Agricultural Insurance schemes

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1. Background: climatic risk in agriculture

The economic stability of an entire rural area can be jeopardized by crises caused by different types of natural disasters, from climatic events to livestock or plant diseases. Economic crises caused by the changes of market conditions may also endanger farm's viability. The CAP should enhance appropriate risk and crisis management strategies, providing an improved response to crises in the agricultural sector.

It is well known that weather is an important production factor in agriculture. Unfortunately, this production factor can hardly be controlled. In fact, weather risks are a major source of uncertainty in agriculture and it seems that fluctuations of temperature and precipitation even increased in the last decade due to global climate changes. Drought or excess rain is responsible for bad harvests all over the world. Perhaps the most obvious impact of weather risk is on crop yields, but its relevance is not limited to crop production. The performance of livestock farms, the turnover of processors, the use of chemicals and fertilizers and the demand for many food products also depend on the weather. Hence, large parts of the agribusiness are affected by weather risks. In the EU the problem of production risk is even more relevant since price volatility is expected to increase due to recent policy reforms.

Producers can try to compensate the negative economic consequences of bad weather events by buying insurance, but also, since the mid-nineties a new class of instruments, namely weather derivatives. Generally spoken, weather derivatives and index based weather insurance are financial instruments that allow to trade weather related risks. Some countries have decided to help the stabilization of their agriculture by supporting the agricultural insurance schemes.

One of the purposes of the current study is to discuss the state of the art in the area of analysis and management of weather-related risks in agriculture. Weather risk is a major challenge in agricultural policy, and it is important to have a new look at it providing suitable information to analyse a possible integration in the Common Agricultural Policy. Some factors add non-negligible difficulties to the study: in particular due to global climate changes the volatility of weather and the occurrence of extreme weather events increases. This leads to destabilization of farm incomes in particular in countries with strong yield variability.

1.1 Policy Framework: The EU agricultural policy

1.1.1 CAP history

The creation of a Common Agricultural Policy was proposed in 1960 by the European Commission. It followed the signing of the Treaty of Rome in 1957, which established the Common Market. The six member states[1] individually strongly intervened in their agricultural sectors, in particular with regard to what was produced, maintaining prices for goods and how farming was organised.
By 1962, three major principles had been established to guide the CAP: market unity, community preference and financial solidarity. Since then, the CAP has been a central element in the European institutional system.

Objectives

The initial objectives were set out in Article 39 of the Treaty of Rome:

- to increase productivity, by promoting technical progress and ensuring the optimum use of the factors of production, in particular labour;
- to ensure a fair standard of living for the agricultural Community;
- to stabilize markets;
- to secure availability of supplies;
- to provide consumers with food at reasonable prices.

The CAP recognised the need to take account of the social structure of agriculture and of the structural and natural disparities between the various agricultural regions and to effect the appropriate adjustments by degrees.

1.1.2 How the CAP works

The CAP is an integrated system of measures which works by maintaining commodity price levels within the EU and by subsidising production. There are three principal mechanisms:

- Import tariffs are applied to specified goods imported into the EU. These are set at a level to raise the World market price up to the EU target price. The target price is chosen as the maximum desirable price for those goods within the EU.
- An internal intervention price is set. If the internal market price falls below the intervention level then the EU will buy up goods to raise the price to the intervention level. The intervention price is set lower than the target price. The internal market price can only vary in the range between the intervention price and target price.
- Subsidies are paid to farmers growing particular crops. This was intended to encourage farmers to choose to grow those crops attracting subsidies and maintain home-grown

[1] France, Germany, Belgium, Italy, Luxembourg and The Netherlands.

supplies. Subsidies were generally paid on the area of land growing a particular crop, rather than on the total amount of crop produced. Current reforms of the system now underway are phasing out specific crop subsidies in favor of flat-rate subsidies based only on the area of land in cultivation, and in return for adopting environmentally beneficial farming methods. This will reduce, but not eliminate, the economic incentive to overproduce.

1.1.3 Reforming the CAP

Pre - 1992

The Mansholt Plan was a 1960s idea that sought to remove small farmers from the land and to consolidate farming into a larger, more efficient industry. Farming's special status, and above all the extremely powerful farming lobbies across the Continent saw the Plan disappear from the Union's objectives.
Bruised by the failure of Mansholt, would-be reformers were mostly absent throughout the 1970s, not least due to the various financial crises that rocked the union in this decade, such as oil supply problems.
The 1980s was the decade that saw the first true reforms of the CAP, foreshadowing further development from 1992 onwards. The influence of the farming bloc declined, and with it, reformers were encouraged. Environmentalists garnered great support in controlling in the CAP, but it was financial matters that ultimately to offset the balance of the situation: due to huge overproduction the CAP was becoming expensive and wasteful. These factors combined saw the introduction of a quota on dairy production in 1984, and finally, in 1988, a ceiling on EU expenditure to farmers. However, the basis of the CAP remained in place, and not until 1992 did CAP reformers begin to work in serious.

1992 – MacSharry reforms

In 1992, the MacSharry reform was created to limit rising production, while at the same time adjusting to the trend toward a more free agricultural market.
The reform reduced levels of support for cereals and for beef. It also created *'set aside'* [2] payments to withdraw land from production, payments to limit stocking levels, and introduced measures to encourage retirement and forestation.
It is worth noting that one of the main catalysts behind the 1992 reform was the need to pacify the EU's external trade partners at the Uruguay Round of the GATT trade talks with regards to agricultural subsidies.
The 1992 reform signed a very important change which was proposing measures for the reduction of prices, making them more competitive on the European and world market, the allotment of compensation to farmers who had experienced big losses and the introduction of environmental protection measures.

[2] Set-aside is a term for land that farmers are not allowed to use for any agricultural purpose.

In general, the MacSharry reform is considered a success and its results have had a positive impact on the European agriculture.

Agenda 2000

During July 1997, the Commission proposed a reform of the agricultural sector in the frame of "AGENDA 2000", the negotiations ended in the European Council in March 1999 in Berlin.
Agenda 2000 represents the most radical and innovative CAP reform from its institution till nowadays. It brought the process started in 1992 to a solid base, giving a strong structure to the future development of the European agriculture competences: economics, environment and rural.

2003 – Fischler reform

On 26 June 2003, EU farm ministers adopted a fundamental reform of the CAP, based on almost entirely "decoupling" subsidies from a particular crop. Member States may choose to maintain a limited amount of specific subsidy.
The new "single farm payments" are linked to respect for environmental, food safety and animal welfare standards. The reforms enter into force in 2004-2005. (Member States may apply for a transitional period delaying the reform in their country to 2007 and phasing in reforms up to 2012)

The reform of June 2003 and the publication of Regulations (EC) 1782/2003 and 1783/2003[3] brought to a close the complex process of market reorganisation of European Community support for agriculture and rural development that began in 1992. The Fischler reform signed a decisive step toward more selective support, aimed at conservation and enhancement of the environment, and explicitly linked to beneficiaries' mode of conduct. One relevant aspect of the reform is that it offers Member States some options for putting decisions taken in common into action. In substance, it grants countries and local institutions an ample role, also in the area of market policies, and abandons the idea of a mechanistic, "single" policy for the entire EU.
In April of 2004, regulations were published containing methods of application[4].

The single-payment scheme

Under the single-payment scheme, beginning from the 1st January 2005 and not later than the 1st January 2007, the majority of CAP direct aid would be made in one payment.
The new system is strongly decoupled, that is, not directly connected to what the farmer produces. Nevertheless, in order to safeguard particular production sectors and avoid abandoning them, some specific aid payments would be provided for certain products[5].

[3] Establishes the legal framework for the new decoupled scheme: the Single Payment Scheme (SPS)
[4] (Regs. 795/2004 and 796/2004, and Reg. 817/2004)

Beneficiaries of the single payment are those who in 2000-2002 received direct payments for at least one of the listed regimes. The three-year average of overall payments a farmer receives becomes the reference figure for calculating right to aid. Thus every farmer is given one entitlement per hectare, calculated by dividing the reference figure by the average number of hectares for the three years period (including area planted to fodder) for which he receives direct payments.
Right to payment is contingent on possession of a number of hectares equal to the number of rights held. The corresponding area may be used for any kind of agricultural activity other than permanent crops, fruit and vegetables, and edible potatoes. Moreover, farmers are required to maintain land in good agronomic and environmental condition.
A national ceiling is set for the amount of single-payment support, on a rising scale from 2005 to 2007, based on average past payments. To maintain this, there may be a linear reduction in amounts.
Member States must set up a national reserve, using linear reduction, of a maximum of 3% of amounts received. The reserve is primarily used to help farmers in particularly difficult situations.
Member States had until 1 August 2004 to decide whether or not to apply the single payment scheme on the regional level, with two possibilities: the general or "historic" scheme, or based on a flat-rate. Partial application of the single-payment scheme is also possible, that is, to subtract part of direct payments for arable crops, sheep and goats, and cattle from the total decoupling, but keeping part of the payment related to the product. Member States may withhold 10% of available financing for a given sector, to be used for payments to aid specific types of agriculture which are considered important for protection or enhancement of the environment, or for improving quality and marketability of farm products.

1.1.4 Policies for disaster aids and risk management in agriculture

The international agreements and the European Union policies directly related with risk management will be addressed in detail in the second chapter (2. Definitions of "disaster" and "crises" and related policies at Member State level, BG and RO and discussion of these issues for the EU level).

1.2 Types of risk

The agriculture sector is characterised by high exposure to risk, often but not only, coming from climatic events.
Let's try to summarize the different types of risk that agriculture faces and evidence of risk exposure in European agriculture.
First we analyse the risk types and afterwards the tools available to manage these agricultural risks.

[5] Durum wheat, high-protein products, rice, nuts, energy crops and starch potatoes, payments which would limit the effect of decoupling and maintain links to production.

Risk types: 1. Price risks = because of agriculture trade liberalisation

2. Production risks = because of an adverse meteorology or other reasons (rising quality requirements on animals and plants diseases across borders, etc). Climate change represents a long term issue that deserves an in-depth specific analysis.

Eurostat and FADN (Farm Accountancy Data Network), managed by DG AGRI, are the main data sources for economic analysis in agriculture. They show that risk exposure in the EU as measured by price, yield and output variability, is widely different across territories and products.

Some risks farmers have in common with other business, others are unique to farming. The most important risks can be classified as follows: (Hardaker, Huirne and Anderson 1997)

- *Human or personal risks*: the farm operator can get health problems or even die.
- *Asset risks*: like theft, fire and other damage or loss. Losses are generally covered by insurance or in case of calamity the public disaster aid may help to reduce the losses outcomes.
- *Production or yield risk*: most of the time the weather is responsible, but it also includes risks like plant and animal diseases. Yield risk is measured by yield variability. In turn, yield variability for a given crop differs from region to region, while is determinate by the soil type, the climate and the production method. Regarding livestock sector the risk is less considerable, because weather has a smaller influence.
- *Price risk*: is the risk of falling or raising prices after a production modification has been done.
- *Institutional risk*: is associated with policy changes which intervene with agricultural issues and that can have a negative impact on farm revenue.
- *Financial risk*: depends from the possible increase of interest of a mortgage, insufficient liquidity and loss of equity.

The above mentioned risks can be often interrelated, so one event can create several impacts on other realities. All the categories of risk have an effect on the income of the stakeholder.
Risk perception can vary from farmer to farmer, from sector to sector and from product to product, it depends on the farmer's experience and on the degree of risk-aversion.
For instance, in 1997 a survey was carried out in the Dutch livestock sector. It has showed that the price risk was identified as the highest source of risks, followed by institutional or personal risk. On the other hand, a similar survey was carried out in the US on other production programmes as wheat, corn, soybean, etc. In this case the producers were more concerned about yield and price risk, while livestock farmers worried mainly for institutional risks (Mewissen, Huirne and Hardaker 1999a).

2. Literature survey on risk management systems in agriculture

2.1 Tools for risk management in agriculture

Two types of risk management strategies are distinguished:

1. Strategies concerning **on-farm measures**: selection of products with low risk exposure or with short production cycles, diversification of the production programmes.
2. **Risk sharing strategies**: marketing contracts, production contracts, hedging on futures markets, participation in mutual funds and insurance.

In other case there is always the possibility to rely on public assistance (disaster or emergency aid) or invest in other activities than agriculture production (agro-tourism, open days of the farms, training, children birthday' parties, social convention with institutions for voluntary work on the farm).
As an example of the first strategy group, the diversification of the business activities reflects the reduced dependence of farmers on agriculture as a source of income. Diversification also implies some kind of entrepreneurial activity on behalf of the farmer. There are some obvious activities that are included as diversification within the definition above such as tourism, sport, recreation, processing, etc.
Another strategy can be to specialise the farm and start to work together with other specialized neighbour farms, with the aim of building up a Cooperative in which the total production cost, the yield and price risk can be shared. Also the degree of risk exposure can decrease thanks to the variety of the crops. This strategy is not always compatible with the dominant mentality of farmers.
Diversification includes as well off-farm strategies. Off-farm employment reduces dependency from agriculture income, it can be considered as a strategy but also as a need while agriculture incomes can easily be too small to support a whole family. Off-farm employment can also increase the probability of stopping the farming activity.

2.1.1 Contracts and vertical integration

A *marketing contract* is an agreement between a farmer and a buyer to sell a commodity at a certain price before the commodity is ready to be marketed. The farmer retains full responsibility for all production management decisions. The contract can be based on a fixed price, or alternatively depend on the development of the commodity's futures price. Contracting provides the farmer with an opportunity to differentiate his products from mass production and to draw an

economic rent from this. Another advantage of these types of contracts in the crops sector is related to time management. In fact during the busy harvesting season, farmers do not have enough time to sell the products.

The *production contracts* typically give the contractor (the buyer of the commodity) considerable control over the production process. These contracts normally specify the production inputs to be used, the quality and quantity of the product and the price to be paid to the producer. This kind of contract partially shifts price risk to the processor.

A *vertically integrated* firm retains ownership control of a commodity across two or more levels of activity. Risk reduction is one of the reasons to vertically integrate them. It helps to reduce risks associated with a variation in quantity and quality of inputs or outputs. Vertical integration is more common in the livestock sector or in the fresh vegetables sector.

Other options for marketing are the spot and cash markets[6], in which prices are set for goods that are immediately available. Production and marketing contracts, as well as *futures contracts*, add the time dimension to these markets. They allow users to cover their price risk by locking in the price of a commodity they wish to purchase or sell at a future date. Futures market contracts are standardised in terms of contract terms and thus they can be more easily traded; they are traded in organised exchanges under rules and regulations. (Larson et al.1998)

2.1.2 Derivative contracts

Futures contracts and others are called *derivatives*. As mentioned in the previous section, derivative contracts can also be used for risk management in agriculture. Even through in the US have appeared some derivatives contracts based on weather indices and even derivatives on yields have been proposed (Canter et al., 1996; Jaffee and Russell 1997; Stoppa & Hess, 2003; Turvey, 2001; Skees, 1999) derivatives markets are essentially and often used for the purpose of managing price risks.

Market agents, confronted with price risk which arise mainly from supply and demand imbalance in the market, can use derivatives instruments to control price (and perhaps yield) risk by transferring it to other individuals who are willing to bear it. The activity of trading derivatives contracts with the objective of reducing or controlling future spot price risk and revenue is called “hedging”. Hedging essentially involves taking a position in the derivatives market which can offset any gains or losses made in the physical market, by locking into a fixed price, or buying a price floor or price ceiling.

The most popular derivative contracts are futures, options and swaps. A **futures contract** is an agreement to trade at a specified future time and price a specified commodity or other asset. The principal idea behind futures contracts is to protect the holder against adverse price

[6] See definition in the glossary.

movements prior to a cash sale or purchase of commodity in the future. Futures hedging is effective in eliminating price risk, but leads to other risks including basis risk. An **option contract** gives its holder the right, but not the obligation, to buy (call option) or sell (put option) an underlying asset (e.g. wheat) at certain price, known as the strike price, and at a certain point in time, known as the expiration date or the maturity. Finally, a **swap contract** is an agreement whereby a floating price for a commodity is exchanged for a fixed price for the same commodity over a specified period for a defined volume. The floating price is normally the prevailing market (spot) price for the asset and the fixed price is the price which is negotiated and agreed before the initiation of the swap contract. (FOA, 2005)

2.1.3 Insurance

The idea behind insurance is that of risk pooling. Risk pooling involves combining the risks faced by a large number of individuals who contribute through premia to a common fund which is used to cover the losses incurred by any individual in the pool.
In order for a risk to be insurable, two basic requirements have to be met: managing the adverse effects of "asymmetric information" and overcoming the implications of "systemic risks[7]".
Natural disasters or epizootic diseases cause special problems for insurance. Natural disaster risk within a certain region is a highly correlated risk between the farmers of that region, with a low probability of very high losses. There are several reasons why it is difficult to develop insurance products to cover such risks (Skees 1997):
If re-insurance or state guarantees are not available, the nature of the systemic nature risks makes it necessary for an insurance company to charge high premia (which can be unaffordable for many farmers) and to build up substantial capital reserves.
Another aspect which makes this specific reality difficult to manage is the scarcity of relevant historical data useful to calculate a premium because of the infrequency of such events.
If governments provide ad-hoc disaster payments, this stifles the development of insurance products.
As natural disasters, epidemic diseases have a *systemic* character and the data concerning outbreaks are normally rare. In the case of animal diseases, farmers can reduce the chance of an outbreak of a disease by taking appropriate precautionary measures (vaccination, veterinary screening of the herd, etc.). Furthermore, state involvement is important with respect to both legislation and covering *direct losses* [8] resulting from outbreaks of animal diseases.
As governments normally cover direct losses, losses which need to be covered are those called consequential or indirect losses[9], resulting from business interruption (empty buildings), supply and delivery problems (because of movement restrictions) and repopulation (Meuwissen, Huirne and Hardaker, 1999a; Meuwissen 2000).

[7] See the definition of asymmetric information and systemic risk in the Glossary.
[8] This specific aspect of direct losses in livestock sector is described in detail in Chapter 7, Paragraph 7.1.
[9] Consequential losses are specifically presented in Chapter 7, Paragraph 7.1.

Whether such private insurance products against epidemic diseases can be developed depends on - as in the case of natural disasters - whether sufficient data is available for calculating premia and whether sufficient re-insurance capacity or state guarantees are available.

2.1.3.1 Insurable risks:

Risks are insurable, if certain conditions are fulfilled (Skees1997, Skees and Barnett 1999).
1. The insurer and the insured have the same information as regards the probability of a bad outcome (*Symmetric information*). This is normally not the case; the main problems are moral hazard and adverse selection.
2. Risks should be *independent* across insured individuals. If risks are systemic (dependent), special measures have to be taken in order to make insurance solutions viable.
3. Calculable: In order to fix the premium rates, the insurance company must be able to calculate the chance of loss so, the average frequency and the average severity of loss.
Actual losses occurring must be determinable and measurable.
4. Premia must be affordable.

2.1.3.2 General types of insurance in agriculture

Many agricultural risks are considered to be *systemic*, for example yield and price risk.
Let's list the types of insurance in agriculture sector.

Yield insurance is mainly feasible for crops; with livestock products it is more complicated while they can be produced in a very fast or very slow speed.
Yields can be insured for specific perils, such as hail, which allows the calculation of the probability distribution of a loss occurring, based on historic data. Yield insurance can be based on individual yields or area yields. In the first case, indemnities are paid, if the individual yield falls below a pre-determined trigger yield. In the second case, a farmer would only receive a payment, if the area yield falls below an established trigger yield.

Price insurance is realistic only for those products, for which objective price data are available. To avoid moral hazard and adverse selection problems, loss assessment should be based on a price that cannot be influenced by the farmer (futures price, spot market price). If losses resulting from a loss of quality are excluded from coverage, then price insurance provides less protection for the farmer. However, including loss of quality may involve significant moral hazard problems, as quality depends to a certain extent on management decisions (Meuwissen, Huirne and Hardaker 1999).

Revenue Insurance is a combination of price and yield insurance. It has the potential advantage of being cheaper than price or yield insurance, as the risk of a bad outcome is smaller (low yields may be compensate by high prices and the contrary).

In order to offer revenue insurance, an insurance company must be able to determine the joint probability distribution of price and yield risks and find solutions to overcome moral hazard and adverse selection problems.

Income insurance is potentially more attractive to farmers than other forms of insurance (e.g. yield, price), because it deals with losses affecting farmer's welfare more directly (Meuwissen 2000). It could be based for instance on net farm income of family workers (farm revenue, - including subsidies, minus variable costs, taxes, depreciation, rent, interest and compensation of employees).
Insurance of individual income risks poses considerable problems of moral hazard and adverse selection. Potential losses do not only occur by accident but depend to a large extent on how well a farmer manages his business. A farmer in fact can easily manipulate certain elements influencing his income (e.g. compensation of employees, operating costs, inventories). Due to these two factors it's quite hard for an insurance company to calculate the right premium.

Re-insurance is important for insurance companies which cover correlated risks and are thus running the risk of having to cover big losses. Without re-insurance, premia would have to be set at a very high level to build up enough reserves in order to cover potentially high losses.
Two basic schemes for re-insurance dominate:

• *Proportional re-insurance* (*Quota share*[10]): Insurer and reinsurer share premia and risk. The re-insurer assumes by mutual consent, fixed percentage of all the insurance policies written by a direct insurer.
The quota determines how premia and losses are distributed between direct insurer and re-insurer.
• *Non-proportional re-insurance*:

a) Excess of loss: re-insurer covers up to a certain amount any part of a loss resulting from a single catastrophic event that exceeds an agreed deductible[11].

b) Stop-loss: re-insurer covers up to a certain amount any part of a total annual loss that exceeds an agreed deductible.

Mutual insurance schemes are a special case of insurance. Mutual funds are owned by the participants. In the case of a member incurring a loss, the loss will be fully or partially compensated through the collected money already available in the fund and an additional collection among participants.
If mutual founds are organised regionally, the advantage is that farmers know each other reducing the problem related with moral hazard and adverse selection. The disadvantage of regionally organised mutual is the danger that many or even all farmers incur losses at the same

10 Quota-share provisions specify what percentage of premiums and loss exposure the private company will retain, with the residue being passed on to the reinsurer. (look up in the glossary)
11 Look up in the glossary.

time. This could mean for a farmer that he incurs losses and has to contribute to the fund to cover other farmers' losses at the same time. Solutions for this problem are re-insurance or the cooperation with mutual schemes in other regions which would cover a share of the loss.
In the Netherlands, for instance, mutual insurance schemes have been developed for contagious disease outbreaks both in crops and livestock. (Meuwissen 2000)
The Commission, in the case of livestock insurance, has recently proposed the setting up of similar funds in Member States intended to stabilise income in the pig sector. These regulatory funds would be financed by producers and would enable them to stabilise revenue through a system of levies to be collected during periods when their economic situation is satisfactory. In exchange, payments would be made during periods of a difficult market situation (European Commission 2001).

Index Insurance Alternatives

About this difficult aspect related with agricultural insurance scheme, a paper by Skees and Hartell is presented in the book by Stoppa.
According to Skees and Hartell it's possible to get a clear overview on what Index insurance scheme is and how it works.
There are lower cost approaches to providing crop insurance that also mitigate the traditional problems associated with multiple-peril crop insurance.
Index-based insurance products are an alternative form of insurance that make payments based not on measures of farm yields, but rather on either area yields or some objective weather event such as temperature or rainfall.
Index insurance products represent innovation offering better pricing for sharing catastrophic risk. In some situations, index insurance offers superior risk protection when compared to traditional multiple-peril crop insurance that pays indemnities based on individual farm yields. This happens when the provider of traditional insurance must impose large deductibles. A deductible basically means that the insurance policy will not pay until the loss is very serious. Deductibles and co-payments (or partial payment for losses) are commonly used to combat adverse selection and moral hazard problems. Since these problems are not present with index insurance, there is less need for deductibles and co-payments.
Index insurance provides an effective policy alternative as it seeks to protect the agricultural production sector from widespread, positively correlated, crop-yield losses (e.g., drought).
When index insurance is used to shift the risk of widespread crop losses to financial and reinsurance markets, the residual personal risk often has characteristics that make it more likely that rural banks can work to smooth consumption shortfalls with loans.

Two types of index insurance products are considered; those that are based on area yields where the area is some unit of geographical aggregation larger than the farm, and those that are based on weather events.
An area-based yield contract has been offered in the United States since 1993. This policy was developed by the author and is named the Group Risk Plan (GRP). There are numerous ways to calculate payments on index contracts (Skees, 2000). For the U.S. GRP program, indemnity is

calculated as where the index is the yield for the county where the farm is located (Skees, Black and Barnett, 1999).

Advantages of Index Insurance

Index contracts offer numerous advantages over more traditional forms of farm-level multiple-peril crop insurance. These advantages include:

1. No moral hazard*:* Moral hazard arises with traditional insurance when insured parties can vary their behaviour so as to increase the potential likelihood or magnitude of a loss. This is not possible with index insurance because the indemnity does not depend on the yield of an individual producer.

2. No adverse selection*:* Adverse selection is a misclassification problem caused by asymmetric information. If the potential insured has better information than the insurer about the potential probability or magnitude of a loss, the insured can use that information to self-select whether or not to purchase insurance. Index insurance on the other hand is based on widely available information, so there are no informational asymmetries to be exploited.

3. Low administrative costs*: D*issimilar from the farm-level multiple-peril crop insurance policies, index insurance products do not require underwriting and inspections of individual farms. Indemnities are paid exclusively on the realised value of the underlying index as measured by government agencies or other third parties.

4. Standardized and transparent structure*:* Index insurance policies can be sold in various denominations as simple certificates with a structure that is uniform across essential indices.

5. Availability and negotiability*:* Since they are standardised and transparent, index insurance policies can easily be traded in secondary (future) markets. Such markets would create liquidity and allow policies to flow where they are most highly valued.
Individuals could buy or sell policies as the realisation of the underlying index begins to unfold. Moreover, the contracts could be made available to a wide variety of parties, including farmers, agricultural lenders, traders, processors, input suppliers, shopkeepers, consumers, and agricultural workers (Skees 1997).

