.e., in Leningrad Oblast of North-West Russia (SLU 2009) dairy farms with a typical farm size of 600-1,000 cows per farm, show that mere economies of scale, even if coupled with significantly increased milk yield per dairy cow does not guarantee profitable production, if farms are (1) highly dependent on imported concentrate feed and thus vulnerable to (sometimes very) high feed prices; (2) forage production and land use is inefficient, i.e., low grass yields of low quality are obtained; (3) and utilisation of manure nutrients is inefficient, resulting in excess costs and very severe environmental problems. Hence a balanced growth also including ecological dimensions of production, such as more diversified crop rotations and soil improvements, should be the aim, since that seem to pay off also in economic terms already, and even more in the future when challenges of both global economic change and climate change are to be addressed.

## 5.5 Conclusion and policy recommendations drawn directly from the analysis

Main outcomes and issues that seem to be worth considering for dairy sector and administration, based on this study, are the following:

- (1) Milk production in different regions in the EU is likely to follow trends observed in recent years, in the short run (< 5 years).
- (2) Agriculture and dairy sector is increasingly dependent on global prices of inputs and output and demand. CAP and other policies seem to have less influence on dairy sector, which on the other hand has been the intended outcome of CAP reforms during the last decades. Small interventions are not likely to be effective in promoting dairy production in less favoured areas, in the context of high expected cereals and feed prices and increased hectare payments, which inhibit investments.
- (3) Does EU level competitiveness increase significantly, if certain less competitive farm types and regions, where production is decreasing already, are driven out of milk production? Uncompetitive milk production still has some economic role in certain areas in the EU while the number of such regions is continuously decreasing. If milk production increases on 70 percent of the NUTS2 regions in the EU due to milk quota abolition, as suggested by the results of Witzke et al. (2009), and decreases clearly only in 17 percent of the regions, one may ask if the marginal and average cost of milk production really decreases considerably and thus increases competitiveness of the EU milk sector. In fact, a very significant reduction in production costs of milk would be needed to bring EU into a position of a competitive producer of bulk dairy products (such as SMP, butter, standard traded cheese qualities). Too much reliance on the milk quota abolition as a vehicle to reach significantly improved competitiveness may not be justified. At the same time, some rural regions are experiencing effects of downsizing milk production and dairy processing operations, without much viable alternative employment and businesses.
- (4) Accumulative gains of farm size development and overall re-structuring of the dairy supply chain (‘snowball effects’ at farm and processor level) may in fact lead to a significantly larger degree of

agglomeration of milk production in the EU, especially in countries and regions where land prices are below average levels. Accumulative gains of concentration are not typically included in large-scale agricultural economics-based simulation models. Such agglomeration processes may, in principle, lead to significantly more drastic dairy sector developments, at least locally and possibly in larger scale as well, than suggested by Kempen et al. (2011) and Witzke et al. (2009), which show relatively stable production development in a majority of Member States. Hence, a deeper differentiation in regional future paths of dairy production is possible. However, expansion of dairy sector is dependent on the availability of land and capital, which may find more profitable uses outside agriculture.

Anyway, one may argue that macro level agricultural sector models are likely to underestimate the magnitude of regional differences in milk production if farm level 'snowball effects' and regional level agglomeration benefits are not taken into account at all.

It depends in a great extent on explicit environmental regulations, how much dairy sector may benefit from milk quota abolition.

- (5) Strong expansion of production on some regions, most likely on those which are already competitive and produce significant quantities of milk, if realizing due to agglomeration processes very well possible, may lead to environmental problems. For example, increases in nitrate leaching may be significant in hot spot areas, as indicated by Kempen et al. (2011). Environmental degradation and attempts to avoiding them may impose significant costs for farmers and society. Problems of water and soil quality deterioration due to excess nutrients are likely if milk prices remain strong compared to feed prices. Higher yields per cow are produced using concentrate feeds with high phosphorous and nitrogen content, leading to rapidly increasing nutrient concentrations in manure and possibly to severe nutrient surplus problems. Overall greenhouse gas emissions are very likely to increase if milk production is increased, and even more so if grass-based milk production is replaced by concentrate-feed based production. However, the environmental outcomes of the dairy sector re-structuring can be influenced significantly using agri-environmental policies and national legislation. In some countries, only a small fraction of the land area is defined as vulnerable zone in nitrate directive while in some others significantly larger areas are defined as vulnerable. In such countries and regions, livestock production has already downsized its operations due to environmental regulations. Now EU level decisions, together with possible demand and global market drivers, will again provide incentives and possibilities for livestock expansion.

What can be done to mitigate the expected negative developments? What might be the relevant policy actions in the case of uncompetitive (often remote) rural regions with little, if any, viable alternatives for milk production?

First, it must be noted that regions are relatively few, in the EU scale, where rural community and society as a large would benefit, in the long run, from maintaining the milk production using agricultural subsidies. Such outcome is, however, possible (at least in theory) in regions where few or no viable alternatives are available for dairy production, while some societal benefits, not only employment, such as cultural values, local brands or environmental benefits are maintained as well together with the milk production. *If this is not the case, some other interventions, not subsidies for milk, are likely to be more relevant and effective for the well-being of the rural community.* For example, case-specific analysis may reveal that investments in some specific human capital, decisive in terms of rural resources and specific opportunities, could promote economic activities in a region. Such measures should be studied and evaluated in the first place, since they may contribute to more sustained economic activity and employment in rural regions. If it turns out that such non-agricultural measures are unlikely to be useful, a region fulfilling the "fragile area" characteristics may benefit from coupled payments for milk production.

According to the reviewed policy evaluations, articles and other studies in northern European context, *one may conclude that production coupled payments for dairy production are increasingly needed if the target is to maintain milk production in LFAs.* Prices of milk relative to feed prices are likely to decrease gradually. Coupled payments may be needed at least temporarily in uncompetitive milk production regions, if the farm size structure and productivity are to be improved. If almost all farms are small in a region, many farms need to grow to reach sufficient levels of productivity and profit margin, and that is most likely not possible without coupled payments and investment aids. Payments per hectare of land largely decoupled from milk production (even payments for grass forage area) do not increase the profitability of necessary investment for animal housing. Hence the increasing volume and flexibility of coupled payments in the Member States, as outlined in

recent CAP agreement for 2014-2020 (European Commission 2013a, 2013b), is a step in the direction of maintaining milk production in less favoured areas.

*Such measures can be complemented by some branding support, such as PDOs or PGIs, for supporting attempts for sustained value creation.* If organic milk demand is increasing, supporting shifts to organic milk production and product development may be effective in less favoured areas and provide sustained value addition. One must emphasize, however, that the milk quota abolition will make all such efforts at least little more challenging than before, due to intensifying competition also in the product segments of value-added products. Over time, however, demand for various value-added and organic products is likely to increase as income level increases, especially in eastern European countries.

It was also found that agricultural direct payments paid per ha of utilised farmland, together with expected and realised high prices of cereals and other feeds, lead to high land prices, and inhibit investments in dairy production even in less favoured regions. Converting part of the land payments conditional on suitable environmental criteria could improve the relative position of dairy farms in less favoured areas, where dairy farms are often less intensive in terms of input use. This is partly realising in the “greening conditions” of new CAP in 2014.2020 if grassland areas are more easily eligible for full CAP direct payments than other crops. Also the realisation of cross-compliance conditions already part of CAP play a role since their implementation affect the relative position of dairy farms on local land markets.

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