6. Reinsurance function*:* Index insurance can be used to transfer the risk of widespread correlated agricultural production losses. Thus, it can be used as a mechanism to reinsure insurance company portfolios of farm-level insurance policies. Index insurance instruments allow farm-level insurers to transfer their exposure to undiversifiable correlated loss risk while retaining the residual risk that is diversifiable (Black, Barnett, and Hu, 1999- mentioned by Stoppa 2004).

Disadvantages of Index Insurance

1. Basis Risk*:* The occurrence of basis risk depends on the extent to which the insured losses are positively correlated with the index. Without sufficient correlation, “basis risk” becomes too severe, and index insurance is not an effective risk management tool. Careful in designing index insurance policy and using in a correct way the parameters (coverage period, trigger, measurement site, etc.) can help to reduce basis risk.
Selling the index insurance for example to a collective group can pass the issue of basis risk to a local group that can develop mutual insurance at some level. Such a group is in the best position to know their neighbours and determine how to allocate index insurance payments within the group.

2. Security and diffusion of measurements*:* The feasibility of index insurance depends critically on the index being objectively and accurately measured.
The index measurements must then be made broadly available in a well-timed way.
Whether provided by governments or other third party sources, index measurements must be widely disseminated and secure from altering.

3. Precision in modelling*:* Insurers will not sell index insurance products unless they can be sure about the statistical properties of the index.
This requires sufficient historical data on the index and good models that use these data to predict the probability of various index measures.

6. Reinsurance*:* In most of the cases, insurance companies do not have the financial resources to offer index insurance without adequate and affordable reinsurance. Effective arrangements must therefore be established between local insurers, international reinsurers, national governments, and possibly international development organizations.

Index insurance is a different approach to insuring crop yields. Unlike most insurance where independent risk is a precondition, the precondition for index insurance to work best for the individual farmer is correlated risk.
It is possible to offer index contracts to anyone at risk when there is an area wide (correlated) crop failure. Furthermore, another difference from traditional insurance is that there is no reason to place the same limits on the amount of responsibility purchases by an individual.
As long as the single farmer cannot influence the outcome that results in payments, then placing limits on liability is not necessary as it is with individual insurance contracts.
Finally, the real advantage of merging index insurance into banking is that the banking entity can use such contracts to manage correlated risk.
Consecutively, the bank should be able to work with the individual to help them in managing the residual risk or basis risk. In simple terms, if the individual has an independent loss when the index insurance does not pay, they should be able to borrow money from the bank to smooth that shock. This could effectively remove the principal concern associated with index insurance contracts that someone can have a loss and not be paid.

As more sophisticated systems are developed to measure events that cause widespread problems it is possible that indexing major events will be easier and accepted by international capital markets.
Under these conditions, it may become possible to offer insurance to countries where traditional re-insurers and main providers would previously have never considered. Insurance is about trust. If the system to index a major event is reliable and trustworthy, there are truly new opportunities in the world to offer a wide array of index insurance products (Skees and Hartell, mentioned by Stppa 2004).

2.2 Some existing studies on Agricultural Insurances in Europe

In this chapter an overview of the main documents is given, which review the agricultural risk management systems in the European countries. Many of those documents have been elaborated by the European Commission. Next, a summary of the main agricultural risk management systems is given, not only in Europe but in the whole world.

Cost-sharing schemes for epidemic livestock diseases (Civic Consulting, 2006) (See also Chapter 7.2)
A working paper for the expert workshop on options for harmonised cost-sharing schemes for epidemic livestock diseases, held in Brussels the 17th of March 2006, analyses 4 alternatives for cost-sharing schemes:

- Continuation of the current system of expenditure in the veterinary field.
- Financing costs of disease control through ad-hoc measures in case of a disease outbreak.
- Setting-up a unified cost-sharing at the European level.
- Defining a unified Community framework for national or regional cost-sharing schemes.

The paper supports the last option on the basis of the next set of criteria:

- Categorisation of animal diseases (impact on public health, animal health or economic impact).
- Incentive compatibility: the effort should be mainly focused on prevention.
- Balancing costs and responsibilities.
- Prevention of competition distortion
- Compatibility with EU financial instruments and ongoing initiatives.
- Harmonisation and flexibility of implementation.

Some of the main characteristics of the proposed harmonised framework would be:

- Obligation of Member States to introduce a cost-sharing scheme.
- The objective of transferring animal health risk from farmers to a cost-sharing scheme.
- The responsibility should cover only certain diseases.

Risks and crisis management in agriculture: University of Naples (2005)

This study, by Cafiero et al. 2005, carried out for the European Parliament in 2005, provides comments on the three options considered by the Communication of the Commission to the Council (EC, 2005a). The report is very critical with the first option (public participation on the insurance premium paid by farms and on the re-insurance scheme), obviously in contrast with the position of insurance companies. When commenting the possibility of a Common Agricultural Policy that would subsidise agricultural insurances, one of the points criticised in this report is that a substantial amount of the subsidies would be given in fact to the insurance companies, instead of finishing in the farmers' pockets. This statement deserves a further analysis by comparing countries where such subsidies exist and countries where alternative tools are dominant (calamity funds or ad-hoc help for catastrophic events, for example)

There is information about insurance in the following countries:
- Countries with public intervention: France, Italy, Spain, Greece
- Countries with private insurance systems: Germany and United Kingdom
- Non-EU countries: United States, Canada, Australia

FOA Agri-report (2005)

This study, carried out by Alizadeh and Nomikos (2005), was commissioned by the Futures and Options Association. Even if it focuses on the potential of the Futures Markets to help farmers manage the increasing price risks, it considers and reviews all kind of risk management strategies used by farmers, including crop insurance.
Its superficial comparison of the use of insurance across the EU Members is based on EC 2001 Risk Management Report and Meuwissen et al. (2003). It raises the question of the efficiency, equity and WTO consistency of the insurance programmes, according to Bascou (2003)

Communication from the Commission to the Council and Commission Staff Working Document (EC, 2005)

This Communication considers what additional measures the CAP could introduce to support farmers, in respect of risk and crisis management, but in such a way that they entail no additional expenditure (a small percentage of the modulation funds can be used for this purpose under some restrictions). The main novelties of the Communication to the Council could be summarized as follows:

a) Encourages the inclusion of risk management training to farmers in rural development programs.
b) Suggest that the potential of three options be assessed:
    - The possibility of public contribution to the cost of the premia, under some conditions, although this support would come from the funds assigned to the second pillar within the C.A.P. As an alternative to supporting the premia, it mentions that in addition to the formula of co-insurance arrangements between insurance companies, governments could participate in co-reinsurance schemes.

- The temporary and digressive support for the administrative operations necessary for developing mutual funds
- Income stabilization payments or liquidity support payments against income crises.

The Communication is accompanied by a Commission Staff Working Document which makes a synthesis of the risks and crises in agriculture, and the instruments available to EU agriculture to manage them (but it does not enter into the details of each country's system).

Analysis of the farm risk management tools in the "Region Wallonne" (2005)

This study was carried out by Harmignie et al. (2005), from the Universite Ctholique de Louvain. It contains the European Communication from the Commission in March 2005, and the conclusions from the European Economic and Social Committee (2005). It reviews the insurance and calamities systems in Belgium, France, Luxembourg, Spain and in a lower extent, Germany.

Its objective was to propose adequate agricultural risk management instruments for the Wallon region. The main proposals are: price risk management systems, such as price information systems and others; mutual funds and a fund for the sanitary livestock crises; and last, even though a greater cooperation between the public sector and the insurance companies is proposed, the climatic risks of the main crops in Belgium do not seem to require combined or yield insurance development (even though crop risks should be object of further research).

Informe final del Proyecto "Gestión del Riesgo Agropecuario en America Latina y el Caribe". ENESA-BID (2004)

This is the final report of the Project "Management of agricultural and livestock risk in Latin-America and the Caribbean area". This project explores the possibilities for the development of the agricultural insurances in Latin-American and Caribbean countries. It reviews the experiences in agricultural insurance in Europe and in North America. There are data from:

- EU countries: Austria, Belgium, Denmark, France, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden (The insurance data source is Forteza del Rey, V., 2002).
- North-American countries: USA, Canada
- Latin-American and Caribbean countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, México, Panamá, Paraguay, Venezuela

"La Gestione del Rischio in Agricoltura: Strumenti e Politiche" by A. Stoppa (2004)

"La Gestione del Rischio in Agricoltura: Strumenti e Politiche", is a collection of articles made by the Forum Internazionale dell'Agricoltura e dell'Alimentazione[12] directed by Andrea Stoppa. It does consist in a scientific review on risk management in agriculture.

[12] The "Forum Internazionale dell'Agricoltura e dell'Alimentazione, is promoted by the Coldiretti National Confederation. The Forum includes many different initiatives run by experts, researchers, and institutional

This review brings into focus the existent realities in some countries like: USA, Canada, Spain, France and Italy. All over Europe there is a strong interest to study the growing importance of political instruments to face out this systemic risk reality.

OECD Workshop "Income Risk Management in Agriculture" Paris (2001)

A paper by Catherine Moreddu[13] (OECD)[14] describes the risk characteristics, the instruments to manage it and discuss the role of economic policies at a European level in the OECD countries. The OECD examines the opportunity to drive public resources towards the support of risk management activity; it is described the various income risk strategies used by farm households. Understanding the origin and nature of risk is necessary to develop risk management strategies. As explained in Hardaker et al. (1997), there is a need for information on risk, its cause, its characteristics (distribution, frequency and correlation with one another), its consequences on farm income, and on the capacity of various strategies to reduce income risk. There has been much theoretical research attempting to explain price variability on commodity markets or the use of futures markets and insurance systems.

Researchers are also concerned with understanding producers' behaviour when confronted with risk and developing modelling tools to help farmers make decisions under risk (Barnett, 1999).

However, it has been found that farmers' behaviour does not always conform to theory and that there is a need to better understand farmers' attitude toward risk and the way they adjust their farm operations.

Once the risk has been identified and assessed, various strategies can be used to reduce income risk at the farm household level.

As a strategy the insurance schemes (private, public or mutual insurance) are another tool used to pool risk. There are examples of totally private insurance in agriculture, covering for example hail damage to crops, fire and theft of farm assets, death and disability of farmers or farm workers. Most other insurance schemes are provided under subsidised governmental schemes because the risks being covered are, in fact, not insurable in the sense that a market determined premium would be too high.

As it has been already mentioned, insurance systems are difficult to apply because asymmetry in information leads to behaviour that undermines the system. There is *adverse selection* when the level of risk in the insured population is higher than the average (i.e. only people with the highest risks will buy insurance)[15] .

Moral hazard occurs when the insured has the ability to increase his or her expected indemnity by actions taken after buying the insurance. It means that farmers covered by insurance might adopt riskier practices than otherwise (excessive specialisation, production in risky conditions like inappropriate climate or fragile land). However, there are techniques, well known to insurance companies, which limit such behaviours (OECD).

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representants of the sector. They focus their work on topics like: economics and agricultural policy, environment and territory protection, and food quality and security.

[13] Catherine Moreddu is Senior Economist at the Organisation for Economic Co-operation and Development, Direction for Nutrition, Agriculture and Fisheries, Paris.

[14] The paper constitutes part of the material of the Workshop "I*ncome Risk Management in Agriculture*, "Approaches to income Risk Management in OECD Countries" (Part I, pp. 17-63) organized by OECD, Paris (2001).

[15] Cross-reference to the Glossary.

Examples of few techniques are list below:
• Deductibles or co-payments (the insured has to bear part of the loss: a fixed amount or a percentage of the total loss);
• No-claim bonuses (see bonus/malus);
• Checks to verify whether the insured takes the precautionary measures agreed upon to prevent losses;
• Indemnification based on an objective index which cannot be influenced by the insured.

Another interesting contribution to this literature survey is by Skees and Hartell (mentioned by Stoppa 2004). The paper analyses some interesting innovations based on the development of *index insurance contracts*. Here the attention is mainly focus on the evolution of some international experiences based on agricultural insurance systems; case studies of: USA, Canada, Spain and France.
The conclusive part of the book is dedicated to the outcomes of a congress organized by "Coldiretti[16]" last March 2004 on the topic "*Risk Management in the agricultural sector: new regulations and opportunities for farmers*".
The attention in this ending chapter is especially dedicated to the Italian situation, trying to compare it with the most developed international experiences; this inspires a discussion forum on the future insurance market in the Italian agricultural scene in which actors of the demanding and offering sides discuss and confront on the new legal regulations.

A paper by Skees and Hartell about index insurance is presented in the book by Stoppa (See in section 2.1.3.2).

Agricultural policies in OECD countries: Monitoring and Evaluation. OECD (2003)

This is the 16th edition in a series on agricultural and related policies in OECD countries, following the request by the OECD Council at Ministeria level to monitor annually the implementation of the principles for agricultural policy reform adopted in 1987. Part II of the report presents detailed information on policy developments in individual Member countries (and for the member States of the European Union). There is some information about insurance in the following countries:

- France, Hungary, Netherlands, Slovak Republic, Spain
- Non-EU countries: USA, Canada, Korea

Risk Management Tools for EU Agriculture, with a special focus on insurance (EC, 2001)

The conclusions of this study do not look at a direct involvement of the EU on risk management systems, but rather propose that the EU has an accompanying or framing role. More specifically:

[16] Coldiretti is an Italian Organisation well-establish in the country. It's constituted by 18 Regional Federations and 98 Provincial Federations, 765 offices are spread on the territory. Its strong presence makes of Coldiretti the main agricultural organization at a national level, and one of the most important on the European scene.

- Regarding price risks, it shows potential interest in promoting the development of futures and options markets
- Regarding production risks, it is considered that insurance systems are to be developed by the member states on a bottom-up approach. Co-insurance and re-insurance can be developed at the European level by private companies, under a common legal framework, but re-insurance could also be provided by the EU
- Anti-cyclical income support would be interesting to apply but it has some caveats or cons.

There is information about the following countries:
- EU countries: Austria, France, Germany, Greece, Italy, Portugal (only in the synopsis table) and Spain
- Non-EU countries: USA, Canada and Japan

Risk Management in Agriculture: A discussion document prepared by the Economics and Statistics Group of the UK MAFF (2001)

An overview of risks and risk management instruments in agriculture

There is a little information on the agricultural systems in:
- EU countries: France, Italy, Spain, Sweden, The Netherlands, United Kingdom
- Non-EU countries: USA

Income insurance in European agriculture (Meuwissen et al. 1999)

The central questions studied by this report are whether there might be a case for farm income insurance in Europe in the future, under what conditions and in what form might such an income insurance scheme be feasible. The report explores a number of issues such as insurance coverage, loss assessment, multi-year versus single year insurance contracts, mandatory versus voluntary participation, etc. Feasibility is tested with a Monte Carlo simulation using panel data from six Member States. The investigation also includes a description of the agricultural sector in Europe and a review of current experiences on income insurance in other countries. There is information about insurance in the following countries:
- Sweden, Italy, France, Netherlands, Spain
- Non-EU countries: USA, Canada, Australia,

Some of they main conclusions are that, if a form of income insurance is introduced in Europe, it is recommended that:

· Gross revenue insurance should only be considered for crop, and not for livestock, commodities.

· Insurance should start with true market commodities, i.e. commodities for which no price support is available.

· If governments provide reinsurance (at zero costs, at fully commercial rates, or as a combination of these two options) they should only reinsure part of the risks underwritten by insurers.
· Before wide introduction, first some pilot tests should be carried out, to test the interest of farmers in insurance schemes that cover systemic risks such as floods, droughts and epidemic diseases, as well as the interest of insurance companies in setting up (mutual insurance funds for) such schemes. In setting up such pilot tests it is crucial for later implementation that governments are involved to no more than the necessary minimum extent, using transparent rules for such aspects as stop losses, i.e. from the beginning there should be no asymmetric information between insurers and governments.

"Régimen comunitario de seguro agrícola." CES (1993)

It contains wide information both on calamities/disaster aids, and on insurance, for the following countries:
- Belgium, Denmark, France, FR Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, United Kingdom.

From this study, the Economic and Social Committee issued a series of proposals to the Commission:

- A common definition of agricultural calamity, but it was left to the individual states to fix the parameters to characterize it. Also, the funding of ad-hoc aids was to be shared among the individual countries and the Community.
- National Insurance Plans would be maintained as they are, and it is allowed to the Governments to subsidize them.
- A common Insurance Plan was proposed to the Commission. This would be additional to the national plans, and it would be applied by the insurance companies in each country. Insurances would be subscribed on a voluntary basis, and there should be a public institution in each country which takes care of its application in that country. This plan would have subsidies, shared on a 50% basis by the national Government and by the EC.
- Active prevention measures carried out within the frame of the schemes for "Improving the Efficiency of Agricultural Structures" (Council Regulation (EEC) 2328/91)

Income stabilization

It is a FP6 (DG RTD) "STRIP" project (Specifically Targeted Research or Innovation Project), whose full title is "Design and economic impact of risk management tools for European agriculture". This project, under the acronym "Income Stabilization", started mid-2005 and has several potential overlaps and complementary aspects with the DG AGRI-JRC Administrative Arrangement of the current project. Contacts have been established and several meetings scheduled to ensure synergy between both projects. Two linked workshops are foreseen in Brussels for the 11th and 12th of September 2006.

The Income stabilisation Project, with 7 partners from 5 countries, is co-ordinated by the University of Wageningen. It is articulated in 7 work packages (additional to WP1, management). Work Package 4, lead by the “Universidad Politécnica de Madrid” is particularly close to the DG AGRI-JRC AA, although there are major differences: The DG AGRI-JRC Administrative Arrangement is more specifically focused on EU25+ and on insurances, rather than generic risk management strategies.
Another target of this project is exploring methods to map the variability of yield that can endanger a suitable farm income. Some preliminary maps are included in this report.

3. Definitions of “disaster” and “crises” and related policies at Member State level, BG and RO and discussion of these issues for the EU level.

3.1 Definitions of “disaster” and “crises”

Disaster

Nowadays it is widely accepted that a disaster is multifaceted and open to a range of different interpretations.
Disaster synonyms used by practitioners and experts have included “calamity” and “catastrophe”. Similar words are “emergency” and “crises”. Disasters are abrupt shocks to the socio-economic and environmental system, involving loss of life and property.
The definition that is provided by the UN/ISDR (United Nations International Strategy for Disaster Reduction) is one of the most appropriate definitions:
“A disaster is a sudden, calamitous event that causes serious disruption of the functioning of a community or a society causing widespread human, material, economic and/or environmental losses which exceed the ability of the affected community or society to cope using its own level of resources.
(Source: UN/ISDR 2004); also used by ECHO

Disaster is a “Situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance” (definition considered in EM-DAT or International Emergency Disasters Data Base). Other sources define it as “An unforeseen and often sudden event that causes great damage, destruction and human suffering. Though often caused by nature, disasters can have human origins.”; “The combination of hazards, vulnerability and inability to reduce the potential negative consequences of risk results in disaster.” etc.

For a disaster to be entered into the database of the UN's International Strategy for Disaster Reduction (ISDR), at least one of the following criteria must be met:

- a report of 10 or more people killed
- a report of 100 people affected
- a declaration of a state of emergency by the relevant government
- a request by the national government for international assistance

Even thought there is not a common worldwide definition of “disaster”, there are some characteristics common to most definitions:

- Sudden, abrupt or unpredictable

- Causing human, material, economic or environmental losses

- Exceeding the ability of the affected community to cope with them

Natural disasters

Following the definitions of Natural Disaster by the UN Office for the Coordination of Humanitarian Affairs, natural disasters can be divided into three specific groups: hydrometeorological disasters, geophysical disasters and biological disasters.

Hydrometeorological disasters are natural processes or phenomena of atmospheric, hydrological or oceanographic nature that may cause loss of life or injury, property damage, social and economic disruption or environmental degradation. These include floods and wave surges, storms, landslides, avalanches, and droughts and related disasters (extreme temperatures and forest/scrub fires).

Geophysical disasters are natural earth processes or phenomena that may cause loss of life or injury, property damage, social and economic disruption or environmental degradation. These include earthquakes, tsunamis and volcanic eruptions.

Biological disasters are processes of organic origin or those conveyed by biological vectors, including exposure to pathogenic microorganisms, toxins and bioactive substances, which may cause loss of life or injury, property damage, social and economic disruption or environmental degradation. These include epidemics and insect infestations.

The economic impact of a disaster usually consists of direct (e.g. damage to infrastructure, crops, housing) and indirect (e.g. loss of revenues, unemployment, market destabilisation) consequences on the local economy.

Disasters in agriculture

The disasters typical of the agricultural sector are mostly natural disasters. They can be can be classified in the following groups of risks:

- Climatic events: hail, flood, drought, storms;
- Damage caused by pests: snails, insects;
- Diseases/epizootics: foot- and mouth disease, swine fever.

This differentiation of hydrometeorological disasters or climatic events, and biological disasters, either caused by pests or by diseases, also appear in the definitions of the European agricultural legislation (see following sections).

However, all the definitions of disaster are quite relative, because they do not differentiate the big disasters and crisis from minor natural events causing small losses. Also the UN's International Strategy for Disaster Reduction (ISDR) criteria, either cannot be applied to agricultural losses, either are very relative, depending on the subjective appreciation of each Government. At the same time, it is widely discussed which is the difference between the terms related to “disaster”, calamity”, “catastrophe”, “emergency” and “crises”.

From this reflection we can conclude that it is not easy to conclude a definition of disaster. Nevertheless, it can be easier and it seems to be necessary to define when the losses due to an event can be eligible for assistance and aids. So, this is what is going to be reviewed and discussed in the following sections. First, we address the conditions under which aids are allowed by the international Trade Agreements. Second, the conditions stated and the aids and subsidies allowed by the European Union legislation. Third, we present the European states definitions of those disasters eligible for ad-hoc aids and for insurance subsidies.

3.2 “Disasters” and “crisis” policies and aids from a WTO perspective

3.2.1 The EU and the WTO: Committed to multilateral trade rules

The EU has extensive contacts and trading relations with third countries and trading blocks. The EU is a major player in global agricultural trade as the biggest importer and second largest exporter of foodstuffs (the EU is a significant net importer of agricultural products, while being a net exporter of processed foodstuffs).The EU plays a leading role in establishing global trade agreements in the World Trade Organisation (WTO). It has also concluded and is in the process of negotiating bilateral trade agreements with individual third countries, free trade agreements with its near neighbours, special arrangements with developing countries, granting preferential access to the EU market, and more extensive relationships with regional groupings such as the South American countries of the Mercosur group[17]. The EU is the only big trading group, among the wealthier nations, which is not only granting preferential access to its markets for imports from developing countries, but is in practice actually importing considerable quantities from those countries.[18]

The growing trade between all countries, whether developed or less must be conducted under multilateral trade rules for the benefit of all countries, in particular developing countries. This is

17 Mercosur was created by Argentina, Brazil, Paraguay and Uruguay in March 1991.
18 http://trade.ec.europa.eu/doclib/docs/2006/may/tradoc_113528.pdf

why the EU is a strong supporter of the WTO and has always played an active role in the WTO discussions and negotiations on trade in agriculture.

The EU is committed to the 'Doha Development Agenda' (DDA[19]), negotiations which aim at further liberalising trade while enhancing development. As regards agriculture the agreement reached in August 2004 paved the way for further negotiations that could deliver a considerably bigger farm trade liberalisation than the previous trade negotiations (the 'Uruguay Round'). The agreement locks in the EU's CAP reform. It should bring a substantial cut in trade-distorting agricultural support, the elimination of trade-distorting export competition practices and contribute to a significant opening of agriculture markets. The EU has made major efforts to redirect its farm policy towards more transparent and non trade-distorting instruments – principally by divorcing about two-thirds of payments to farmers from levels of production.

3.2.2 The WTO agreements

"The Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations", signed by ministers in Marrakesh on 15 April 1994 contains legal texts which spell out the results of the negotiations since the Round was launched in Punta del Este, Uruguay, in September 1986. In addition to the texts of the agreements, the Final Act also contains texts of Ministerial Decisions and Declarations which further clarify certain provisions of some of the agreements.

In WTO terminology, subsidies in general are identified by "boxes" which are given the colours of traffic lights: green (permitted), amber (slow down — i.e. be reduced), red (forbidden). In agriculture, things are, as usual, more complicated. The Agriculture Agreement has no red box. All domestic support measures considered to distort production and trade (with some exceptions) fall into the **amber box**, which is defined in Article 6 of the Agriculture Agreement as all domestic supports except those in the blue and green boxes. These include measures to support prices, or subsidies directly related to production quantities. These supports are subject to limits: "de minimis" minimal supports are allowed (5% of agricultural production for developed countries, 10% for developing countries); the 30 WTO members that had larger subsidies than the de minimis levels at the beginning of the post-Uruguay Round reform period are committed to reduce these subsidies. Domestic support exceeding the reduction commitment levels in the amber box is prohibited. The reduction commitments are expressed in terms of a "Total Aggregate Measurement of Support" (Total AMS) which includes all supports for specified products together with supports that are not for specific products, in one single figure.

There is a **blue box** for subsidies that are tied to programmes that limit production. This is the "amber box with conditions" — conditions designed to reduce distortion. Any support that would normally be in the amber box, is placed in the blue box if the support also requires farmers to limit production (details set out in Paragraph 5 of Article 6 of the Agriculture Agreement). There

19 Launched in November 2001 in Doha, Qatar.

are also exemptions for developing countries (sometimes called an "S&D ? box", including provisions in Article 6.2 of the agreement).

The **green box** is defined in Annex 2 of the Agriculture Agreement. In order to qualify, green box subsidies must not distort trade, or at most cause minimal distortion (paragraph 1). They have to be government-funded (not by charging consumers higher prices) and must not involve price support. They tend to be programmes that are not targeted at particular products, and include direct income supports for farmers that are not related to (are "decoupled" from) current production levels or prices. They also include environmental protection and regional development programmes. "Green box" subsidies are therefore allowed without limits, provided they comply with the policy-specific criteria set out in Annex 2.

In the current negotiations, some countries argue that some of the subsidies listed in Annex 2 might not meet the criteria of the annex's first paragraph — because of the large amounts paid, or because of the nature of these subsidies, the trade distortion they cause might be more than minimal. Among the subsidies under discussion here are: direct payments to producers (paragraph 5), including decoupled income support (paragraph 6), and government financial support for income insurance and income safety-net programmes (paragraph 7), and other paragraphs. Some other countries take the opposite view — that the current criteria are adequate, and might even need to be made more flexible to take better account of non-trade concerns such as environmental protection and animal welfare.

As mentioned above, Paragraph 7 of Annex 2, together with Paragraph 8, relate to the governmental service programmes which care about the consequences of calamities. These programmes are:

- the economical risk insurance (for the price and of the revenue)
- the climate risk insurance

Paragraph 7 opens the green box for government financial support for income insurance and income safety-net programs under certain conditions. This Paragraph was included under the proposal of the United States, Canada and Australia. Next we show the original text, together with that of Paragraph 8, which includes in the green box payments for relief from natural disasters (made either directly or by way of government financial participation in crop insurance schemes).

Annex 2 of the Agreement on Agriculture: "Domestic support: The basis for exemption from the reduction commitments".

7. Government financial participation in income insurance and income safety-net programmes
(a) Eligibility for such payments shall be determined by an income loss, taking into account only income derived from agriculture, which exceeds 30 per cent of average gross income or the equivalent in net income terms (excluding any payments from the same or similar schemes) in the

preceding three-year period or a three-year average based on the preceding five-year period, excluding the highest and the lowest entry. Any producer meeting this condition shall be eligible to receive the payments.
(b) The amount of such payments shall compensate for less than 70 per cent of the producer's income loss in the year the producer becomes eligible to receive this assistance.
(c) The amount of any such payments shall relate solely to income; it shall not relate to the type or volume of production (including livestock units) undertaken by the producer; or to the prices, domestic or international, applying to such production; or to the factors of production employed.
(d) Where a producer receives in the same year payments under this paragraph and under paragraph 8 (relief from natural disasters), the total of such payments shall be less than 100 per cent of the producer's total loss.

8. Payments (made either directly or by way of government financial participation in crop insurance schemes) for relief from natural disasters
(a) Eligibility for such payments shall arise only following a formal recognition by government authorities that a natural or like disaster (including disease outbreaks, pest infestations, nuclear accidents, and war on the territory of the Member concerned) has occurred or is occurring; and shall be determined by a production loss which exceeds 30 per cent of the average of production in the preceding three-year period or a three-year average based on the preceding five-year period, excluding the highest and the lowest entry.
(b) Payments made following a disaster shall be applied only in respect of losses of income, livestock (including payments in connection with the veterinary treatment of animals), land or other production factors due to the natural disaster in question.
(c) Payments shall compensate for not more than the total cost of replacing such losses and shall not require or specify the type or quantity of future production.
(d) Payments made during a disaster shall not exceed the level required to prevent or alleviate further loss as defined in criterion (b) above.
(e) Where a producer receives in the same year payments under this paragraph and under paragraph 7 (income insurance and income safety-net programmes), the total of such payments shall be less than 100 per cent of the producer's total loss.

There is a wide debate about which of the current payments fall within each box. The *Canadian Farm Income Program* (CFIP) (formerly *Agricultural Income Disaster Assistance* AIDA) was notified in the Green box because it provides coverage to income (so it should fall within the conditions stated by Paragraph 7). However, this program does not exist any longer. Both CFIP and NISA (*Net income stabilization Account*) have been substituted by one single program, CAIS (*Canadian agricultural Income Stabilisation*) in 2003.

The revenue insurances in the United States do not fall neither under paragraph 7 nor 8. They cannot be included under paragraph 7 because they are not covering income but revenue, and they do not fall under paragraph 8 because they do not cover only against climatic or natural disasters but also against market risks. So, they have been notified in the Amber box and thus, they are subject to reduction compromises.

The public aids to crop insurances are “conceptually” included in the “Green Box”, as can be deduced from Paragraph 8. However, when this is to be applied, subsidies to agricultural insurances result, by a formal requirement, excluded from the box. Assuming that they comply with the trigger or threshold of the 30% minimum loss, the exigency of a public formal declaration by government authorities every time there is a loss is not operational in an insurance model managed by private companies. This would eliminate one of the advantages of the insurance schemes over the aid-hoc aids, which is the agility of the system Therefore most of the subsidies to the European and North-American crop insurance schemes have been notified within the Amber box.

3.3 “Disasters” and “crisis” policies and aids in the EU legislation

3.3.1 Accepted State payments in the Treaty of Rome

The 1957 Treaty of Rome established the European Economic Community. Title V in Part Three of this Treaty settled the Common Rules on Competition. Its section 3, Article 92 delimited the aids that can be granted by the States. The 1997 Treaty of Amsterdam amends the Treaties establishing the European Communities, among which the Treaty of Rome, and also the Treaty on European Union (Maastricht 1992). The 1997 Treaty of Amsterdam provides a consolidated version of the Treaty of Rome. Both in this consolidated version and in the 2002 Consolidated version of the same Treaty, the aids that can be granted by the states appear in Part three, title VI, Chapter 1, Section 2, Article 87.

Article 87 (previous Article 92 of the 1957 Treaty of Rome) prohibits certain State aids, and authorises the European Commission to accept some such aids as "compatible with the common market". Among the accepted aids are aids to soothe the effects of natural disasters, and other aids. Article 87.2.b and Article 87.3.c reproduced below are the basis for aids related to risk management and safety net programs in agriculture.

Section 2

Aids granted by States

Article 87 (ex Article 92)

1.

2. The following shall be compatible with the common market:

(a)

(b) aid to make good the damage caused by natural disasters or exceptional occurrences;

(c)

3. The following may be considered to be compatible with the common market:

(a)

(b)

(c) aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest;

(d)

(e).

3.3.2 Agriculture guidelines

The Commission has applied Article 87 of the 1997 Treaty in numerous decisions. The CES (Comité Économique et Social) 1993 publication on EC Systems of Agricultural Insurance already collected how the old article 93 was to be applied. More recently, the Commission has stated its policy in the "Community guidelines for state aid in the agriculture sector" ("Agriculture guidelines" from now on). These have four points related to the application of Articles 87.2.b and 87.3.c. The application of these articles is currently being reviewed. A Regulation is under study, which for some special cases refers to new Commission Guidelines, also under debate. Next we will comment the aids the Commission has been allowing under the old and existing guidelines, and how disasters and crises are defined in them. In the following section we will refer to the expected changes to be introduced by the future Regulation and the future new Guidelines.
As mentioned above, in the EU – Community guidelines (2000) there are four points relating to allowed aids in risk management in agriculture. These points are the following (for the complete text of the four points, refer to the Official Journal of the European Communities OJ C28, 01.02.2000, p. 2-24 or OJ C232, 12.8.2000, p. 17-41):

Point 11.2 – Defines the notions of "natural disaster" and "exceptional occurrence" contained in Article 87.2.b. "*Earthquakes, avalanches, landslides and floods may constitute natural disasters. Exceptional occurrences (...) include war, internal disturbances or strikes, and with certain reservations and depending on their extent, major nuclear or industrial accidents and fires which result in widespread loss. (...) The Commission will permit aid of up to 100% to compensate for material damage.(...)"*

Point 11.3 – This point refers to adverse weather conditions. It states that "*adverse weather conditions such as frost, hail, ice, rain or drought"* on agricultural production *"(...) may be assimilated to natural disasters once the level of the damage reaches a certain threshold, which has been fixed at 20% of normal production in the less-favoured areas and 30% in other areas. (...). In the case of damage to the means of production the effects of which are felt for several years (for example the partial destruction of tree crops by frost), for the first harvest (...) the percentage real loss (...) must exceed 10% and the percentage real loss multiplied by the number of years in which production is lost must exceed 20% in the less-favoured areas and 30% in other areas*." This threshold does not apply to buildings and equipments, where the damages can be accepted up to 100% of actual costs.

Point 11.4 – Animal and plant diseases: "*this does not normally constitute a natural disaster or an exceptional occurrence within the meaning of the Treaty. In such cases aids (...) may only be permitted by the Commission on the basis of Article 87.3.c of the Treaty. (...)* They *may only be accepted as part of an appropriate programme for the prevention, control or eradication of the disease concerned.(...)."*
"*(...) Aid may be granted up to 100% of actual costs (...)"* with some exceptions.

Point 11.5 – It refers to aid towards the payment of insurance premiums. In it, it is stated that "*It is consistent Commission policy to allow aid up to 80% of the cost of insurance premiums to cover against losses caused by natural disasters and exceptional occurrences, falling within the scope of point 11.2, and by adverse climatic events which can be assimilated to natural disasters in accordance with point 11.3. Where the insurance also covers other losses caused by adverse climatic events, or losses caused by animal or plant diseases, the aid rate is reduced to 50% of the cost of the premium*".

Most of these issues had already been addressed in the CES (Comité Économique et Social) 1993 publication on EC Systems of Agricultural Insurance. It states that besides the evident natural disasters and natural occurrences within the meaning of Article 92.2.b, other risks can be considered as such under the damage intensity criterion: the loss in the normal agro-livestock production must reach the 30% and the 20% in the less-favoured areas. In the case of damage to the means of production the effects of which are felt over several years (for example the partial destruction of tree crops by frost) for the first harvest following the occurrence of the adverse event the percentage real loss in comparison with a normal year, determined in accordance with the principles set out in the previous paragraphs, must exceed 10 % and the percentage real loss multiplied by the number of years in which production is lost must exceed 20 % in the less-favoured areas and 30 % in other areas.
It also states that under Article 92.3.c of the Treaty (which provides that aids to facilitate the development of certain activities may be considered compatible with the Common Market provided that it does not affect trading conditions to an extent contrary to the common interest) can be included aids to combat animal and plants diseases.

Regarding the aids that can be given to agricultural insurances, three categories are established. The first two are similar to the ones in the Guidelines (80% / 50% of subsidies for those insurances covering only / also natural calamities). The third one states that those insurances which cover only exceptional climatic or sanitary risks which cannot be assimilated to natural calamities, are considered "measures useful for the agricultural development" within the scope of Article 92.3.c. In these cases the governmental aids must be regressive from a maximum of 30% of the premium and cannot exceed 10 years.

3.3.3 The new Regulation and Agriculture Guidelines

The "Commission Regulation (EC) No 70/2001 of 12 January 2001 on the application of Articles 87 and 88 of the EC Treaty to small and medium-sizes enterprises" (OJ L10, 13.1.2001, p. 33-42) does not directly address the aids to be given to risk and crisis management in agriculture. So, all the aids given for agriculture under Article 87 should follow the "Community guidelines for State aid in the agriculture sector" which have been reviewed in the previous section. However, currently is being discussed a draft of a "Commission Regulation (EC) No …/… on the application of Articles 87 and 88 of the EC Treaty to state aid to small and medium-sized enterprises active in the production of agricultural products and amending Regulation (EC) 70/2001". This regulation includes the aids given under Article 83.2.b and those given to the agricultural sector under Article 87.3.c.

The main changes added by this draft Regulation in the field of risk management aids in agriculture, besides the fact of being a Regulation and not only Guidelines, can be summarised in the following:

- it applies only to "transparent aid"
- It does not apply to aid granted to enterprises active in the processing or marketing of agricultural products
- it does not apply to fishery and aquaculture products
- It does not explicitly include a point for aids given in the case of natural disasters
- It includes three type of aids relating to agricultural risks:
    - aid in respect of animal and plant diseases and pest infestations (Art. 10);
    - aid for losses due to adverse climatic events (Art. 11);
    - aid towards the payment of insurance premiums (Art. 12)
- All the three aids considered (Arts. 10, 11, 12) are considered compatible with the common European market within the meaning of Article 87.3.c.
- It sets as a condition for losses suffered after 2010: the farmers must contribute to the cost sharing mechanisms or insurance schemes.
- Regarding animal and plant diseases (Art. 10), it clearly differentiated two types of aids: the costs of prevention or eradication, which can be compensated up to 100% but the aid must not involve direct payments to producers; and the compensation to the farmers for their losses, which must have a threshold of 30% (according to "Green Box"

requirement), which cannot exceed 75% of the losses (80% in less favoured areas) and which requires a formal recognition by public authorities.

- Regarding adverse climatic events (Art. 11): they can be assimilated to natural disasters when they exceed the threshold of 30%, but there is no more the 20% threshold for less favoured areas. The exemption for less favoured areas is eliminated from the threshold, but there is exemption on the compensation. In this case the compensation cannot exceed 80% of the losses and 90% in less favoured areas. These same maximums (80% and 90%) apply for damages to farm buildings and farm equipment. Also, the event must be formally recognised as a disaster by public authorities. Last, there is an additional requirement for the State: it has to comply with the water directive in order to be able to compensate for losses due to drought.
- Regarding the aids towards the payment of insurance premiums (Art. 12). There are no other changes

According to Article 3 of the Regulation, "*aid which does not fall within the scope of this Regulation (...) shall be notified to the Commission in accordance with article 88.3 of the Treaty. Such aid shall be assessed in accordance with the criteria laid down in the* ***Community guidelines on agriculture"***. The new Community guidelines on agriculture are also still under discussion. Their main novelties are:

V.B.1 General Principles: the compensations will not be paid later than 4 years after the occurrence of the losses.
V.B.2. Natural disasters and other exceptional events: No changes. Compensation is allowed up to 100% of the damages.
V.B.2.1. Adverse climatic conditions: the same changes as in the Regulation: aids are accepted under Article 87.3.c, not 87.2.b of the Treaty; the threshold is only 30%, no longer 20% for less favoured areas; also disappears the exemption of 10% the first year for fruit trees; there is now the deductible, not only the threshold; the water-drought requirement; and last, from 2010, the requirements of buying insurance in order to be eligible for receiving the compensations.
V.B.2.2. Aids to fight animal and plant diseases: No big changes with respect to the Regulation
V.B.2.3. Aids to insurance premiums: The main novelty is probably that the aids cannot be given to big firms or big agricultural holdings, neither to firms dedicated to the transformation and commercialisation of agricultural products.
It is stated that there is no real need to combine the insurance on animals and plant diseases with the insurance for natural disasters of assimilated events. However, at the moment, there seem to be no expected changes regarding this condition of insuring both for receiving the aid.

3.4 "Disasters" and "crisis" definitions, policies and aids in the EU member countries

Most EU states are following the Community guidelines on agriculture in order to decide when they are going to bestow some aids. Some of them incorporate or explicitly mention the guidelines definitions in their legislation; others just assume it without explicit mention to it; some others have a definition more restrictive than that established in the Guidelines, as is the case of the calamity fund system in France. Last, some states not yet in the EU at the moment have less restrictive definitions than that in the Guidelines. The table below shows which states follow more or less closely the Community guidelines.

Table 1. States "crisis" and "disaster" definitions in relation to their following of the Agriculture guidelines

Explictly mention the EC guidelines definition	EC Guidelines with no explicit mention in legislation	More restrictive definition	Less restrictive definition	Unknown
Belgium	Finland	Austria	Bulgaria	Denmark
Cyprus	Ireland	Czech Republic	Hungary	Poland
Estonia	Luxembourg	France		Slovakia
Greece	Spain	Portugal		
Italy		Romania		
Latvia		The Netherlands		
Lithuania		Sweden		
Slovenia		UK		

Some of the countries included in the group which assume the EC Guidelines with no explicit mention in legislation have the constraint to aids given in case of crisis or disaster that it must not be due to an insurable risk. This is the case for Spain, Portugal, etc.
Next we show some of the definition of disaster and crisis which are eligible for aids in the different countries, as well as the definitions of insurable risks, when they exist.

Table 2. Definitions of disaster

Country	Definition, concept
Austria	- Catastrophe: The catastrophe fund compensates extraordinary losses such as flood, avalanches and storm. The compensation of loss by the catastrophe fund is linked to the condition that there is a disaster defined by the public authorities. The loss has to be more than € 1.090,- per farm. But there is no legal title of compensation. - Most of the financial contributions of the public fund are used for preventive measures. - Insurable risk: Only a small part from the catastrophe fund is reserved for the support of agricultural insurances (hail and frost). Other insurable risks like drought, storm, flood, livestock, etc. are without public support.
Belgium	- According to the Law 12 July 1976, the agricultural calamities are defined as "The natural phenomena of exceptional nature and character, or the unforeseeable and massive action of noxious organisms only in case they have caused important and generalised destruction of soils, crops or harvests, as well as the diseases and intoxications of exceptional character if they have caused, by mortality of compulsory slaughter, important and generalised losses of animals useful to farming". The Royal Act 6 July 2002, in order to conform to the European legislation, introduces a deductible of 30%.
Bulgaria	- The new Law on Crisis Management defines "crisis" as "an unexpected or expected change of already established living conditions as a result of human activities, events or natural phenomenon, and when the life, the health or the property of big groups of people, territories, environment, the cultural or the material values of the country are in danger". The law stipulates the publishment of a Statute for its application but it has not been published yet. - Insurance is not subsidized.
Cyprus	- The first definitions of natural disaster in Cyprus were specified in 1977 when the Government prepared the first legislation for creating an organization (AIO) and a relevant scheme (Agricultural Insurance Scheme) which was initiated in 1978. The major perils which are covered by the Cyprus legislation are hail, frost, drought, rain, flood, water spot, windstorm, strong dry wind, heatwave and warm dry air. Currently the subsidizaztion level is 50%, which is the maximum possible under the EU's current guidelines. - Some ad-hoc aids are given for products not covered by the public scheme, but triggers are not specified

Czech Republic	- According to Act No. 586/1992 Coll., concerning income taxes, as amended, a natural disaster is defined as accidental fire or explosion, thunderbolt, windstorm with wind speed exceeding 75km per hour, flood, hail, land slippage, land slide and rock fall not caused by industrial activity or building activity, avalanches or earthquake recording at least 4th degree on the international macro. Seismic scale.
Denmark	- No explicit definition seems to exist. Government has a support scheme that grants subsidies in accordance with the Danish Act on Compensation for Damage Caused by Storm (storm surge flooding and forest storm damage).
Estonia	- Laws are harmonized with EU laws, but there are no definitions provided.
Finland	- The Crop Damage Compensation Act has been amended several times since 1975. It allows the government to compensate loss of crop yield due to frost, hailstorm, pouring rain, storm, unexceptional flood, unexceptional drought, or other similar and unusual ("catastrophic") change in the natural conditions, to which agricultural producer is unable to affect, unusual conditions during the overwintering, or unusual flood or unusually voluminous rain, which prevents producer from seeding the crop. There is a reference yield for each region and crop. Reference yield is the arithmetic mean of the average yield of the crop during the past 5 years in a given region. Franchise deductible is 30 %; i.e. producer is eligible for the compensation if actual yield (calculated at the farm level) is less than 70 % the reference yield. Producer must farm in Finland and he must cultivate at least 3 ha of field crops or at least 0.5 ha vegetables (including horticulture). Farm must be cultivated in accordance with the common agricultural practices of the region. - Another public system is the practice of compensating direct losses due to highly contagious animal diseases from the state budget. It is based on Animal Disease Act, which has been amended several times during the past decades.

France	- The 1964 Law for the agricultural calamities, modified by the 2006 orientation law, defines the characteristics of the damages that can be subject of a public indemnity from the "Agricultural Calamity Regimen". Among them: • Exceptional character of the climatic phenomenon causing the damages (long periods between events, losses intensity), which has to be officially established by inter-ministerial decree on the basis of a local assessment performed by the administration and of an examination conducted by a national administrative corporation • damage for which there is no efficient preventive technique available • For the crop losses, they must be above a double threshold: 27% or more of normal crop value and 14% of the farm gross revenue. The 27% which meant a loss of 27€ per 100€ of "production value+ CAP aids", after the Single Payment has now become 42% of production value alone, regardless of the Single Payment value. - Multi-peril insurance is subsidized at maximum rate of 35%
Greece	- Disaster and related concepts are defined in the regulation for "state financial aid" issued by ELGA recently (01/2006) and are similar to those found in the guidelines of the E.C. for state aids in the agriculture sector (2000/C 28/02).
Hungary	- The definitions of disaster were laid down in the "Law LXXIX of 1991 on Land Taxation". Natural disasters can be, according to Article 7: Drought in all cultivation activities; Hail-storm, flood, standing water and fire losses in all taxable cultivation activities; frost and sand-blast on arable farming, horticulture, viticulture and fruiticulture. - Farmers are eligible for lease reduction or cancellation when the yield does not reach the two thirds of their average yield. They are eligible for tax and to lease reduction or cancellation when the losses exceed the 25% of the yield in the affected area, or 15% of the crop yield in the whole farm. (Since 1994) - Direct ex-post aids are defined on an ad-hoc basis. In the case of the 2003 extreme drought and frost, the Regulation issued established that farmers would be entitled to subsidies if the extent of frost and/or drought losses together exceeded 30% in case of arable crops (including vegetables), viniculture, fruticulture, forestation and fishponds. The final amount of the compensation is the 30% of the loss value exceeding 30%. Farmers would be entitled for preferential credit if frost and/or drought losses are 20% or greater. - Since 2004 insurance is not subsidized

Ireland	- There is no definition of “disaster” used in public policy. Responses to situations are on an ad-hoc basis. The typical policy response has been to seek EU approval for limited measures, such as paying direct payments earlier than scheduled.
Italy	- For the purposes of the National Farm Risk Management System, natural calamity or exceptional event are those defined in point 11.2 of the “Community guidelines for state aid in the agriculture sector” (2000/C28/02) and also the adverse atmospheric conditions foreseen in point 11.3 of the foresaid orientations. That reference is explicitly contained in the main law currently in force on the subject: Legislative Decree 29/March 2004 n. 102: Reform of the National Solidarity Fund) - Insurance is subsidized. No explicit definitions
Latvia	- Upon entering the European Union were applied the definitions, which are specified in Community Guidelines for State Aid in the Agriculture Sector.
Lithuania	- Criteria of natural disaster are indicated in 9 March, 2006 Lithuanian Government Resolution No. 241 “Regarding Confirmation of Criteria of Extreme Events”. Natural events, those cause more than 20% of losses in average agricultural production in LFA and more than 30% of losses in other areas are considered to be natural disaster.
Luxembourg	- There is no definition of “disaster” used in public policy. There have not been given ad-hoc aids - The EC Guidelines are followed in insurance subsidization.
Netherlands	- There is a general law on indemnity payments for disasters but the government has announced that this is not applicable anymore for agriculture. Weather adversaries are considered to be normal risks for which the tax payer has not to pay. - For livestock there are funds that are sector-wide and ultimately financed by all the farmers until a maximum per sector. It is a fund for epidemic livestock diseases, concerning cattle, pigs, poultry, sheep and goat. It is financed by farmers through levies on the production of milk, meat, etc. When the costs of suppression of an epidemic outbreak reach a certain, in advance agreed level, the government will carry the costs.
Poland	- No explicit definition seems to exist. Government offers ad-hoc aid in case of tremendous natural disasters (i.e. flood), but we could not find any regulation fixing the conditions under which an event can be considered as a disaster.

Portugal	- Aids are given by the Fund for losses caused by risks not covered by the current crop insurance products, in those cases where a Calamity situation is officially declared both by the Ministry of Finaces and by the Ministry of Agriculture, Rural Development and Fisheries. - Climatic agricultural calamity is defined as the happening of phenomena, exclusively climatic, with an exceptional character, which cause a generalised damage on crop production of at least 50%, resulting from this an important decrease in the farmers' yields. The determination of the damages refers to the yields usually obtained in the region, calculated in base to the average obtained in the last six years, with exclusion of the year of lowest productivity.
Romania	According Law 381/2002 natural phenomena and diseases are considered to be the following: excessive drought, floods coming from overflowing rivers, or broken bridges, heavy rains, excessively low temperatures below the biological resistance limit of the plant, heavy snow falls which cause loss in vegetal and livestock sector, rapid melting of the snow which causes floods, rivers overflowing, hurricanes. The indemnities are granted to the agricultural producers as follows: For agricultural crops and plantations affected by calamities, **only for losses which exceed 30% of production**, the maximum level of indemnities being 70% of the expenses made until the date the event occurred. For animals, birds, bees' families and fish, the indemnity represents maximum **80% of the insurance value,** diminished with the value of the resulting by-products, which can be commercialized according to legal provisions. The agricultural producers benefit from the stipulation of this law if they are affected by natural phenomena presented above and if they are located in a calamity area declared by Governmental Decision, and if their crops, plantations, animals, fowls, or fish are insured by insurance companies approved by the Ministry of Agriculture.
Slovakia	- No Information

Slovenia	- According to the Slovenian law a natural disaster is a “disaster caused by earthquake, flood, land-slide and snow slide and disasters in agriculture and forestry caused by adverse weather conditions”. The causes for disaster in agriculture and forestry are sleet, frost, drought, storm and hail. In addition, mass outbreak of plant or animal diseases and pests are included. - The Law on natural disaster relief (OJ No. 114/2005; p. 12354) is related to the Law on protection from natural and other disasters (OJ RS No. 21/2006; p. 5609). - Disaster aid is paid to the applicant if the evaluated damage resulting from natural disaster reaches 30 % of normal production, whereas for the less-favoured areas the limit is set at 20 %. If a natural disaster results in a long term production potential deterioration (e.g. perennials) than the aid is paid when the production in the first year after the natural disaster occurrence is reduced by 10 %. Moreover, in all the following years in which the production is reduced due to the natural disaster the total damage have to sum up to 30 % of a standard annual production and for the LFA’s the damage is set to 20 %.
Spain	- For ad-hoc measures, it is necessary a legal declaration by the government, they must be caused by extraordinary phenomena. No explicit mention of definition of crisis and disaster. The Guidelines implicitly apply. They can only be given for non-insured risks - According to the Spanish law, it is permitted to insure all the damages produced by natural phenomena which cannot be managed by the farmer, always under the condition that the losses are higher then a minimum threshold established in every insurance contract.
Sweden	- Ad-hoc measures for climatic calamities not covered by insurance: There is no particular definition of disaster, and the Swedish policy is to apply these measures restrictively. Up to now no such compensation has been paid. The government does not consider the market to suffer from any obvious market failures. - Regulated measures for infectious diseases, contaminated feed, plant pests and radioactive fall-out: The Swedish Board of Agriculture is responsible for the management and combat of these disasters. Regarding infectious disease there is a pre-existing system for compensation payments. For the other types of disasters mentioned, ad-hoc compensations apply. Farmers do not pay any explicit fee.
UK	- There is no definition, no legislation and no disaster assistance for crops. - Livestock: A “Notifiable Disease” is a disease named in section 88 of the Animal Health Act 1981 or an “Order” made under that Act. - Insurance is not subsidized

3.5 Discussion on a "disaster" definition common for the EU

The CAP policies are changing, leading the EU agriculture into a more liberalised market. Further than the proposed changes by the regulation currently under debate, the EU legislation on matter of risk could be adapted to the changes by providing or allowing further protection against climatic and market risks. All these changes should take into account the conditions fixed in the WTO agreements.

If a common EU definition were to be applied to all member countries, it could consider the following aspects:

- Exceptional character of the climatic phenomenon

- Affect a minimum number of farms or a surface large enough

- Thresholds for the losses at crop level and/or at farm level (already existing in the "Community Guidelines for State Aid in the Agriculture Sector" - OJ C28 01.02.2000 p. 2-24)

- Officially established (need to establish a fast procedure)

- No efficient preventive technique available

- No insurance available

3.6 Review of the state of the discussion on the options on a EU risk management policy

3.6.1 The Communication from the Commission to the Council

The communication from the Commission to the Council on risk and crisis management in agriculture COM (2005) 74 (see EC, 2005a), proposes a few possible measures to help farmers in the European Union manage risk. Three options that refer to agricultural insurance, mutual funds and an income crisis tool are considered. Specific training for farmers on the use of risk management instruments is also mentioned.
The three options identified are:

- Option 1: contributing to the payment of premiums farmers pay for the insurance against natural disasters, extreme weather conditions or animal and plant diseases. Reinsurance might also be supported.
- Option 2 encouraging the development of mutual funds for agriculture, by granting temporary and digressive support for the funds' administration.
- Option 3: launching new instruments to protect farmers in different types of income crises.

The aim is to help farms resist temporary shocks and improve their access to finance. Such measures would in any case differ from the type of guarantees provided by the “old” CAP.

The purpose of the Communication is to launch a discussion on risk and crisis management in the framework of the CAP reform, respecting the Commission's commitment to the Agricultural Council when CAP reform was agreed. The mandate of the Council had two aspects:

- Clarify alternative ways to use some of the funds that should become available with the application of the new modulation mechanism, and in particular if it might be used to finance risk management, crisis and disaster remediation in agriculture;
- Discuss if provision of funds for crisis in each Common Market Organisation (CMO) may be appropriate. This second option is rejected.

A Commission staff working document (EC, 2005b), linked to the communication, analyses several types of risks and crises in agriculture, and the measures that are applied in the last years. The possible support to insurances in this scheme would come from the funds assigned to the second CAP pillar.

3.6.2 The position of the insurance sector

The position of the insurance companies’ active in the sector, in general terms, is that they are ready to support crop and livestock insurance under certain conditions: subsidies to the cost of premia, public reinsurance system and coexistence of national systems, instead of a “unique” European system. The European Committee of Insurers (CEA) proposed to establish co-insurance and co-reinsurance systems at a national level, as well as a public reinsurance system, possibly supported by the EU Common Agricultural Policy.

During the year 2004 the Committee for the Insurance for Agricultural Risks of CEA has elaborated a questionnaire with the aim of establishing the “Average annual amount of losses”, that is, the average “risk premium” (costs of acquisition and management not included) needed to cover natural catastrophic risks related to the agriculture and livestock (only cows, pigs and sheep) on the bases of a Combined coverage. The CEA estimate the “average annual amount of losses” is around 3.7 billion € for EU15 (15 members States before the enlargement).

In April 2005, the CEA Committee for the insurance of agricultural risks, addressed a letter to the Deputy Director General of DG AGRI commenting some of the issues which had arisen after a first and quick analysis of the Communication COM (2005) 74:

- The DG Agri’s paper proposes a different level of financial aid to the cost of the premia, compared to the Directive 2000/C 28/02, paragraph 11.5.
- The provisions of the paper are based on the WTO requirements, in particular on those of the “green box”. Nevertheless, the interpretation of such requirements is also quite confusing. CEA considers useful to review all the definitions under the said “green box”.

4. Existing agricultural insurance systems in the World

4.1 Definitions of agricultural insurance schemes

Single-risk insurance:
Single-risk insurance covers against one peril or risk, e.g. hail.

Combined (peril) insurance:
Combined insurance means a combination of several risks covered (two or more risks, mostly with hail as basic cover). In some countries this type of insurance is also referred to as multi-risk insurance.

Yield insurance:
Yield insurance includes yield guarantee, based on regional average yield or on individual historic yield, where the main risks affecting yield (e.g. drought) are comprised. In some countries (e.g. USA) this type is also called combined or multi-peril insurance.

Revenue insurance:
Revenue insurance combines yield and price risks coverage in a single insurance product. It can be product-specific or whole-farm.

Income insurance:
Income insurance covers income, so it covers yield and price risks, but the costs of production are also considered. Usually this type of insurance is not product-specific, but whole-farm income.

Whole-farm insurance:
This type consists on a combination of guarantees for the different agricultural productions in a farm. Depending on the coverage of the guarantees, it can be whole-farm yield insurance, or whole-farm revenue insurance or whole farm income insurance.

Area yield index insurance:
Indemnities are computed from the decrease of the average yield in an area.

Area revenue index insurance:
Indemnities are computed from the decrease on the product of the average yields and prices in an area.

Indirect index insurance:
Indirect index insurance reports to those indices of yields or vegetation computed from weather based indices, satellite images and others.

Stabilization accounts
Stabilization accounts are a form of self-insurance. They consist on individual accounts where farmers put an amount of money every year, which they can withdraw in a year of big losses. Stabilization accounts can be based on yield, revenue or other indices.

4.2 Review of the agricultural insurance systems in the world

A wide range of agricultural insurance schemes based on different approaches exist in the world. The following figures and tables give an overview of the main insurance types in the different countries. They can be compared with similar ones available in the EU member states and candidate states (Section 5).
The figures represent maps corresponding to the same type of insurance products. On the first map, the existence of single-risk and combined insurance schemes is shown. On the second map, yield and income insurances are addressed. Next, index based schemes, and last, non-insurance schemes, such as: calamity funds, stabilization accounts based insurance schemes and ad-hoc aids.
The information shown in the maps is contained in the table following the figures and commented later.

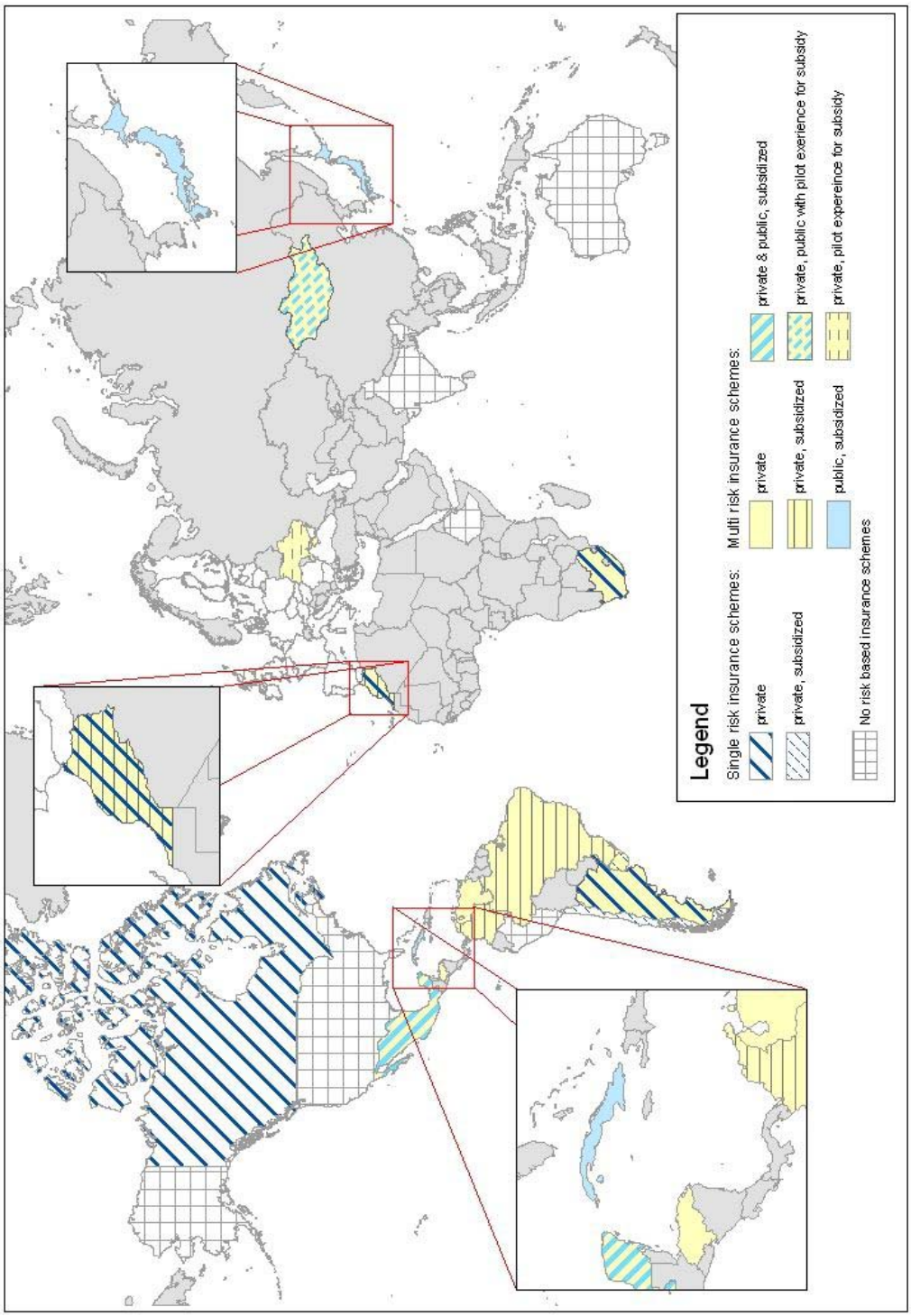


Figure 1. Single and combined insurance schemes in the world.

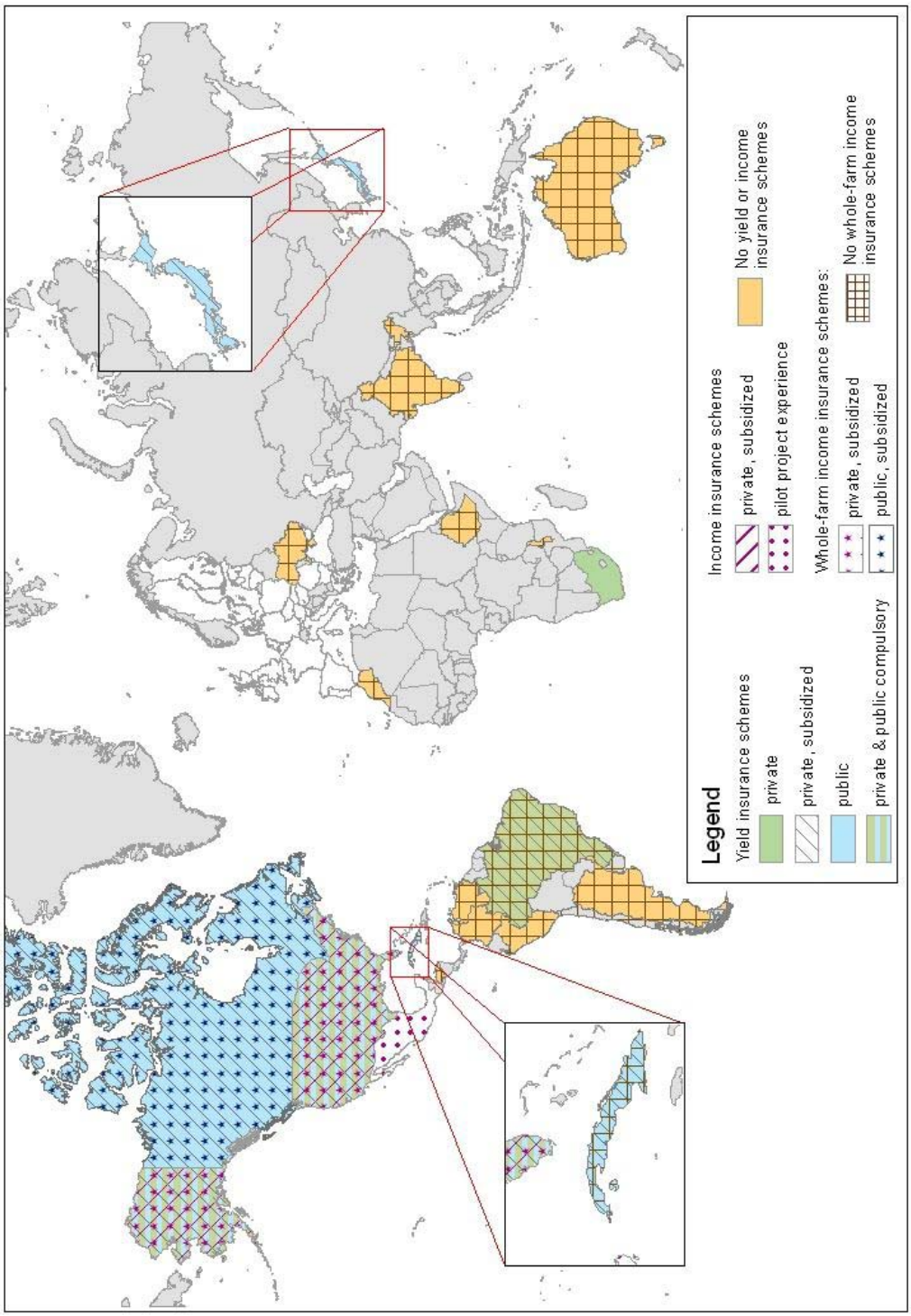


Figure 2. Yield and income insurance schemes in the world.

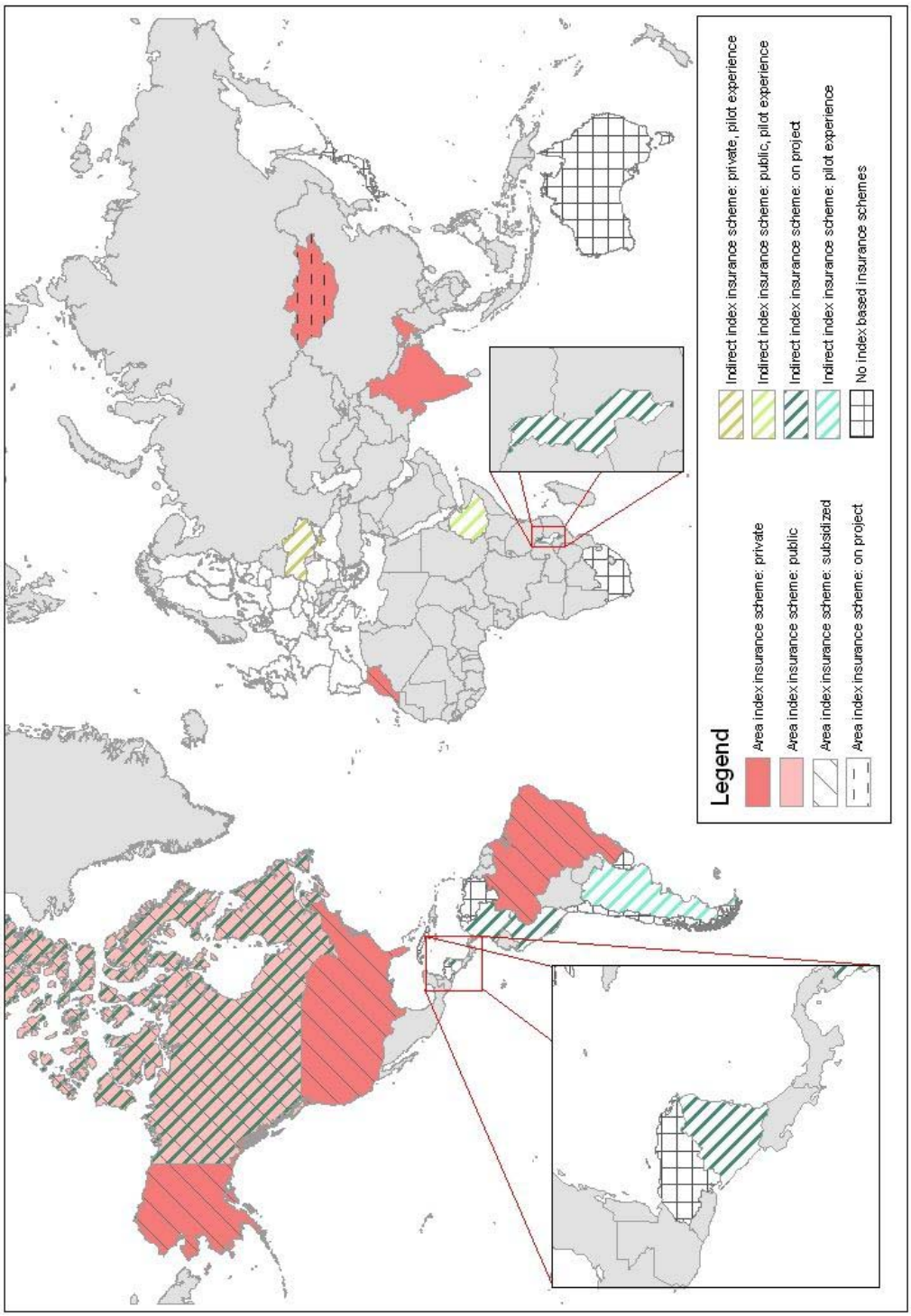


Figure 3. Index based insurance schemes in the world.

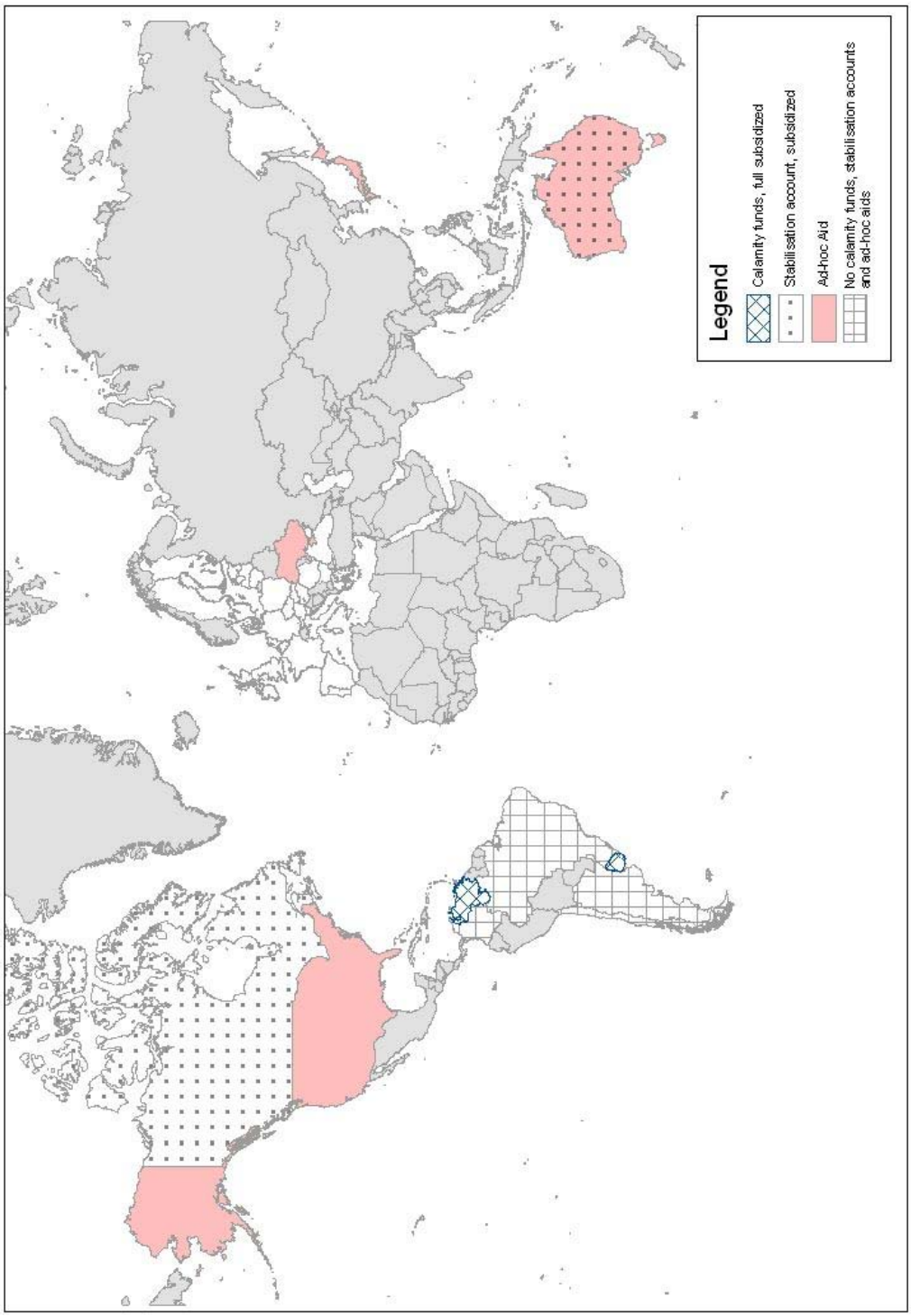


Figure 4. Calamity funds, stabilization accounts based insurance schemes and ad-hoc aids in the world.

Table 3. Agricultural insurance systems in non-EU Countries

Country	Single-risk insurance (1)	Combined insurance (2)	Yield insurance (3)	Revenue insurance (4)	Whole-farm yield insurance (5)	Whole-farm revenue insurance (6)	Area index insurance (7)	Indirect index-insurance (8)	Stabilisation accounts (9)	Calami-ties fund (10)	Ad-hoc aids (11)	Date of most recent info available
Argentina	P	P	-	-	-	-	-	#	-	-	-	2002-04
Australia	-	-	-	-	-	-	-	-	S	-	GF	2000
Brazil	-	PS	PS	-	-	-	PS	-	-	-		2002-04
Canada	(P)	-	GS			-	GS	##	S	-		2005
Chile	PS		-		-	-	-	-	-	-		2002-04
Cuba	-	G (GS)	GS	-	-	-	-	-	-	-	-	2002-04
Colombia	-	PS	-	-	-	-	-	##	-	-	-	2002-04
Ethiopia	-	-	-	-	-	-	-	G#				2005
Honduras	-	P	-	-	-	-	-	-	-			2006
India	-	-	-	-	-	-	P	P#				2005
Japan		GC+GS	GS		GS	-	-	-			GF	2000
Malawi	-	-	-	-	-	-	-	##	-			2005
Mexico		P + PS + GS		#?						-		2002-04
Mongolia		P(+GC#)					##	-				2005
Morocco	P	PS	-	-	-	-	PS	-	-			2005
Nicaragua							-	##				2005
Peru	-	-	-	-	-	-	-	##	-			2005
South-Africa	P	P	P	-			-	-				2002-04
Ukraine		P(S#)	-	-	-	-	-	P#	-		GF	2005
Uruguay	PS	P	Pilot experience in 2002	-	-	-	-	-	-	GF	-	2002-04
USA	-	-	PS	PS	-	PS	PS	-	-	-	GF	2005
Venezuela		P	-	-	-	-	-	-	-	GF	-	2002-04

Source: Prepared from information in Alasa (1992), ENESA (2004), Ibarra and Mahul (2004), Skees et al. (2005), Skees and Enkh-Amgalan (2002), Skees et al. (2001), Stoppa and Hess (2003), The World Bank (2005)

Legend:
- : Not existing (empty space means that there was no information about it)
S : Subsidized
P : Private non-subsidized
PS : Private partially subsidized
G : Public non-subsidized
GS : Public partially subsidized
GC : Public compulsory partially subsidized
GF : Public free
: Pilot experience
: On project
§: Failed experience

Due to the differences in denominations in the different countries, we use the following nomenclature:
(1) Single-peril insurance means hail or hail + fire insurance, or one single peril for livestock
(2) Combined insurance means a combination of several risks protection. It would be the Italian "poli-" or "combined"
(3) Yield insurance means multi-peril insurance where the main important risks are comprised (also drought), so some countries call it combined
(4) Revenue insurance covers from yield and price risks for a single product
(5) Whole-farm yield insurance consists of a combination of yield guarantees for the different agricultural productions in a farm; in case of loss with compensation between each other
(6) Under Whole-farm revenue insurance we include two types of insurance products: those that work as a combination of revenue insurance policies for various crops and/or livestock in the farm (in a similar way as the whole-farm yield insurance), and also those products which directly cover the total revenue of the farm.
(7) Area index insurance refers to area yield insurance or area income insurance (Indemnities are computed from the decrease on the average yields or income in an area).
(8) Indirect-index insurance reports to those indices of yields or vegetation computed from satellite images, weather based indices, etc.
(9) Stabilization accounts are individual bank accounts for self-insurance but which are publicly regulated or promoted
(10) Calamities funds include from single-product funds (crop or livestock) to funds that do not cover only agricultural productions
(11) Ad-hoc aids are Government aids after a calamity or catastrophe

The table summarises the insurance systems in the different countries in the world. Next we comment the table following the columns, that is, by types of insurance systems, which have been defined in the previous section.

4.2.1 Single and combined risk insurance

Combined risk insurance is available in most countries, mostly with a basic coverage in hail insurance.
The particular case of the US and Canada is quite different, because there is yield insurance and however, we have had no notice of single-risk policies. In both countries, there is a basic coverage which corresponds to yield insurance which covers only for losses above the 50% of the average yield (it is called CAT or catastrophic coverage). It is highly subsidized by the government (almost entirely in the US - where farmers only pay an administrative fee - and 50% in Canada). As the level of coverage increases, the subsidy decreases. But for any level of coverage, the most important risks are included, so it is possible to speak of yield insurance at a wide variety of coverage levels.

4.2.2 Revenue and income insurance and the USA

The USA is currently the only country where revenue and income insurance exists today. In the UK there was a private revenue insurance product by Dalgety Co. but it soon disappeared. In Canada there is an income stabilization account which will be presented later.

USA has developed a wide variety of revenue insurance products. There are three standard revenue insurance products, one area index revenue, insurance, one livestock prices insurance, or livestock gross margin insurance and one whole-farm income insurance. The three standard revenue insurance products are *Crop Revenue Coverage* (CRC), *Revenue Assurance* (RA) and *Income Protection* (IP). Among these, the most popular is CRC, which offers the possibility to get a higher price if the market price increases. These revenue insurance products apply for the main field crops usch as corn, soybeans, wheat, rice and cotton. *Livestock Risk Protection* (LRP) provides protection against declining livestock prices for swine, feeder cattle and fed cattle. *Livestock Gross Margin* (LGM) protects the gross margin between the value of insured hogs and the cost of feed inputs (corn and soybean meal). One main characteristic of most of the USA insurance products which offer some price risk protection is that the reference price is the futures markets price, and mainly, the guaranteed price is that predicted by the futures market. So, they provide coverage against the oscillation of the price within the year. Revenue insurance is very important in the USA, the 73% of the premiums collected coming from these types of insurance.

4.2.3 Whole-farm insurance

In Japan exists a whole-farm insurance which covers against all climatic hasards for all crops on the farm.
In the USA, there is Adjusted Gross Revenue (AGR), which uses a grower's historic tax information as a basis to calculate a level of guaranteed revenue. It covers both crops and livestock if livestock percentage is less than 35% of the total income. AGR-Lite is also available in limited areas and is identical to AGR with some exceptions. Among these, producers are eligible for this program regardless of the percentage of their income which is derived from animals or animal by-products.

4.2.4 Index insurances

Index insurances differ from the other type of insurances in that the indemnities are not computed from the individual farmer loss but from a parameter or index external to the farm[20]. They have been divided into two categories: area-index insurance (the index is directly an area average yield or income) and indirect-index insurance (other kind of indices, such as the vegetation indices computed from satellite images). The reason for this division is that the latter are more complex and so more difficult to understand or to trust by the farmers. Even if all of them have a short history, the area-index insurance have been experienced for some years in some countries (USA, Canada, Brazil or India), while the indirect indices are brand new and are only under study in most countries.

The area-index insurance are most often based on the yields of an homogeneous area, so that if the area yield decreases below a given value, all the insured farmers in that area get an indemnity with independence of their having a loss or not. An example of this is the GRP or Group Risk Plan in the USA. In the USA there is also another area insurance available, GRIP or Group Risk Income Protection, for which the index is an "area revenue", that is, the product of the area yield times the price of the specific product. In 2004, area yield and area revenue policies accounted for 7.4 % of total acreage insured but less than 3 % of total premiums.

One particular case has been included in the area indices: it is the case of Mongolia. The insurance policy that could be implemented in Mongolia in a near future is for livestock, and it is based on area mortality rates. This is possible because Mongolia performs a complete census of every species each year (Skees et al. 2005).

Regarding the indirect indices, the World Bank is promoting this kind of products as a tool for developing countries, sometimes for the individual farmers, other times for the Governments, so that they get funds to give aid to the rural population when there is a catastrophe.

20 for more information on index insurance see 2.1.3.2

In the case of Nicaragua, a weather index insurance was offered to the Government with this purpose, but the Government considered it unnecessary because "they could depend on the global community for assistance when major catastrophes occurred" (The World Bank, 2005).

4.2.5 Stabilization accounts and Canada

Following the order of the table above, the stabilization accounts are present in some countries. As mentioned before, these stabilization accounts are individual accounts where farmers put an amount of money every year, which they can withdraw in a year of big losses. They can be based on yields, revenues or other indices. These particular accounts are considered because they are not self-insurance accounts created under the farmers' own initiative but they are supported and usually regulated by the Government. The support can be given by means of direct subsidies complementing the farmer's contributions to the accounts, and/or by means of fiscal incentives. In the case of Australia, the account has fiscal incentives and the farmer can freely choose when he wants to withdraw the money. The Spanish account exists only for potatoes in one province (Alava) and it is based on an area index. It benefits both from fiscal incentives and from subsidies from the regional government.

The Canadian system is mainly led by public insurance agencies, from the provincial governments. It profits from subsidies both from the Federal and the provincial governments, which total € 425.5 Million and which amount to 66% of the premiums. Besides yield insurance products similar to those in the USA, it has an important income program, CAIS (*Canadian Agricultural Income Stabilization*), which consists on an stabilization account. It started in 2003, and substitutes two former programs: income stabilization account (NISA or *Net Income Stabilization Account*) and an income disaster assistance program (CFIP or *Canadian Farm Income Program*). CAIS is based on a farm's production margin, or farm revenue minus expenses directly related to a commodity's production (such as fuel, fertilizer, pesticide and feed costs). The CAIS program is a whole-farm program available to eligible farmers regardless of the commodities they produce. A program payment is generated when a producer's current year production margin falls below that producer's reference margin, which is based on an average of the previous five-year' program margins less the highest and lowest. A producer is required to open a CAIS account at a participating financial institution and deposit an amount based on the level of protection they have chosen. For a disaster level of coverage (0-70 percent of their reference margin) the producer must deposit an amount equal to 20 percent of their reference margin, and the other 80 percent is to be put by the Federal and Provincial Governments. For a second tier of protection (71 to 85 percent of the reference margin), the producer must deposit an amount equal to 30 percent (and the Governments 70 percent). Finally, if producers choose for their protection (86 to 100 % of their reference margin), they must deposit an amount equal to 50 % (and the Governments 50%). Under the program, Governments pay increasing portions of the payment as the seriousness of the income decline increases. But Governments only provide their share of funding when producers withdraw funding from their accounts.

The program now includes coverage for negative margins (program margins which fall below zero). CAIS participants will be eligible for coverage of 60 percent of their negative margins should they occur. The negative margins payments will be fully funded by the federal and provincial governments, without the need for further producer deposits.

4.2.6 Calamities funds and ad-hoc aids

The calamities funds and ad-hoc aids are all aids given by the Provincial Governments under the declaration of catastrophes. The ad-hoc aids are ex-post aids which have to be budgeted after a catastrophe has occurred while the Funds are provided every year by the Government and they are regulated. The main advantage of the funds over the ad-hoc aids is that they avoid big distortions of the government budget. Funds sometimes receive also contributions from the private sector, usually compulsory, in the form of levies to production, levies to premiums.

4.3 Some background on the USA system

4.3.1 The USA agricultural risk management policy

The USA agricultural insurance policy is defined in the insurance acts. However, agricultural insurance policy is closely related with Farm Policies, which are settled in the farm Bills (see table Table 4.).

Table 4. USA Farm Bills and Insurance Acts

U.S. Farm Bills	U.S. Insurance Acts
1990 Food, Agriculture, Conservation and Trade Act	1980 Act
1996 Farm Bill The Federal Agriculture Improvement and Reform Act	1994 Act
2002-2007 Farm Bill The Farm Security and Rural Investment Act	2000 ARPA Agricultural Risk Protection Act
2008-20013 Forthcoming	

Insurance was strongly promoted from the 1994 Act, which opened the way for revenue and incombe insurance products. After the 1996 Farm Bill, an important weight of the USA farm policy was laid on agricultural insurance. However, by stablishing the Cuntercyclical payments, the 2002 Farm Bill stablished an important public tool for market risk management.

The Farm Bill 2002 and the Counter-cyclical Payments (CCPs)

The Farm Bill 2002[21] stablishes the following support programs:

Title I Commodity Programs
- Direct payments
- CCPs Counter-cyclical payments
- Market Assistance Loans and Loan Deficiency Payments LPDs

Title II Conservation programs

Title III Trade
- Export support programs

The counter-cyclical payments are subsidies given to farmers by the Government whenever the commodities effective price is lower than a target price stablished by the Government. Because they vary inversely with the market prices, these payments have been called “counter cyclical”.

The effective price for a covered commodity is equal to the sum of the following:
(1) The higher of the following:
(A) The national average market price received by producers during the 12-month marketing year for the covered commodity, as determined by the Secretary.
(B) The national average loan rate for a marketing assistance loan for the covered commodity in effect for the applicable period under subtitle B.
(2) The payment rate in effect for the covered commodity for the purpose of making direct payments with respect to the covered commodity.

The target prices are stablished in the 2002 Farm Bill. They apply to wheat, corn, grain sorghum, barley, oats, upland cotton, rice, soybeans and other oilseeds.

The payment rate used to make countercyclical payments with respect to a covered commodity for a crop year shall be equal to the difference between (1) the target price for the covered commodity; and (2) the effective price. If counter-cyclical payments are required to be paid for any of the 2002 through 2007 crop years of a covered commodity, the amount of the counter-cyclical payment to be paid to the producers on a farm for that crop year shall be equal to the product of the following:
(1) The payment rate.
(2) The payment acres of the covered commodity on the farm.
(3) The payment yield or updated payment yield for the farm, depending on the election of the owner of the farm.

[21] http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=107_cong_public_laws&docid=f:publ171.107.pdf

CCPs are paid according to a fixed yield per farm, so that they are not directly coupled to the farmer's final production. However, the payments are made according to the farmers' most recently seeded surfaces, so they are not completely decoupled from production.
Also, CCPs are commodity-specific payments and they cannot be considered non-specific. The decoupling is a classification criterium in the Green Box. But because CCPs are dependent on the prices, it can be argued that they are not decoupled from prices, and so, not eligibles for the Green Box. (Basco et al. 2002)

4.3.2 The Insurance system in the USA

Insurance in the USA is private but subsidized and benefiting from public reinsurance. Currently, 17 companies are involved, among the main ones: Ace Property & Casualty Ins. Co.; Hartford Fire Ins. Co.; Rural Community Ins.. They work in agreement with the Government's *Risk Management Agency* (RMA), which is part of the USDA (United Sates Department of Agriculture).

Table 5. Some data on the USA insurance system (Crops)

	Total production value 2004 (M€)	Currently insured production value (M€)	% of insured production value / total	Premiums (M€) And % of insured value	Subsidies (M€) And % of premiums
USA	81,560 (50,154 eligible production value - field crops)	37,000 (crops only)	45% crops 74% of eligible	3,300 9%	1,900 58% (72% incl. adm. costs & reinsurance)
Europe 25	161,923	36,730	23 %	1,538 4 %	497 32%

(1 € = 1.273 US$ - September 2006)

Sources: Approximate values calculated from data in CEA Data, The World Bank 2005, Rain and Hail Insurance Society 2005 and AGmanager.info (http://www.agmanager.info /crops/insurance/risk_mgt/rm_html05/ABksLR.asp)

Approximately the 45% of the crops produced in the USA are insured while in Europe only approximately the 23%. The average premium rates in the USA (9%) are much higher than in Europe (4%), most probable because they correspond in a big proportion to revenue insurance schemes and in a lower proportion to yield insurance schemes, whereas in Europe it corresponds to single-peril, multi-risk and yield insurance schemes.

The premium subsidies in the USA amount to €1,900 million, which corresponds to a 58% of the total risk premiums. The USA Government also provides funds for the administrative costs of the

insurance companies and reinsurance. The total support thus provided to insurance would amount to 72% of the total premiums.
The European subsidies to insurance premiums are around 500 M€ (32%).

5. The current agricultural risk management systems in the EU and Candidate Countries

In this section we are going to describe the risk management systems in general (which include not only insurance but also funds, public systems, ad-hoc aids, futures markets, etc.) existing in EU and candidate countries. This helps to understand the insurance systems themselves. In the following sections we will enter into more details about insurance, providing some data on the evaluation of the insurance systems. For further information on the systems per country, please refer to the Fact Sheets in the annexes.

The figures and table shown next are similar and can be compared with those shown on the previous section, on risk management instruments in the world. The figures show maps corresponding to the same type of insurance products. On the first map, the existence of single-risk, combined and yield insurance schemes is illustrated and if there is a public involvement.
On the second map non-insurance schemes, such as: calamity funds, stabilization accounts and ad-hoc aids are shown.

The information shown in the maps is contained in the table below, and commented later.

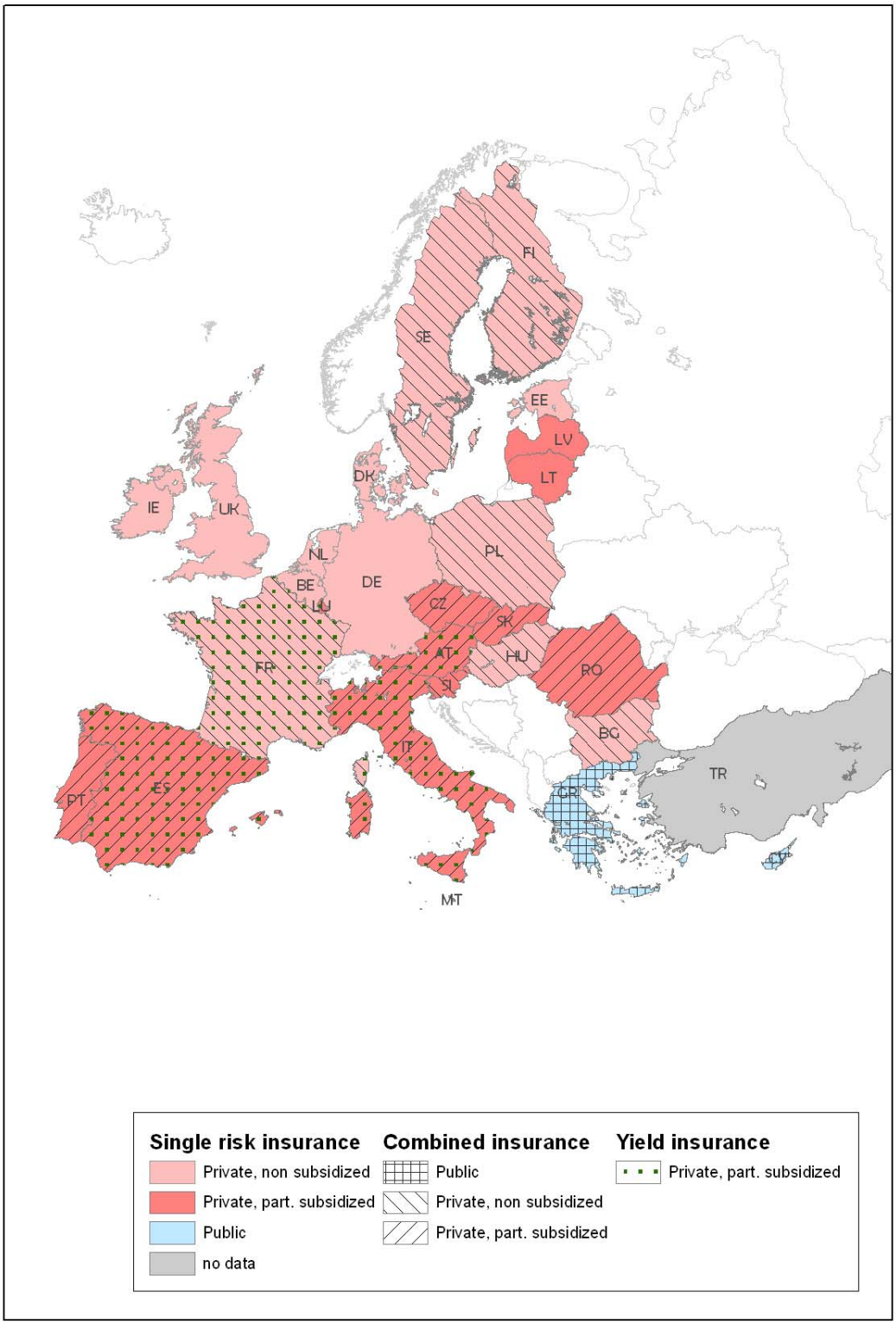


Figure 5. Single, combined and yield insurance schemes in Europe.

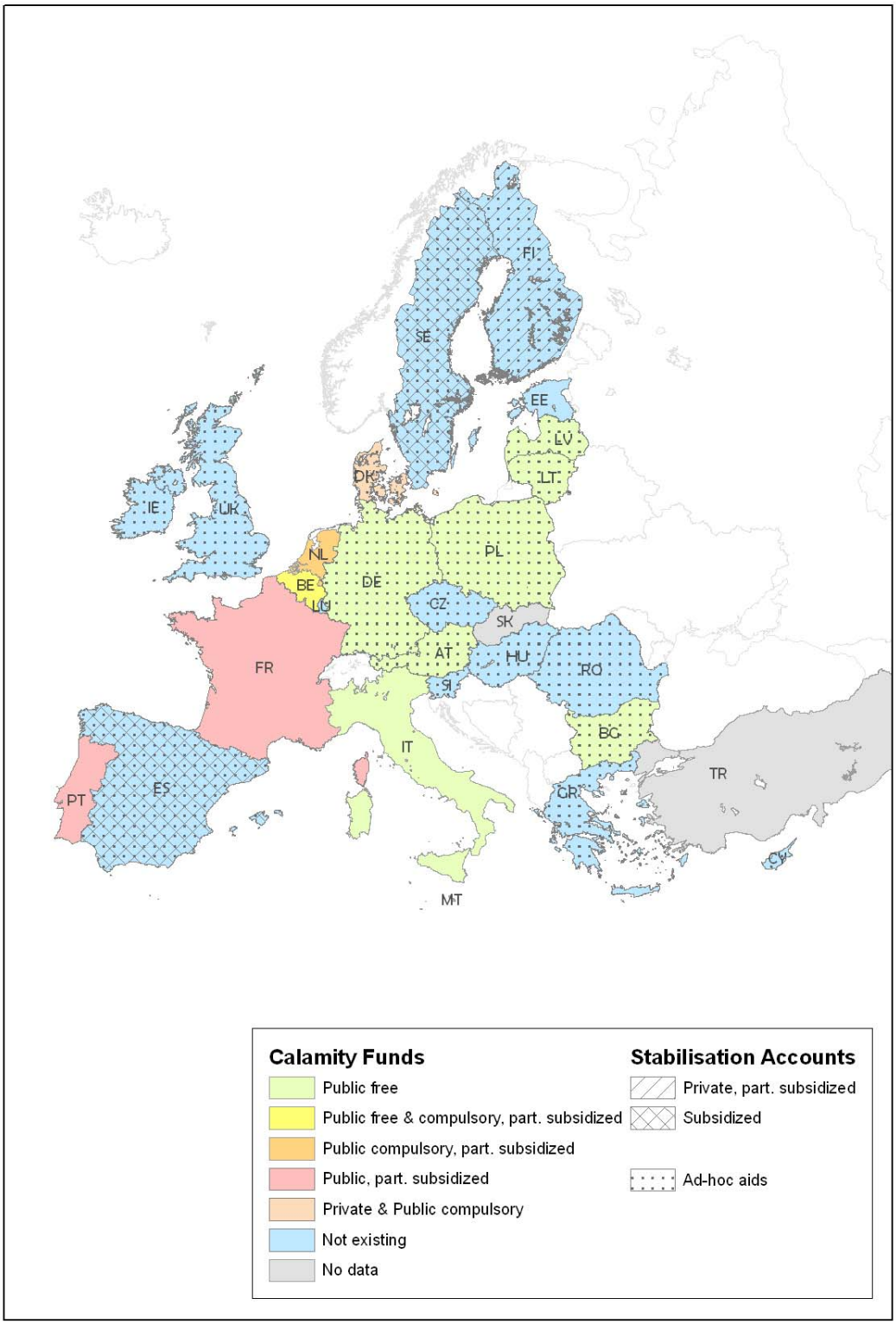


Figure 6. Calamity funds, stabilization accounts and ad-hoc aids in Europe.

Figure 7. Agricultural risk management tools and insurance systems in EU countries (BG, RO)

Country	Single-risk insurance	Combined insurance	Yield insurance	Revenue insurance	Whole-farm yield insurance	Indirect index-insurance	Stabilisation accounts	Calamities fund	Ad-hoc aids	Date of information
Austria	PS	PS	PS	-	-	##	-	GF	GF	2006
Belgium	P	-	-	-	-	-	-	GF & GC	-	2006
Bulgaria	P	P	-	-	-	-	-	GF	GF	2006
Cyprus	GC	GC	-	-	-	-	-	-	GF	2006
Czech Rep.	PS	PS	-	-	-	-	-	-	GS?	2006
Denmark	P	-	-	-	-	-	-	P+ GC	GF	2006
Estonia	P *	-	-	-	-	-	-	-	-	2006
Finland	P *	P *	-	-	-	-	PS	-	GF	2006
France	P	P	PS	#	PS	##	-	GS	-	2006
Germany	P	-	-	-	-	-		GS?	GF	2006
Greece	G	GC+GS+G	-	-	-	-	-	-	GF	2006
Hungary	P	P	-	-	-	-	-	-	GF	2006
Ireland	P	-	-	-	-	-	-	-	GF*	2006
Italy	PS	PS	PS	-	-	-	-	GF	-	2006
Latvia	PS	-	-	-	-	-	-	GF?	GF	2006
Lithuania	PS	-	-	-	-	-	-	GF	GF	2006
Luxembourg	PS	PS	PS	## *	-	-	-	-	GF*	2006
Netherlands	P	-	-	-	-	-	-	GC	-	2006
Poland	P(S#)	-	-	-	-	-	-	GF	GF	2006
Portugal	PS	PS	-	-	-	-	-	GS	-	2006
Romania	PS	PS	-	-	-	-	-	-	GF	2006
Slovakia	PS	PS	-	-	-	-	-	?	?	2006
Slovenia	PS**	P	-	-	-	-	-	-	GF	2006
Spain	PS	PS	PS	§	-	PS	S	-	GF	2005
Sweden	P	P	-	-	-	-	S	-	GF	2000
UK	P	-	-	-	-	§	-	-	GF *	2006

Source: Prepared from information in the fact sheets provided by the experts in each country

Legend:
- : Not existing (empty space means that there was no information about it)
S : Subsidized
P : Private non-subsidized
PS : Private partially subsidized
G : Public non-subsidized
GS : Public partially subsidized
GC : Public compulsory partially subsidized
GF : Public free
: Pilot experience
: On project
§: Failed experience

*) Livestock only
**) a national programme in Slovenia for subsidies insurance in 2006 for the first time (30-50%)

Whole-farm income insurance and Area index insurance are not existing in Europe

The table summarises the insurance systems and complementary tools in the different countries in Europe. Next we comment the table following the columns, that is, by types of insurance systems, which have been defined in the previous section.

5.1.1 Single-risk, combined and yield insurance

Single-risk insurance for hail is the most developed insurance with a long history and exists in all countries. It will be addressed in detail with data per country in sections 5.5 and 6

Yield insurance available

In Spain the insurance system is the most developed in Europe where insurance policies cover most risks affecting agricultural yields. The Government, farm unions and insurance companies agreed that the farm insurance system defined in a law would be the tool for managing catastrophic damages in the farm sector. One of the specific characteristics of the Spanish agricultural insurance system is that all the insurance companies operating within a pool, which assumes the risk in a co-insurance regime. In Austria, France, Italy and Luxembourg the insurance also is well developed and most risks are covered depending on the contracts. Mostly there is a basic coverage for hail and in addition a yield insurance covering the most important risks in the country. In the majority of cases there is also a high level on public support in these countries.

Combined insurance available

In Bulgaria, the Czech Republic, Hungary, Portugal, Romania, Slovakia, Slovenia and Sweden there is a basic coverage and additional a combined risk insurance is more or less available. This means that hail and only a few numbers of risks are covered by insurance, but there is no comprehensive coverage available.

Only single risk insurance available

For several countries, in particular for Belgium, Germany, the Netherlands and UK hail insurance or single-products insurance are the main insurance product available, other types of farm insurance products demands are negligible in these countries and public support to the private insurance do not exist.

In some northern countries and also in the Baltic States there is less demand on crop insurance or they are starting to develop their systems like it is in Poland, Latvia and Lithuania.
In Finland private crop insurance is less developed, but there is a public “Crop Compensation Scheme” provided to compensate yield losses after natural disasters.

Compulsorry public insurance

Different are the schemes in Greece and Cyprus where a compulsory insurance system is provided from the public sector.

5.1.2 Index insurances

The area-index insurance has been commented with the examples of GRP and GRIP in the USA and Mongolia (section 4.2). In Europe this kind of insurance does not exist.

Regarding the indirect indices, there are two examples in Europe. Probably the first country where they have been commercialized is Spain, where an insurance product for pastures is available since 2001. In United Kingdom an index-based insurance programme was launched in 1998 based upon the yield statistics of the Home Grown Cereals Authority and prices based upon the LIFFE commodity futures. The cover provided indemnity for a 10% fall in yield and a 5% fall in price. Premium rates varied depending of the region from 1.10% to 3.5%. Take up was minimal and the product offering was cancelled in the following season.
In Austria an indirect index based insurance is on project for the coverage of drought.

5.2 Ad-hoc aids and funds

When there are no market based instruments available to manage risks (such as futures markets, insurance or mutual funds), or complementary to these market instruments, ad-hoc aids are given from the public budget in order to help farmers in case of calamities or natural catastrophes. In some countries, most of the risk management protection for crops is privately provided, while for animal diseases most often there is a Government intervention (this is the case for the Netherlands, Ireland, the United Kingdom, etc.). The rest of the countries give all of their compensations to agricultural catastrophic losses by means of ad-hoc aids or through calamity funds.
The aid-hoc aids or assistance in case of calamity or natural disaster usually cause big distortions in the national budget. For these reason, many countries create funds for risk management in agriculture. Usually these funds have the purpose of accumulating money every year for the years when it is necessary to provide assistance after a calamity or natural disaster. Some countries feed the funds entirely from the public budget, and others have more “private” funds, usually fed from levies to some products.

In other countries, as an alternative or a complementary to ad-hoc aids or providing catastrophic aid via funds, there is a public involvement:

2. either in the provision of subsidies to private insurance
2. either in the direct provision of insurance
2. or of a security net (this is the case for Greece and Cyprus).

Next table shows the Funds existing in the EU and candidate countries.

Table 6. Funds related with subsidies and ex-post aids

Country	Pub/priv	Fund
Austria	Public	Austrian Catastrophe fund
Belgium	Public	Fonds «Caisse Nationale des Calamites» (since 1976)
	Public-private	Fonds de mutualisation des animaux (since 1998) Fonds de mutualisation des végétaux (since 1993) - Potato
Bulgaria	Public	Fund for insect pest control (against Moroccan locust)
Cyprus	-	-
Czech Rep.	Public	Support and Guarantee Fund for Farmers and Forestry (PGRLF)
Denmark	Private	Fund for floods, not agri-specific. Privately fed by charges on fire insurance premia. (1991)
	Public-private	Compensation scheme for slaughtering of animals in response to disease outbreaks. This compensation is, under certain circumstances, supplemented by compensation from funds established by the agricultural industry.
Estonia	-	-
Finland	-	-
France	Mixed	FNGCA or Fonds National de Garantie des Calamites Agricoles (50
Germany	-	-
Greece	-	-
Hungary	-	-
Ireland	Private	Potato pool (potato producers fund) (ENESA 2004)
	Mixed	Fund for animals disease eradication (mixed 50%)
Italy	Public	FSN or National Solidarity Fund (since 1970) and FSNPA or Nat. Sol. Fund for Fisheries and Aquaculture (since 2004)
Latvia	-	-
Lithuania	Public	Calamity Fund
Luxembourg	Public	Vineyard Solidarity Fund
Netherlands	Mixed	Compulsory Livestock Fund
	Public	Non agri-specific fund (source: ENESA 2004)
Poland	Public	Fund for epidemic diseases
Portugal	Mixed	Fundo de Calamidades
Romania	-	-
Slovakia	-	No information
Slovenia	-	-
Spain	-	-
Sweden	Public	(Program for livestock infectious diseases) The Swedish Board of Agriculture
UK	-	-

Most often, support to agricultural insurance comes directly from the national budget. In some of these countries, it is not directly the Government by means of a Ministry, but a public institution, who manages the agricultural insurance-related affairs. The names of these institutions are shown on Table 7.

Table 7. Public Institutions related with agricultural insurances

Country	Institutions
Cyprus	AIO (Agricultural Insurance Organisation)
Greece	ELGA (Hellenic Agricultural Insurance), public insurer
Italy	ISMEA (Istituto di Servizi per il mercato agricolo alimentare) Not only for insurance
Spain	ENESA (Entidad Estatal de Seguros Agrarios) – Ministry of Agriculture

However, in those countries who also have funds, most often funds and insurance support are closely related, a part of the fund being used for subsidizing insurance premiums (this is the case for Austria, Italy, the Czech Republic since 2004 and to a minor extent in France).

In Austria, the catastrophe fund is used mostly for preventive measures, and a small part is used for subsidies in crop insurance (25% of the hail and frost insurance premiums). This subsidy is provided on the condition that the regional government also provides 25 % of the insurance premium. In the case of a natural disaster like hail or frost there are no paymants from the national fund allowed, because these disasters cause by subsidized insurable risks. Sometimes there are additional ad-hoc payments by the government after natural disasters.

In Belgium, there are three Funds. The Calamities Fund or “Caisse Nationale des Calamitées” is exclusively fed from the public budget. It gives aids in case of calamities which are defined in the Law 12 July 1976 (see section on “disaster” and “crises” definition). Besides, there are two mutualisation Funds: The “Budgetary fund for the health and quality of animals and animal products”, (Fonds des animaux) since 1998, and the “Budgetary Fund for the production and protection of crops and crop products” (Fonds des végétaux). The activity of the latter is limited to the potato sector. These two Funds are co-financed on a 50% by the producers through compulsory levies and, for the last crisis, on a 50% by the European Union. However, besides these, Funds, ah-hoc aids are given in very special cases, by the Federal Government (Dioxine Intervention 1999), and or by the administrative regional governments (Avian Flu 2005 by the Flemish region)

In Cyprus the public Agricultural Insurance Organization which basic objective is the formation of a comprehensive system of agricultural insurance, which will cover all agricultural crops against all natural hazards provide subsidies (50%) to the compulsory insurance system. Complementary the system provide ad – hoc government financial assistance to farmers who suffer loss of income from the perils caused by natural hazards to compensate the farmers damages caused by natural hazards which are not included in the Insurance Scheme or from

crops which are not included in the range of crops covered by the Insurance Scheme or when the reserves were not adequate to cover the claims.

In the Czech Republic insurable risks are supposed to be covered by the private sector. Since 2004, the Support and Guarantee Fund for Farmers and Forestry (PGRLF) has offered premium subsidies for both crop and farm animal insurance.

In Denmark, there is a compensation scheme for slaughtering of animals in response to disease outbreaks. This compensation is, under certain circumstances, supplemented by compensation from funds established by the agricultural industry. Manufacturers are obligated to pay an amount to such schemes within the agricultural industry, according to a percentage of their production or turnover.

In Finland coverage is available for all farmers free of charge, given that they follow certain guidelines. The coverage comes from the public crop damage compensation scheme (based on Crop Damage Compensation Act) and compensations also paid for the prevention of certain animal diseases (limited coverage, based on Animal disease Act). Commercial insurance are not subsidized in Finland. Insurance companies are generally not willing to offer insurance for such events (excepting livestock), because extreme damage is compensated by state.

In France, the FNGCA or *Fonds National de Garantie des Calamités Agricoles* covers non-insurable risks. The financing of FNGCA is granted by farmers and by the public budget on a parity base (50%). The contribution of farmers arises from taxes levied on premiums paid to cover the whole set of farm risks (13% in fire insurance premiums, 5% in farmers' car insurance premiums and 7% in the rest of agricultural insurance premiums). At the same time, the FNGCA subsidizes a small part of the insurance premiums depending on the insurance product. After the official declaration of natural disaster, indemnities are paid to farmers that bought insurance on at least one insurable risk and that suffered losses above a certain threshold.

In Germany there are special public programmes after natural disasters, but usually emergency aid is part of the federal states.

In Ireland, the Fund compensates farmers for the commercial value of compulsorily slaughtered animals. The farming community as a whole contributes to the farm in the form of a levy. These "disease eradication" levies are imposed at the point of slaughter of all cattle and on milk products. The levies are adjusted regularly, with the objective of ensuring that 50% of the cost of compensation is met from the levies.

In Latvia State-guaranteed compensations take place in the particular animal epizooty cases from the state funds intended for unforeseen events. There are compensation of losses caused by unfavourable weather conditions, natural disasters and animal diseases and similar, in compliance with the particular political resolutions. Subsidies are granted in amount of 50 %, but limited per unit (hectare, livestock).

In Lithuania there is a calamity fund for losses of farm buildings, agricultural technique, animals and birds occurred due to natural disasters, adverse weather conditions and animal epidemic diseases. Compensation of up to 60% of losses is given for those, who had insured the aggrieved assets and compensation of up to 20% for those who hadn't.
In case of extraordinary disasters government approves ad-hoc support for the farmers. Compensations vary according to loss extent, e.g. in 2005 those who suffered 100-80% of losses got 50% compensations, who suffered 80-50% - 30%, who suffered 50-30% - 15%. Usually the compensations are paid in the period of one year.
There is also a partial support to insurance premium up to 50% since 1992.

In Portugal, for the last ten years, measures taken to face events caused by calamities not covered by crop insurance were taken, in most cases, through the Calamities Fund or *Fundo de Calamidades*. The Fund is financed from dotations from the Government budget and by contributions from the farmers. Farmers, to have right to the compensations from the Fund, must have bought some crop insurance policy in the date of occurrence of the calamity, and they have to pay a contribution to the Fund equivalent to 0.2% of the insured value. The Fund compensations are given, in most cases, as bonus to credit interests, and exceptionally, as direct subsidies.

In Romania the agricultural producers benefit from the stipulation of law 381/2002 if they are affected by natural phenomena and if they are located in a calamity area declared by Governmental Decision, and if their crops, plantations, animals, fowls, or fish are insured by insurance companies approved by the Ministry of Agriculture. Insurance premium is subsidized initially with 20% but beginning with 2005 the level of subsidy rose to 50%. There is no public fund for natural disasters.

In Slovenia there is a range of ad-hoc measures applied by government in agriculture to compensate for extraordinary disasters. Compensation of damage from natural disasters includes state aid in case of draught, hail and frost. In the last decade (1994 and 2004) the average annual expenditure was at EUR 8.2 millions, however after the year 2000 the expenditure increased drastically, since the average 2000-2004 is EUR 15.6 millions. In terms of total budgetary expenditure to agriculture disaster aid represents about one tenth in last five years (2000-2004 average is 10.5 %). Only in the year 2006 for the first time a national programme for insurance premium subsidies has been available to crop producers. This seems to be initiation to a more systematic "public-private" cooperation in agricultural risk management in Slovenia.

In Sweden there is a public program to combat and compensate damages from infectious diseases, while for other disasters in agriculture, such as contaminated feed, plant pests or radioactive fall-out, compensation is rather made on an ad-hoc basis. In the infectious diseases program, farmers do not have to pay a premium but are obligated to take certain measures (such as slaughter or decontamination) in case of an outbreak of any of the regulated diseased. In the case of epizootic disease, farmers are fully compensated (100) for the value of animals

and costs of decontamination, and 50 for production losses. In the case of zoonoses (salmonellosis), farmers are compensated for up to 70% of the costs in connection with the disease-

In the United Kingdom ad-hoc payments are given from the Gouvernment for compensation in the case of an "Order" for slaughtered animals (especially in 2001 with around 1.640 M€ for Food and Mouth disease).

Ad-hoc payments directly provided from the Governmet budgets, and compensation payments from catastrophe funds where they exist, are shown in the table below.

Table 8. Ad-hoc and Funds Payments in the last years (data from fact sheets)

Country	Years available	Total payment (M €)	Average payments /year (M€)	Comments
Austria	1995-04	55.9	5.6	frost, drought, flood
Belgium	1985-02	29.4	1.6	frost, drought, rain, pests
Belgium	1999	280	-	Livestock: dioxine
Bulgaria	2000-04	2	0.4	Insect pest control fund & others
Cyprus	2001-04	28.6	7.2	-
Czech Rep.	1995-04	369.3	36.9	flood, drought, frost
Denmark	-	-	-	Storm & forest storm damage
Estonia	-	0	0	No payments
Finland	1996-05	114.2	11.4	crop damage compensation scheme
France	1996-05	1,555.8 (1)	155.6 (1)	drought 67%, frost 19%, rain 13%
Germany	-	-	-	no data
Greece	1995-04	701.0	70.1	-
Hungary	1999-02	48.8	12.2	frost, drought
Ireland	1999-04	400.6 (1)	66.8 (1)	Livestock disease
Italy	2001-06	680.0	113.3	drought and others not covered by insurance
Latvia	2000-05	19.3	3.2	frost, drought, rain
Lithuania	2000-05	15.7	2.6	frost, drought, rain
Luxembourg	-	-	-	No ad-hoc aids for crops. No other data
Netherlands	1998	250.0	-	excessive rain. Not allowed any more
Poland	-	10.0	10.0	epidemic diseases
Portugal	last 10 ye	30.0(2)	3.0(2)	-
Romania	last 5 years	56.8	11.4	Drought, frost, floods
Slovakia	-	-	-	no data
Slovenia	1995-04	97.8	9.8	drought, hail, frost
Spain	2000-05	22.2	3.7	Frost, drought, rain
Sweden	-	-	-	Infectious diseases
UK	2001-05	1,897.7	379.5	Livestock disease
TOTAL			**904.3**	

(1) The 50% of this amount comes from private contributions from the sector, either through taxes on agricultural insurances (France) either from levies on the commercialization of the products (Ireland). (2) Portuguese farmers also contribute to the calamities fund but the amount refers to Government contributions

5.3 Ad-hoc aids and insurance: Law barriers

A key point for the development of agricultural insurances is whether or not the law forbids that ad-hoc measures or disaster funds compensate damages that could have been insured.
In Spain, Portugal, Greece and Sweden there are no payments from a public fund if there is insurance available.
In France Payments include those damages for which there is no insurance at all or that insurance has not reached yet a significant diffusion level.
In Austria and Italy only subsidized risks are excluded from public ad-hoc payments after natural disasters.
In Romania only Payments from the public budget are given to farmers in the case of natural disasters if they have insured risks called "standard risks" like hail.
In other countries it seems that there are no explicit regulations.

Table 9. Law barriers for aids

Country	Law barrier
Austria	There are sometimes ad-hoc measures by the national or regional governments. These measures are forbidden for insurable risks which were supported by the public authorities regarding the costs of premium paid by farmers. But there are sometimes ad-hoc payments for insurable risks without public support.
Belgium	The definition of the phenomena that can be covered by the Calamities Fund implies that the usually insurable risks cannot perceive aids from the fund. According to the Law 1976, only hail is considered as normally insurable and so cannot be covered by the Fund.
Bulgaria	There are no law barriers for payments from public funds for natural disasters which could be covered by insurance.
Cyprus	The insuring of the crops and the perils specified in the basic law and the subsequent amendment of the Agricultural Insurance law in Cyprus is compulsory. Consequently all crops and perils which were consider by law as insured, have to be insured. The crops which cannot be insured or are not covered for all perils, rely on the government to compensate them when they suffer damages. Usually the compensation is given to farmers who are organized.
Czech Republic	In the Czech Republic the law doesn't forbid ad-hoc measures and diseaster funds compensating insurable damages. But there are changes undergoing now regarding the condition for state compensations, so that farmers have to be insured against these risks.
Denmark	No, there are no limitations
Estonia	No barriers, because insurance isn't developed
Finland	There are no law barriers for ad-hoc measures to compensate damages that could have been insured. Ad-hoc measures like the public crop damage compensation scheme is the mostly used system.
France	The new 2006 legal dispositions establish that the agricultural calamity regime can only include those damages for which there is no insurance

	at all or that insurance has not reached yet a significant diffusion level. In this latter case of partial diffusion of insurance, only those farmers that are not insured yet can profit form the indemnities regime. The legal frame also establishes that, once a particular insurance product has reached a certain diffusion threshold (in terms of insured surface in relation to the national surface) all farmers, whether they are insured or not, will be excluded form the public regime for the particular damage.
Germany	?
Greece	In article 4 ("exclusions") of the 2006 regulation, it is stated that the ad-hoc compensation is not paid: *9. "To the owners of livestock or aquaculture exploitations they have not insured with an insurance body (all or some of the) main components of their exploitation for at least one insurable risk".* (It is not clear what is meant by "insurance body" but it is understood that, in practice, the ELGA services tend to consider both ELGA and private insurers as "insurance bodies"). *10. "For losses covered partially or totally by insurance programmes of the legal entities providing protection services for the agricultural activity in the framework of the system "HESIODUS…"* (The legal entities providing "protection services for the agricultural activity" in the framework of the system "HESIODUS" are, according to L.2945/01, the ELGA as well as the insurance companies and the farmers' mutual organizations participating in the "annual programme of agricultural insurance". There are no, at present, such programmes offered by private insurers and mutual organizations. Therefore, the paragraph 10 above should be read as following: "For losses covered by ELGA".)
Hungary	In case of subsidies which can be accessed based on natural disasters losses have to meet the criteria laid down in article 7 of the "Act LXXIX of 1991 on Land taxation". There are ad-hoc payments for insurable risks.
Ireland	The law does not forbid compensation for losses which could have been insured
Italy	It is excluded from the compensation interventions the damages to productions and structures eligible for subsidized insurance (Legislative Decree 29 March 2004, n. 102, art. 5.4). For that reason, every year, the specific regions will specify, limited to their own territory, the guarantees, the products and the municipalities that they intend to include in the subsidized insurance system and, so, to exclude from eventual compensation interventions.
Latvia	There is no specified legal, but under certain circumstances losses caused by any risk may be recompensed from the state funds, which diminish motivation of farmers to have their risks insured and delay development of the insurance market.
Lithuania	State compensates damage to all aggrieved farms, but the compensation rate for insured and uninsured ones is different. Compensation of up to 60% of losses is given for those, who had insured the aggrieved assets and compensation of up to 20% for those who hadn't.
Luxembourg	There are no ad-hoc aids given for climatic damages. Insurance is subsidized.
Netherlands	There are no ad-hoc measures for crops, and for animals there is no private insurance, but a compulsory fund system fed by the sector.

Poland	Ad-hoc measure is granted regardless of the fact that the given farmer is insured or not.
Portugal	Within the SIPAC framework ((Sistema Integrado de Protecçao contra Aleatoriedades Climaticas – DL 20/96 March 19th and DL 23/2000 March 2nd), the Calamities Fund compensates the farmers for damages produced by risks exclusively not covered by crop insurance
Romania	In case the loss is caused by calamities stipulated in Law 381/2002, the agricultural producer is compensated by state (when the calamity status is declared by G.D.), but only if the producer has insured the "standard" risks (insurable risks).
Slovakia	No information
Slovenia	There is no legal inhibition to eligibility for any kind of support from disaster aid in Slovenia conditioned with insurability. Even though, the state aid compensation level is higher for the claimants which prove a compensation for the same loss from the commercial insurance company which exceeds a specified level of officially evaluated loss (Board of evaluators). In the case of state aid for damage on agricultural production, the level of compensation is increased by 20 percentage points (from 40 % to 60 %) if payments form insurance exceeds 30 % of total damage.
Spain	The legal frame is composed by the Law 87/1978, 28 December and the Royal Decree 2329/1979, 14 September. Also, every year there is a legal "Yearly Farm Insurance Plan". This plan includes the explicit compromise from the Government of not to grant extraordinary aids to farmers affected by insurable risks.
Sweden	There are no aids for insurable risks; the Government considers there are no obvious market failures in insurance. Only in the case of salmonellasis
UK	The Animal Health Act 1981 provides for the introduction of 'Orders' under the Act, which can provide for or amend compensation payments for slaughtered animals. For these direct losses also insurance is available.

5.4 Derivatives markets

Derivatives markets were introduced in the first chapter. Organised trading in agricultural derivatives markets dates back to the mid 1860s with the opening of the Chicago Board of Trade in the US. Since then, the trading volume as well as the variety of futures contracts available for trading has increased dramatically.

A list of the major exchanges offering agricultural futures contracts word-wide is presented in Table 10.

Table 10. World futures and options markets in agricultural commodities

Exchanges	Location & Date of Establishment	Agricultural Products Offered
Euronext.liffe	London, Paris, Amsterdam, Lisbon & Brussels; 2000	Cocoa, Robusta coffee, white sugar, feed wheat, milling wheat, rapeseed, corn, potatoes
Warenterminborse Hanover AG (WTB).	Hanover; 1998	Hogs, piglets, potatoes, wheat, brewing barley
Budapest Commodity Exchange (BCE)	Budapest; 1989	Corn, wheat, feed barley, rapeseed, soybean, sunflower seed
Poznan Commodity Exchange	Poznan, Poland; 1991	Corn, wheat, sugar
Chicago Board of Trade (CBOT)	Chicago; 1848	Corn, soybeans, soybean oil, soybean meal, wheat, oats, rough rice, mini corn, mini soybeans, mini wheat, Dow AIG Index*
Chicago Mercantile Exchange (CME)	Chicago; 1874	Beef, dairy, e-livestock, fertilizer, hogs, lumber
New York Board of Trade (NYBOT)	New York;	Cocoa, coffee, cotton, FCOJ, sugar
Kansas City Board of Trade (KCBOT)	Kansas; 1856	Wheat
Minneapolis Grain Exchange (MGE)	Minneapolis; 1881	Wheat, three classes of wheat Indices**, national corn index (NCI), national soybean index (NSI)
South African Futures Exchange (SAFEX)	Sandown; 1988	White maize, yellow maize, wheat, sunflower seed, soybeans
Sydney Futures Exchange (SFE)	Sydney; 1960	Wool, New Zealand Broad Wool, MLA/SFE cattle.
Winnipeg Commodities Exchange	Winnipeg; 1972	Canola, Barley, Flaxseed, Feed Wheat

*Dow Jones AIG Commodity Index Futures (AI)

**Hard winter wheat index (HWI), Soft red winter wheat index (SRI) and Spring wheat index (SWI).

Source: Battley, Nick (1999) The world's futures and options markets, Second Edition, John Wiley & Sons, LTD.

In the European markets, agricultural derivatives have been traded since 1929 with the establishment of the London Commodity Exchange (LCE). [22] Recently, there have been considerable efforts in Europe to develop agricultural futures and option markets. At least four new commodity exchanges that offer futures and options based on agricultural commodities have been established since 1988. Although many of the new European agricultural futures and option markets are not actively traded, changes in economic and agricultural policies over the last 10 to 15 years appear to have created more favourable conditions for the development of futures and option markets. In particular, many of the new agricultural derivative markets were introduced after the implementation of reductions in price supports for major commodities due to the 1992 and AGENDA 2000 reforms, as well as implementation of the 1995 WTO Agreement on Agriculture. This has resulted in the launch of a number of new commodity and agricultural exchanges in Central and Eastern Europe as well as the introduction of at least 38 new agricultural futures and options contracts. These new contracts include futures and/or options for wheat, corn, live hogs, rapeseed, rapeseed meal, and rapeseed oil. On the whole, it seems that, consistent with the trends in European agricultural policy towards reduced market intervention, most new European agricultural futures contracts have been designed to reflect the needs of producers and are more in line with agricultural commodities produced and consumed within Europe.

Evaluation of derivative markets

The growth in derivatives trading over the recent years reflects the increased economic benefits[23] which futures markets provide to market agents. These benefits are mainly price discovery, market transparency and risk management through hedging. Price discovery is the process of revealing information about current and expected spot prices through the futures and forward markets. Risk management refers to hedgers using derivatives contracts to control their spot price risk. The dual roles of price discovery and hedging provide benefits that cannot be offered in the spot market alone and are often presented as the justification for futures trading. Futures market prices are used as the reference for all the US revenue insurance products. Besides these benefits, there is a basic benefit from the policy perspective: if farmers can manage market risks effectively by using derivatives markets, there will be less pressure for taxpayer-funded support prices or emergency aid packages.

In summary, derivative markets could provide a theoretically sound agricultural risk management method for farmers (as well as processor, merchandiser or others). Yet European agri-businesses were slow in the uptake of derivative products; for instance, only as much as 11 percent of UK grain producers has been reported to employ agricultural derivative products. The low participation in the market can also by judged by the number of futures contracts traded relative to the physical base. In the UK for instance, the volume in the futures market is

[22] The London International Financial Futures Exchange (LIFFE) merged with London Commodity Exchange (LCE) in 1996. Later in 2001, Euronext acquired LIFFE and was renamed to Euronext.liffe.
[23] For further information see FOA 2005

equivalent to the level of physical activity. In contrast, in the US, futures volume is on average 10 times the level of physical activity while, in South Africa, the ratio in 2003 was at about the same level as in the US. Lack of correlation and basis risk, the presence of Common Agricultural Policy, inadequate information and training, liquidity risk, transaction costs and affordability and availability of other risk management tools may have contributed to the low participation of agricultural producers in the European derivative markets[24].

5.5 Agricultural insurance in Europe

The agricultural insurance systems in the EU and candidate countries have already been introduced in the previous chapter. In it, the main characteristics of the insurance in those countries have been presented. This chapter aims to deepen in the knowledge of the European systems, entering more into the details of the specificities in each country.

5.5.1 Coverage in the last years: Main countries' figures

Collecting basic information on the situation of agricultural insurances in countries of the EU is not straightforward. Few or no figures at all can be found in the standard statistical sources. Collection has been undertaken by two channels:

- through a series of experts (consultants, insurance companies, public organizations), who have accepted to provide such information.
- through the CEA ("Comité Européen des Assurances") members. Some information has been extracted from a document entitled "European Insurance system for agricultural risks" (June 2005), which contains a number of very valuable quantitative indications, suitable for comparison of the situation in different Member States. Additional work is certainly needed to complete data, check its comparability and analyse the differences. The CEA document itself points out a large number of remarks that underline the comparability problems of the single figures in the tables.

Next we present the information from the expert's reports or fact sheets and the information from CEA is presented in the next section.

[24] For further information see FOA 2005

Table 11. Coverage - Insured farms and insured area and animals (All agricultural products: crops and livestock)

(Data shown: average of last three years available; symbols see legend after tables)

Country Insurance-systems	Years available	Number of farms (num. contracts)	% insured farms on insurable farms	Total area insured (ha)	% insured area on insurable area	% insured area on total agricultural area	Number of animals covered	% insured animals on eligible animals
Austria ♣ ♦	2000-05	67,866 (78,418)	78%(10)	1,053,991	78%	46%	270,911	14%
Belgium ° (13)	1993-04	-	-	-	-	-	-	-
Bulgaria● ♦ (15)	2000-05	-	-	1,275,989	52%	-	14,519,000	62%
Cyprus ●	2005	(49,954)	100%	112,173	100%	-	0	0%
Czech Republic ● ♦	2000-05	4,000	-	1,072,667	35%	35%	-	85%
Estonia ♦	2005	-	-	0%	0%	0%	7,136	6%
Denmark ° ♦	2001-05	-	95%	-	-	82.5%	-	-
Finland ♦	1996-05	20,600	30%	-	-	-	-	-
France ♣	1996-04	60,000	15%	3,507,186 (12)	-	-	-	-
Germany ° ♦	2000-05	-	-	7,265,071	-	43	-	-
Greece ELGA● ♦	-	-	100%	-	100%	-	-	100% (less for pigs and poultry)
Greece private(4) ● ♦ ♠	2000-04	987	<1%	5,300	<1%	-	-	-
Hungary ● ♦	1999-05	14,108	-		52%	30%		
Ireland °	-	-	-	-	-	-	-	-
Italy(5) ♣	2001-05	84,373 (212,733)	-	975,667	-	8%	-	-
Latvia ° ♦	2000-05	54	<1%	-	<1%	<1%	-	<1%
Lithuania ° ♦	2004-05	2,062	-	9,000	<1%	<1%	164,647	<1%
Luxembourg ♣	2001-05	1,555	57%	26,000	45%	45%	-	-
Netherlands(6) °	-	-	-	-	-	-	Fund	Fund
Poland(7) ° ♦	-	-	3%(1)	-	6.6%	-	-	>4%
Portugal ●	1998-03	77,954	40%	298,329	22%	22%	-	-
Romania ● ♦	2005	43,000	1%	812,109	-	12%	141,360(17)	8%
Slovakia ● ♦	2000-04	-	-	-	-	-	-	-
Slovenia ● ♦	2000-05	(65,992)	-	-	17%	-	-	16%
Spain(4) ♣ ♦ ♠	2001-05	(477,354)	-	5,849,598	26%(16)	-	102,854,756	-
Sweden ● ♦	2005	-	-	1,500,000	60%		80,730,700	91%
UK ° ♦	-	-	-	370,000	-	6.9%	1,280,000	2.6%

Table 12. Coverage - Insured value (All agricultural products: crops and livestock)
(Data shown: average of last three years available)

Country Insurance-systems	Years available	Crop insured value (mill. €)	Livestock insured value (mill. €)	Production value covered (mill. €) Crop+livestock	% total insured value on insurable production	% total insured value on total production
Austria ♣ ♦	2000-05	1,739*	267	2006	79[2]	-
Belgium ° [13]	1993-04	-	-	-	-	-
Bulgaria● ♦ [15]	2000-05	111,8	151,3	263,1	20.4%	9%
Cyprus ●	2001-05	120,8	0	120,8	-	-
Czech Republic ● ♦	-	708[14]	1062[14]	1770[14]	-	-
Estonia ♦	2005	0	-	-	-	-
Denmark ° ♦	-	-	-	-	-	-
Finland ♦	1996-05	-	-	-	-	-
France ♣	1996-04	12,149	-	-		
Germany ° ♦	2000-05	11,293	-			
Greece ELGA● ♦	-	-	-	-	-	-
Greece private[4] ● ♦ ♠	2000-04	15	292	307		
Hungary ● ♦	-	-	-	-	-	-
Ireland °	-	-	-	-	-	-
Italy[5] ♣	2001-05	3,636	-	3636	20%	12.6%
Latvia ° ♦	2000-05	-	-	-	<1%	<1%
Lithuania ° ♦	2004-05	3	22.6	25.6	-	-
Luxembourg ♣	2001-05	56	-	-	-	-
Netherlands[6] °	-	-	-	-	-	-
Poland[7] ° ♦	-	-	-	-	-	5.5% [1]
Portugal ●	1998-03	561	-	561	14%	14%
Romania ● ♦	2005	258,5	-	258,5	-	6%
Slovakia ● ♦	2000-04	-	-	-	-	-
Slovenia ● ♦	2000-05	59.9	64.8	124.7	16%	-
Spain[4] ♣ ♦ ♠	2001-05	5,659[2]	4096[2]	9033		
Sweden ● ♦	2005	-	-	-	-	-
UK ° ♦	-	198	1130	1328	-	-

* Without greenhouses

Table 13. Premiums, indemnities and subsidies from fact sheets (All agricultural products: crops and livestock)

(Data shown: average of last three years available; indemnity in M€ and loss ratio average all available years)

Country Insurance-systems	Years available	Total amount of premiums (mill. €)	% premiums on insured value	Indemnities (mill. €)	% indemnities on insured value	Loss ratios (Indemnities / premiums)	Subsidies (mill. €)	% Subsidies on premium
Austria ♣ ♦	2000-05	52	2.6%	32	1.6%	0.72	24[9]	46%
Belgium ° [13]	1993-04	49[13]	-	0.27[13]	-	0.65	0	0
Bulgaria● ♦ [15]	2000-05	6.6	4.77%	4.5	1.8%	0.74	0	0
Cyprus ●	1978-05	8.7	7.2%	4.5	3.5%	0.95	4.4	50%
Czech Republic ● ♦	2000-05	32	1.8%	24	1.4%	0.73	7.1	30% crops 15% livestock
Estonia ♦	2005	0.1	-	-	-	-	0	0
Denmark ° ♦	-	-	-	-	-	-	0	0%
Finland ♦	1996-05	1.8	-	1.1	-	0.67	-	-
France ♣	1996-04	211	1.7%	-	-	-	5.1	2.4%
Germany ° ♦	2000-05	129.2	1.14%	104.5	0.93%	0.83	0	0
Greece ELGA● ♦	2000-04	-	3% (2.5%) crops 0.5% livestock	218	-	-	-	-
Greece private[4] ● ♦ ♠	2000-04	4.98	1.6%	1.62	1.9%	0.38	0	0
Hungary ● ♦	1999-05	43.5	0.68%[11]	30.7	0.50%[11]	0.74	-	-
Ireland °	-	-	-	-	-	-	-	-
Italy[5] ♣	2001-05	271.2	7.4%	166.2	4.1%	0.63	180[2]	67.2%[2]
Latvia ° ♦	2000-05	0.1	-	-	-	-	0.05	50%
Lithuania ° ♦	2004-05	1.1	4.3%	1.1	4.3%	1	0.55	50%
Luxembourg ♣	2001-05	1.3	2.3%	0.36	0.64%	0.29	0.75	50%
Netherlands[6] °	2004	75	-	30,7	-	0.41	0	0
Poland[7] ° ♦	?	9.9	-	6.3	-	0.64	0	0
Portugal ●	1998-03	46.9	8.4%	30.2	5.1%	0.60	31.8	67.7%
Romania ● ♦	2005	14	5.4%	4,4	1.7%	0.32	-	20% (50% since 2005)
Slovakia ● ♦	2000-04	10.7	-	5.8	-	0.57	-	50%
Slovenia ● ♦	2000-05	9.5	7.6%	13.8	11.1%	1.48	4.3	45%
Spain[4] ♣ ♦ ♠	2001-05	564.7	6.3%	388.30	4.3%	0.69	232.3[8]	41.1 %[8] around 50% incl. regional sub.
Sweden ● ♦	2005	-	-	-	-	-	0	0
UK ° ♦	-	11.1	0.84%	-	-	-	0	0

Legend

° Hail insurance for crops
• Combined insurance (possibly single-risk for some crops)
♣ Yield insurance (possibly single or combined for some crops)
♦ Livestock insurance
♠ Fish/forest insurance

- Not available
(1) Only crops. Livestock excluded
(2) Only 2005
(3) Calculated from the number of insurance contracts (78.418) which amount for 80% of the farms. Verify how this was calculated
(4) Aquaculture is included in Greece and Spain. In the number of animals, Poultry insurance is included in Spain.
(5) Animal insurance data are not available for Italy because they are not subsidized. The insured values and premiums data include crops and structures.
(6) Data from the Netherlands are for hail and glasshouse insurance. Most data are not supplied by the companies for competition reasons.
(7) It is not very clear at the moment if the data provided for Poland are averages on a series of years. Clarification has been asked.
(8) It does not include the regional subsidies. Including them, the % subsidy may reach a figure close to the 50% of the premiums.
(9) Hail and frost which is subsidized in a 25% by regional government and another 25% by national government (total: 50% subsidy). Other insurable risks are not subsidized.
(10) Estimated from the number of insured farms (68851), and insurable farms (number of farms without part-time farms (88223).
(11) Average premium and indemnities (1999-05) on total production value 2004 (6129,1M€) (insured value not provided).
(12) only the area from subsidized insurance in 2005
(13) There is only a part of the premiums and indemnities in Belgium (only fr those companies in the CDFA. Also, premiums correspond to hail insurance plus fire and other risks (flood, windstorm, etc) insurance while indemnities correspond only to hail insurance. Premiums for hail insurance amount to 0.6 million euros.
(14) insured value and insured number of farms approximate data
(15) There are no official data about the agricultural insurance market in Bulgaria. For this reason, all data is based on interviews with senior experts from leading insurance companies.
(16) Data from CEA
(17) Data from Romania only from cows

In the next table we summarized the key figures of insurance systems in Europe.

Table 14. Summary of data provided from Fact sheets

Country	Single-risk ins.	Com-bined ins.	Yield ins.	Intro-duction	Insured area (1000 ha)	Premium amount (M€)	Premium /insured value (%)	Average indem-nities (M€)	Loss ratio (%)	Insurance subsidies in M€ (%)
Austria	PS	PS	PS	78%	1,054	52,0	2.6%	32,0	72%	24 (46%)
Belgium	P	-	-	n.d.	n.d.	49,0	n.d.	n.d.	65%	0
Bulgaria	P	P	-	52%	1,276	6,6	4.8%	4,5	65%	0
Cyprus	GC	GC	-	(100%)	112	8,7	7.2%	4,5	95%	4,4 (50%)
Czech Rep.	PS	PS	-	35%	1,074	32,0	1.8%	24,0	73%	7 (30%)
Denmark	P	-	-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0
Estonia	P *	-	-	<1%	n.d.	0,1	n.d.	n.d.	n.d.	0
Finland	P *	P *	-	<1%	n.d.	1,8	n.d.	1,1	67%	0
France	P	P	PS	n.d.	3,507	211,0	1.7%	n.d.	n.d.	5 (2.4%)
Germany	P	-	-	43%	7,265	129,2	1.2%	104,5	83%	0
Greece	G	GC+GS+G	-	(100%)	n.d.	n.d.	2.5%	218,0	n.d.	n.d.
Hungary	P	P	-	52%	n.d.	43,5	n.d.	30,7	74%	0
Ireland	P	-	-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0
Italy	PS	PS	PS	8%	976	271,2	7.4%	166,2	63%	180 (67%)
Latvia	PS	-	-	<1%	n.d.	0,1	n.d.	n.d.	n.d.	0,05 (50%)
Lithuania	PS	-	-	1%	9	1,1	4.3%	1.1	100%	0,55 (50%)
Luxembourg	PS	PS	PS	45%	26	1,3	2.3%	0,4	29%	0,65 (50%)
Netherlands	P	-	-	n.d.	n.d.	75,0	n.d.	30,7	41%	0
Poland	P(S#)	-	-	7%	n.d.	9,9	n.d.	6,3	64%	0
Portugal	PS	PS	-	22%	298	46,9	8.4%	30,2	60%	32 (68%)
Romania	PS	PS	-	12%	812	14,0	n.d.	4,4	32%	7 (50%)
Slovakia	PS	PS	-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	(50%)
Slovenia	PS**	P	-	17%	n.d.	9,5	7.6%	13,8	148%	4,3 (45%)
Spain	PS	PS	PS	26%	5,850	564,7	6.3%	388,3	69%	232 (41%)
Sweden	P	P	-	60%	1,500	n.d.	n.d.	n.d.	n.d.	0
UK	P	-	-	7%	370	11,1	0.8%	n.d.	n.d.	0
TOTAL						**1,537.7**		**1,061**		**497**

Source: Prepared from information in the fact sheets provided by the experts in each country

Legend:
- : Not existing; n.d.: no data; #: Pilot experience
S : Subsidized
P : Private non-subsidized
PS : Private partially subsidized
G : Public non-subsidized
GS : Public partially subsidized
GC : Public compulsory partially subsidized
*) Livestock only
**) a national programme in Slovenia for subsidies insurance in 2006 for the first time (30-50%)

Insurance Systems:

For the first three tables, the two first columns show a similar scheme. In the first columns, the name of the country is accompanied by a symbol or a set of symbols which indicate which are the main insurance products available in that country, in the last table we point out the available insurance system with color. It can help the reader to understand and explain the differences in the figures, which are sometimes marked by the differences in insurance systems.

In Austria, France, Italy, Luxembourg and Spain insurance for most risks affecting agricultural yields is available in a comprehensive yield insurance.

In Spain the insurance system is the most developed in Europe where the Government, farm unions and insurance companies agreed that the farm insurance system defined in a law would be the tool for managing catastrophic damages in the farm sector.

In other countries such as Bulgaria, Cyprus, Czech Republic, Greece, Hungary, Poland, Portugal, Romania, Slovakia, Slovenia and Sweden, more risks are covered depending on the productions. Additional to single risk insurance several risks are covered in combined insurance.

For several countries, in particular for Belgium, Germany, the Netherlands and the United Kingdom, hail insurance or single-products insurance are the main insurance product available; other types of farm insurance products demands are negligible in these countries.

Livestock insurance is important in Austria, Bulgaria, Czech Republic, Finland, Greece, Poland, Spain, Sweden and UK. Besides, only Spain and Greece and in a minor extent, Bulgaria provided some information about aquaculture insurance. The second column shows the years for which data were provided. However, only the data from the last three years have been used to calculate the values shown on the tables, except for the average loss and loss ratio where we used the longest available time series.

Insurance introduction:

Let us have a look across the first table and summary table. We see that in Austria the percentage of insured farms and insured area on insurable area is the highest, which is explained by the existence of subsidies given since 1995 and the coverage of the most risks. Since this time there is a continuous increase on insured area every year. Currently there are almost 80% of insurable area covered against hail as basic coverage, but also around 46% in yiels insurance.

The relative high demand of insurance in Bulgaria (52%) and around 1.2 mill. hectar in the absence of subsidies needs to be explained. In fact, insurance is asked to farmers in order to get other aids from the Government. This applies for crops receiving annual state support. In 2005 those were: wheat, maize and sunflower, rape, rice, potatoes, red peppers and tomatoes growers.

The total area insured in Spain, Austria and Italy, three countries with subsidised insurance, is respectively 6, 1 and almost 1 million hectares.

In the Czech Republic the market penetration in crop insurance is about 35% (more than 1 million hectare, close to the Austrian insured area, 33% in arable crops, 67% of hop fields, but only 15% of the wine area and 20% of fruits. In livestock insurance (cattle) the degree is about 85%.

In Cyprus the crop insurance is compulsory in a public system, so it seems to be 100%, but there is no insurance for livestock available and no complementary insurance on the private sector for crops.

In Finland there is no commercial crop insurance available, but almost the whole area is covered in the public crop compensation scheme. In livestock insurance around 30% is covered in a model of group insurance.

In the Baltic States (Latvia, Lithuania, Estonia) the agricultural insurance have only started to build up. The insurance introduction is around 1%. In Estonia there is only Livestock insurance available.

Again, we find there is a lack of data, even from other countries which subsidise insurance such as Greece or France. But the total insured area in France with arounfd 3.5 mill. hectar is very high.

It is interesting to notice that the percentage of insured area on total area in Italy is only the 8% (nearly 1 mill hectar), in a system with the highest level on subsidies to insurance (67%).

A high level on insured area with 43% and more than 7 mill. hectar we have in Germany, but there is no yield insurance available. So the introduction refers to single risk (hail) insurance.

In Sweden and Hangary there is also a high degree on market penetration (60% and 52%) but no yield insurance available.

Introduction of livestock sector

In the Netherlands, the existence of a compulsory fund for livestock producers hinders the development of livestock insurance. For Italy and France, animal or livestock insurance data are not available because this type of insurance is not subsidised. Nevertheless, the demand of livestock insurance for those countries, as well as for the UK, is really residual.
In Greece, insurance is compulsory for livestock, but it is voluntary for pigs and poultry. Pigs and poultry insurance are also offered by the public entity ELGA. In the case of Spain, the number of animals includes also those of Poultry insurance which has been offered in 2004 and 2005. If we ignore Poultry insurance, the average number of animals insured for the last three years would reduce from 102.850.000 to 3.800.000. Data on the number of animals would become more meaningful by applying equivalence coefficients to different species, so that everything is expressed in “UGB” (Unité-Gros-Bétail = large livestock unit) or LSU (Livestock Standard Unit).

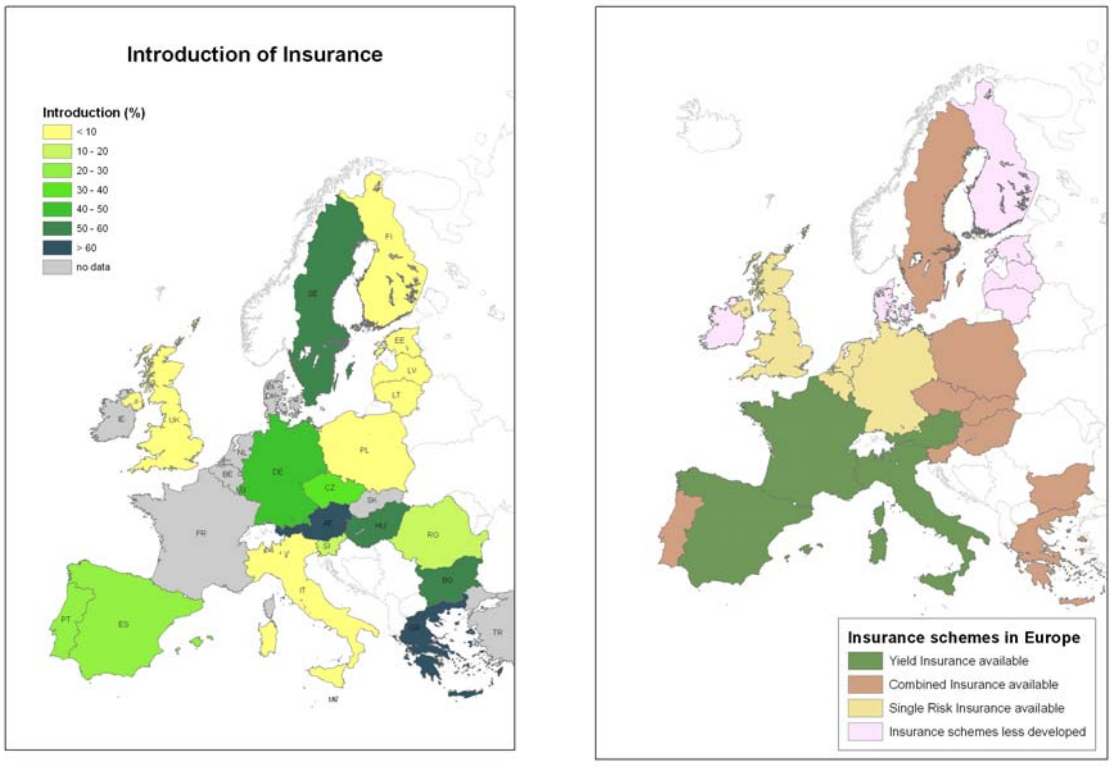


Figure 8. Introduction of crop insurance and developed schemes in Europe

Insured value:

The second table shows the insured capital or liabilities in absolute values and as a percentage of the insurable production and the total production. In general we have to point out that there are missing a lot of data and that these data are difficult to compare, particular on the livestock sector. Aquaculture has been included in cattle production in Spain and Greece. In Greek's private insurance, the aquaculture production accounts for the 98% of the livestock insured value, and for the 93% of the total. The total insured production without aquaculture would be 21.7 million euros instead of 307. In Spain we only have this information disaggregated for 2005, but aquaculture in that year represents less than 0.5%, more or less the same as forest insurance. Last, it seems unavoidable to notice the decreasing trend in private crop and livestock insurance in Greece. The insured value of crops has decreased from 2000 to 2005 in a continuous way from €23 to €15 million, and that of livestock, from €18 to €5 million.
The highest insured production values in crop insurance are in France (12 bn. €), Germany 11 bn. €), Spain (6 bn. €) and Italy (3.5 bn. €).

Premiums. Indemnities and Subsidies

The third Table refers to the technical evaluation of insurances: premiums, indemnities, subsidies and loss ratios. On looking at the premiums expressed as a percentage of the insured value, we find very different levels, from a low around 1.5 % of private insurance in the Czech Republic, Greece and France to the highest level around 6-7% in Cyprus, Italy, Portugal and Spain. First we must point out, that these rates are the percentage of the insured value in crop or livestock production and do not constitute premium rates on risk level. Also the Greek ELGA premiums do not follow the actuarial rule of insurance premiums: they are not calculated on the basis of the risk of loss for the covered events. The rates fixed by ELGA are the same for all crops (or livestock) in all the country. So, we will not take them into account in further analysis of potential European scenarios. Second, we must indicate that the French 1.7% corresponds to hail and windstorm insurance only, not subsidized by the government. Multi-peril insurance is not included, because it started in 2005; this explains the low rate.
The high values in Spain and Italy can be explained mainly by the higher number of perils covered, apart form the effect of the potentially higher risks in those countries.

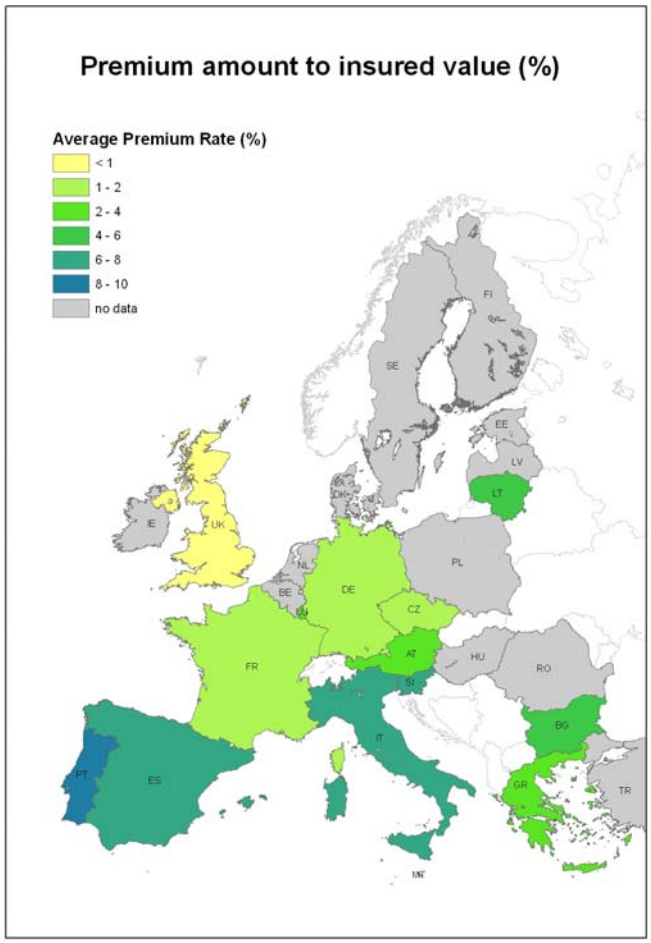


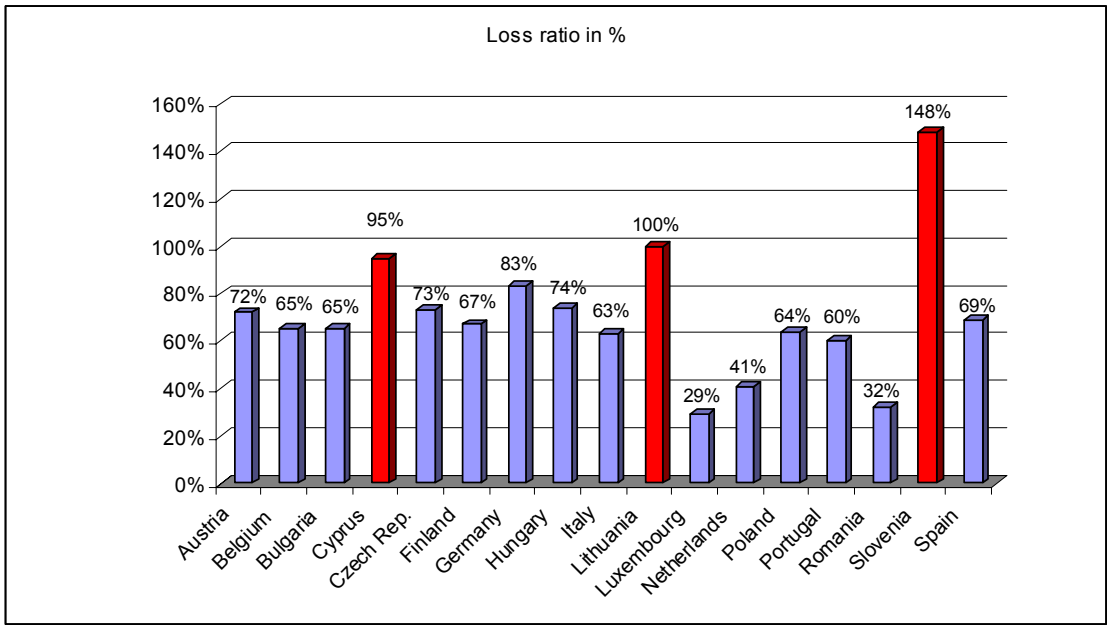
Figure 9. Premium amount to insured value

In Greek's private insurance, the 89% of the premiums and the 80% of the indemnities come from aquaculture (see Annex 1 Fact Sheets). The Greek private insurance has so low premium rates because of the low rates of aquaculture insurance. The rates for aquaculture insurance are around 1.6% while the rest of rates would average 2.5%, very similar to the Austrian premium rates. The low risk of aquaculture also diminishes the proportion of the indemnities on the insured value from 1.9% to 0.7%. Last, the loss ratio if we do not include aquaculture would be 0.60 instead of 0.38.

Ones more in the case of premium rates we have to point out, that these are the average rates as a percentage of the insured value.
More detailed information to premium rates you will have in the chapter 6.1 "Technicalities of existing insurance schemes for EU agriculture" where some examples given to specific insurance systems. Because the altitude of premium rates depends on the insurance system (risks covered, type of crops are covered and other technicalities).
Also in the Chapter 9.6 "Possible cost of some of the options" you will find summarised tables with average premium rates for single-, combined- and yield insurance.

Average Loss ratio:

Loss ratios in table 10 and in the summary table tell about the proportion between indemnities and premiums paid. Because we are taking into account the entire premiums, for an insurance system to be actuarially sound, the loss ratios should be lower than one, so that the premiums would be greater than the indemnities in a quantity enough to pay the administrative costs and loss adjustment costs of insurance. The loss ratios shown were not calculated for the last three years but for the longest period of time available, because they are more representative of the soundness of the insurance systems.
What is interesting is that we find the lowest values for Luxembourg, the Greek's private insurance, the Dutch non-subsidized and the Romanian insurance. In Greece it is explained by the particular case of aquaculture, and in Luxembourg and The Netherlands it is hard to tell.
In general we can say that in most countries the loss ratios is between **0.60 and 0.75**. The highest loss ratio is found in Slovenia with 1.48 followed from Lithuania with 1. Also in Germany we have a high loss ratio with 0.8.
Surprising is the high loss ratio in the compulsory system in Cyprus with 0.95 in the time from 1978 to 2005.



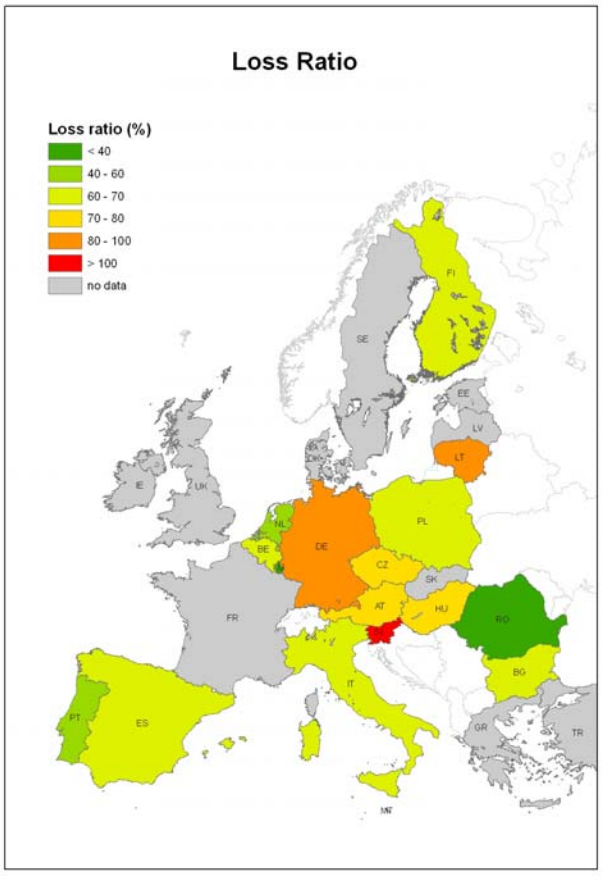


Figure 10. Average Loss ratio

Level on subsidies to insurance

Having a look at the subsidies in the summary table, it can be observed that in Italy the average subsidy rate with 67% is one of the highest in Europe. Single-risk insurance products receive a subsidy of 50%, while combined and yield insurance products get 80%.
In Italy, the subsidy is a percentage of the Government risk parameter. This percentage depends on the characteristics of the contract:

- If threshold is greater than 20%, the subsidy is 80%
- If threshold is lower than 20%, the subsidy is 50%
- If the contract considers also other events, for example animal diseases, subsidy is 50%.

The threshold of 20% is interesting for fruits and vegetables, who have big losses, so the threshold is easily passed, and as the premiums are high they need a high subsidy. On the contrary, for cereals, a lower threshold and lower subsidy is preferred.

Also the level on subsidies in Portugal is very high with around 68%.

The Austrian and Spanish subsidies amount to almost 50% of the premiums (including the regional support). In Austria only hail and frost is subsidized with 50%.
In France, the average subsidy rate is very low because hail insurance has no subsidy, and until 2004, only some insurance for specific products and specific regions were granted a subsidy. Subsidies were mainly given for fruits and vegetables insurance (2.5% of the premiums).

In the compulsory crop insurance system in Cyprus the subsidies provided are 50%.
In the Czech Republic crop insurance was subsidized with 30% and livestock insurance with 15% in 2005.

In Hungary from 1996 the state contributed to the agricultural insurance premiums (for crops and livestock) paid by farmers by 30%. This measure facilitated the increase of agricultural insurance contracts. If no claims were reported the farmers had to pay even lower proportion of the insurance premium, around 40%. In 2004 this state subsidy was abolished that resulted in a great fallback in agricultural insurance as many producers cancelled their policies. Along with these cancellations their risk of losses increased considerably. In 2003 revenues of insurance companies from agricultural insurance reached around 78.8 million Euros while in 2004 it hardly exceeded 26.2 million Euros. This collapse was the direct result of the termination of subsidies. (Hungarian Financial Supervisory Authority, 2005)

In Latvia and Lithuania partial compensation of insurance premiums is provided up to 50%. But the introduction of insurance is very low, because the system has only started to build up. In Latvia the Subsidies are limited per unit (hectare, livestock).
In Estonia no subsidies to insurance provided.
In Luxembourg all insurable risks are subsidized with 50%

In Romania initially the subsidy represented 20% of the insurance premium but beginning with 2005 the level of subsidy rose to 50%.

In Slovenia in the year 2006, subsidies of insurance premium in crop production were available for the first time. Level of subsidy was set at 30 % of insurance premium including the tax on insurance transactions. The maximum level of subsidy; when a municipality programme of the same purpose exists is 50 % of the insurance premium including tax. However, only the basic risk coverage (hail, fire and thunderstorm) is eligible for co-financing. This seems to be initiation to a more systematic “public-private” cooperation in agricultural risk management in Slovenia.
In the period 2004-2006 about half of the municipalities (102 from 210 municipalities) have notified a state aid measure to co-finance insurance premiums to farmers.
Also in Solvakia the level of subsidies to agricultural insurance is 50%.

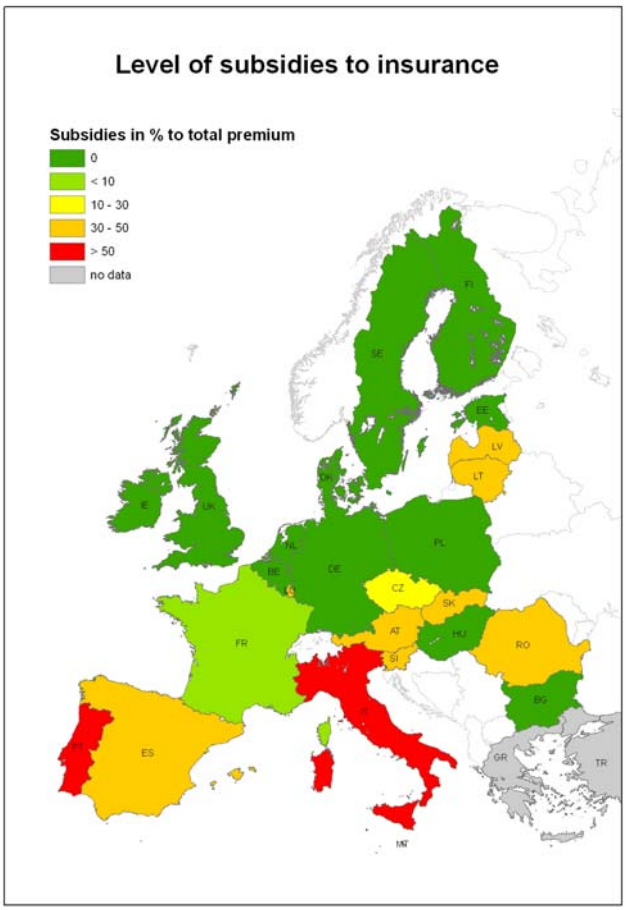


Figure 11. Level of subsidies to insurance in Europe

From data provided in the fact sheets the total amount of subsidies to insurance in Europe is around **500 M€ (32%).**

We can point out that in countries where public support is provided since a longer time, the insurance systems are developed to a comprehensive coverage against adverse weather conditions. In many member states a 50% level for agricultural insurance subsidies exist, but only since a few years and it needs a lot of time to change the mentality and behaviour of farmers to use these supported instruments for risk management.

5.5.2 Market conditions

Table 15. Agricultural insurance market conditions

Country	Is there competition on prices?	Is there competition on quality of services?	Is there a dominant company?	% of the market of the dominant company, if any.
Austria	There is no competition for tariffs	There is no competition on services	"Die Oesterreichische hagelversicherung VVaG", founded by 17 insurance companies as a mutual organisation	100%
Belgium	Yes	Yes	KBC, AXA, OFH	-
Bulgary	Yes	Yes	No. There are three or four leading companies	-
Cyprus	No	No	Agricultural Insurance Organisation (public, compulsory)	100%
Czech Republic	Yes	Yes	Ceska pojistovna Generali pojistovna	86.1% 11.3%
Denmark	Yes	Yes	Five companies	45%, 28%, 13%, 10%, 2%
Estonia	-	-	IF Eesti Kindlustus Ergo	47% 24%
Finland	Yes	Yes	Làhivakuutus Tapiola-group	40-45% 40-45%
France	Yes	Yes	Groupama	Aprox. 50%- 60% traditional policies
Germany	Yes	Yes	Vereinigte Hagelversicherung VVaG	Aprox. 60%
Greece	No. For compulsory insurance by ELGA premium rates are fixed by law. Free competition for aquaculture insurance	No. Free competition for aquaculture insurance	There is only one insurance company, the Agrotiki Insurance S.A., operating in the field of crop and livestock insurance.	Almost 100% of crop and livestock insurance not covered by ELGA.
Hungary	Yes	Yes	Allianz-Hungaria Garancia Generali	46.9% 26.6% 15.8%
Ireland	No	No	FBD Insurances plc.	100%

Country	Is there competition on prices?	Is there competition on quality of services?	Is there a dominant company?	% of the market of the dominant company, if any.
Italy	Yes, but companies tend to tailor their tariffs to the subsidy reference parameter fixed by ISMEA	Yes	FATA Assicurazioni, which belongs to Generali Group since 2000	Both in terms of sums insured and premiums collected: FATA: 13% Generali Group: 22%
Latvia	(Yes)	No priority	IJSC Balta IJSC BTA	50% 25%
Lithuania	Not in crop insurance	(Yes)	1 Crop insurer 7 Livestock insurer	100% One with 60%
Luxembourg	No	No	Vereinigte hagelversicherung VVaG	100%
Nether-lands	Yes for crops Not for livestock, fund financed by levies	Yes for crops	No	-
Poland	Yes	Yes	The former state company, PZU SA	About 67%
Portugal	Yes	Yes	Yes	45%
Romania	Yes	Yes	Agras Asirom Generali Allianz Tiriac	25% 28% 19% 17%
Slovakia	Yes	Yes	Allianz Slovakia Uniqa Generali	
Slovenia	Yes	Yes	Largest ?	Two third of premium
Spain	No. Tariffs fixed by the pool Agroseguro S.A. It must justify changes in rates to ENESA and the farmers organizations	Yes on attention to the client and quality of service, but not on the guarantees offered nor on the damages estimation.	Agroseguro is a pool of all the insurance companies which provide agricultural insurance (33 companies)	Agroseguro 100% MAPFRE holds the 22.5% of Agroseguro
Sweden	°Theoretically yes	Theoretically yes	Agria (Lansforsakringar)	75% in crop insurance 90-100% livestock insurance
United Kingdom	Yes	Yes	National Farmers Mutual Insurance Society	75 %

In general we can see, that in most countries only a few number of marketplayers with one or two dominant companies on this very specially sector of agricultural insurance.
Also we can point out that there is a competition on price and service normally for the private insurance sector, but the competition is more on service and in the coverage of risks than on price.

5.6 Information on agricultural insurance in Europe provided by the CEA

Questionnaire on agricultural risk insurance, CEA

The « Comité Européen des Assurances » (CEA) had been informed about the existence of the request by DG AGRI to have a description of the situation of agricultural insurances in Europe. The Secretariat in Paris took the initiative in December 2005 to send a two-page form to their members (national associations of insurers). At the current date, the next countries have replied:

- Austria
- Switzerland
- Germany
- Spain
- France
- Italy
- The Netherlands
- Poland
- Portugal

According to the information received, it is not expected that many more countries reply. The preliminary analysis of the replies indicates that they are, in general terms, too generic and insufficiently specific. However the information provided is already interesting information. Below we report some of the information contained in these replies by CEA members.

Next tables are shown which summarise and assess the information provided by the “Comité Européen des Assurances” or “Agricultural Risks Insurance Committee” (AGR 5037 (06/05) Paris, 6 June 2005).

The “Total production value: Eurostat 2004” data are crop and livestock Outputs at basic prices.
The CEA Questionnaire refers to the CEA Questionnaire for a European Insurance system for agricultural risks (AGR 4020 April 2004)

Following tables contain information about insured and insurable production value, premiums and losses in several countries, but the provided data are incomplete for EU25.
But the listed nine countries in the next table of production value result in 81% of the total EU25 Crop production value (Eurostat).

5.6.1 CEA Data on insured value

We have to take into account that the percentage of insured production value reclusively considered is not an indicator of the development of agricultural insurances, because it depends more or less if there is only a single- risk insurance or also combined insurance developed.

Table 16. CEA data: Production value and Insurance (Crops)

	Total production value **Eurostat** 2004 (M€)	(A) Insurable production value CEA (M€)	Currently insured production value (1) M€)	% of insurable production value/total Eurostat	% currently insured pv / insurable pv	% currently insured pv / total Eurostat
Germany	22.848	16.742	11.120	73	66	**49**
Austria	2.639	2.100	1.739	80	83	**66**
Denmark	3.227	2.613	2.613	81	100	**81**
Spain	28.403	20.328	5.310	72	26	**19**
France	36.508	12.000	9.477	33	79	**26**
Greece	8.378	6.317	6.317	75	100	**75**
Italy	29.405	27.333	3.384	93	12	**12**
Netherlands	9.915	10.677	1.736	108	16	**18**
Portugal	3.964	1.178	634	30	54	**16**
Switzerland	*2.929*	*1.279*	*1.358*	44	106?	**46**

Also combined or yield- insurance systems developed

Table 17. CEA data: Production value and Insurance (Livestock)

	Total production value **Eurostat** 2004 (M€)	(A) Insurable production value CEA (M€)	Currently insured production value (1) M€)	% of insurable production value/total Eurostat	% currently insured pv / insurable pv	% currently insured pv / total Eurostat
Germany	19.784	6.094	8.993	31	148	**45**
Austria	2.614	1.100	267	42	24	**10**
Denmark	4.880	10.451	10.451	214?	100	**214?**
Spain	13.871	4.427	997	32	23	**7**
France	23.903	8.000	633	33	8	**3**
Greece	2.877	2.007	2.007	70	100	**70**
Norway	1.683	279	278	17	100	**17**
Switzerland	*3.315*	*1.300*	*1.000*	39	77	**30**

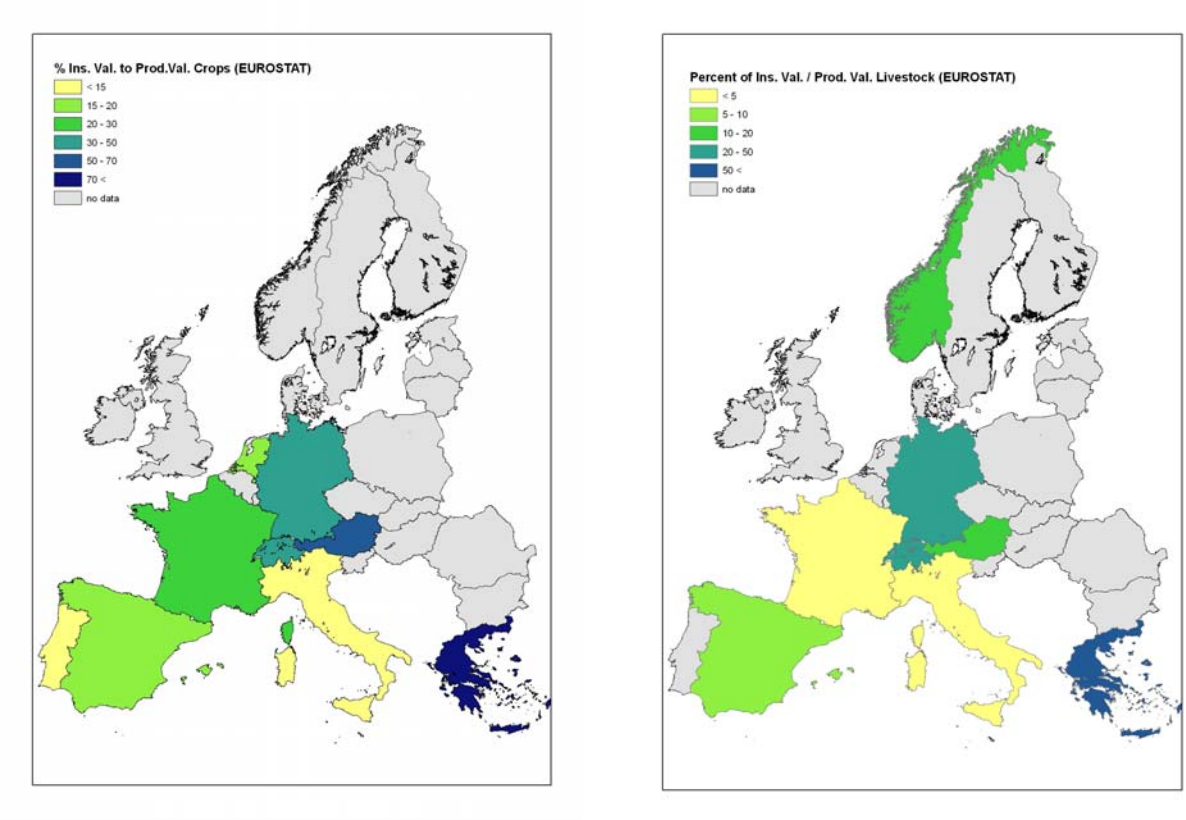


Figure 12. Production value (Eurostat) to insured value (CEA) separate for crops and livestock in Europe:

The insurable production value (CEA): These are the results of the CEA questionnaire and should give a realistic value of the insurable production value in the countries.
Looking at the data % of insurable production value to the total production value, it seems that around 60% to 70% is a realistic percentage of the insurable production value, if in the countries the systems would be well developed with public support. It is surprising that the percentage of insurable production value in France is only 33%. On the contrary, if we compare this high possible introduction with the development of insurance in the USA or also in Spain over the time, it seems to be too high.
There are important discrepancies in the tables about the production value, where the total production value is lower than the insurable value especially in Denmark and the insurable value is lower than the insured production value. This needs to be clarified, mainly for the German livestock, where the discrepancy is not minor. The rates over 100% are of course consequence of the discrepancy of the figures of production value, insurable production and currently insured production value. May be the reason could be that there are different bases by product prices have been used.
It should also be verified why in Denmark the insured values equal the insurable values and the insurable livestock value is more than 200% of the total production value.
On the contrary, in the case of Greece, it can be explained because the Greek insurance system is compulsory for farmers.

Data in the next tables provided from CEA we can see projected data for a possible maximum premium amount and amount of loss.

5.6.2 CEA Data on premium amount and losses

Table 18. CEA data: Losses and premium (Crops)

	Losses		**Premium**		
	(C.) Average annual amount of losses CEA (M€); projected	(C/A) % Average annual amount of losses / insurable prod value (risk rate)	Currently insured premium amount (M€)	(B) % Currently average premium rate CEA	(AxB) Maximum premium amount (M€); CEA projected
Germany	711	4,2	124	1,12	188
Austria	108	5,1	49	3,3	69
Belgium	1	-	-	-	-
Denmark	-	-	18	1	26
Spain	1.054	5,2	286	5,4	1.098
France	960	8,0	203	2,14	257
Greece	86	1,4	88	1,4	88
Italy	-	-	274	8,1	2.214
Netherlands	110	1,0	15	0,89	95
Portugal	44	3,7	50	7,86	93
Switzerland	*120*	9,4	*34*	*2,5*	32
Total	**3.194**		**1.141**		**4.159**

Table 19. CEA data: Losses and premium (Livestock)

	Losses		**Premium**		
	(C.) Average annual amount of losses CEA (M€); **projected**	(C/A) % Average annual amount of losses / insurable prod value (risk rate)	Currently insured premium amount (M€)	(B) % Currently average premium rate CEA	(AxB) Maximum premium amount (M€); CEA **projected**
Germany	100	1,6	38,7	0,4	24,4
Austria	20	1,8	1,3	1,15	12,7
Denmark			104,5	1	104,5
Spain	183	4,1	55,3	5,55	245,7
France	160	2,0	19,0	3	240,0
Greece	30	1,5	30,0	1,5	30,1
Norway			4,8	1,7	4,7
Portugal			0,3		
Switzerland	60	4,6	*20,0*	*2*	26,0
Total	**553**		**273,9**		**688**

Table 20. CEA data: Losses and premium (Crops and Livestock)

	Losses			**Premium**		
	Currently average annual indemnity (M€)	(C.) Average annual amount of losses CEA (M€); projected	(C/A) % Average annual amount of losses / insurable prod value (risk rate)	Currently insured premium amount (M€)	(B) % Currently average premium rate CEA	(AxB) Maximum premium amount (M€); CEA projected
Germany		811	3,6	163,20	*0,8*	211,9
Austria	32	128	4,0	50,00*	*3,2*	82,0
Belgium		1				-
Denmark		-		122,50	*1,0*	130,5
Spain	388	1.237	5,0	341,70	*5,4*	1.343,4
France		1.120	5,6	222,00	*2,2*	496,8
Greece	2**	116	1,4	118,00		118,5
Italy	149	-		274,00	*8,1*	2.214,0
Netherlands	31	110	1,0			95,0
Norway		-				4,7
Portugal		44	3,7	50,00		92,6
Switzerland		180	7,0	*54,00*	*2,3*	58,0
Total	**602**	**3.747**		**1.395,6**		**4.847,4**

* Without greenhouses

** Greece only private insurance (indemnity Greece ELGA: 301 M€)

Average annual losses are ascertained data from the CEA questionnaire; deductibles not included and assumed that the insurable production value is insured.

The risk rates (average losses/insurable production value) give an idea of the risks in each country. We see that there are great differences. In France and Spain the risk rates are the highest. It can be deduced that the rates calculation are biased by the characteristics of the current insurance systems in the different countries. The low risk rate for Greece can be explained by the fact that the Greek risk protection system is compulsory for crop and livestock, so also those farms with very low risks are insured.

Columns four and five show the currently insured premium amount and the average premium rates. The total premium amount of CEA data (1.395 M€) correspond more or less to the premium amount of the fact-sheets (around 1.540 M€) if we take into account CEA data not from EU-25, but they include the Greece public sector.

The maximum premium amount is computed from the currently premium rates and the insurable production value. So it is assumed that the insurable value is covered to the currently rates.

The premium rates in Germany and Denmark are surprising because they are extremely low. This could be due to the fact that only rarely occurring perils are insured (hail + fire probably). The greatest premium rates are for Italy and Spain, the systems where more perils are covered

and also where there are high risk productions such as fruits and vegetables. Also in Portugal the premium rate for crop insurance is high.
In France, it should be greater with the last reforms, but not with the existing system until 2004. It is interesting to see that the Spanish livestock insurance premium rates are the highest.
In Austria the livestock premium rate is also very low, but in this system the livestock insurance is combined with the insurance against hail and flood in grassland (so the total premium rate for the insurance product is higher).

We also find that in most cases, the risk rates are much lower for livestock insurance than for crop insurance. A reason for this can be that the high risks like epizootic diseases in most countries are not insured by private insurance companies. Besides, it is worthy pointing out the lack of data from the Spanish livestock insurance, which could be explained by the fact that Spain does not have any combined livestock insurance, but only single-risk livestock insurance.

Last, if we compare the currently average premium rates and the risk rates (from computed data) we see that there are great differences.
So it seems, that in some countries the currently premium rates are too low, if we assume there is all the insurable value (also high risks and sensitive products) insured.

In some countries there are great differences between the projected risk rates and the currently average premium rates.

Table 21. Risk rates and premium rates (Crops):

	Risk rate (average annual amount of losses / insurable prod value) CEA	Currently average **premium rate** CEA
Germany	4,2	1,12
Austria	5,1	3,3
Denmark		1
Spain	5,2	5,4
France	8,0	2,14
Greece	1,4	1,4
Italy		8,1
Netherlands	1,0	0,89
Portugal	3,7	7,86
Switzerland	9,4	*2,5*

Average premium rates (crops): these are the currently average premium rates for crops in the countries.

Risk rates (crops): these are the ratios of the projected average annual losses and the projected insurable production value.

Potential casuals for low premium rates:

- Countries where mainly mono risk insurance exists
- The degree of high risks and sensitive crops insured is low
- In the northern countries, where sensitive crops (vegetables) mostly produced in greenhouses, based on the climatic conditions

In these cases the rates may be need an adjustment upward for using them for the whole insurable prod value.

Where the rates are high and the premium rates close to the risk rates, already high risks and sensitive crops are insured, in this cases may be an adjustment downward is possible, because if the insurable production value is insured to a certain percentage the risks will be widespread.

6. Technical aspects of agricultural insurance

In the previous section, we have presented already a lot of information in general about the insurance systems in Europe. In this chapter we will go more in detail and give information of different systems and insurance products.

6.1 Technicalities of existing insurance schemes for EU agriculture

The tables below summarise the available information on a large number of insurance types in different countries of the EU. The number of different insurance types is very high, for example in Spain there are nearly 150 types. Types have been grouped in order to make the information digestible. For more information in detail please see Annex Fact sheet per country.

6.1.1 Agricultural insurance products and insured risks in Europe

Most of the insurance types have already been defined before. Single risk insurance (especially Hail- insurance) has a long tradition and is well developed in Europe. Yield insurance systems are mainly developed in countries where there is support from the public sector for agricultural insurance. However, looking at their technical aspects, it seems necessary to clarify which are the particularities of what we have chosen to call “yield insurance” from a technical point of view. There are several type of insurances which have been classified under the type of yield insurance, even though some of them are called yield insurance and others multi-peril insurance. The common characteristic to all of them is that they provide coverage for the yield against all the main climatic hazards that can affect yields (plant diseases and plagues are not covered in most cases). These types of insurance work in a different way from the United States “Multiple Peril Crop Insurance” (MPCI). This yield insurance provides coverage against ALL possible natural risks that can cause a decrease in yields, including plagues and diseases. In MPCI damages are calculated simply as the difference between the guaranteed yield and the actual yield. On the contrary, in the Spanish and in general the European yield insurances, to determine the losses it is necessary to ascertain which was the risk that caused the loss, that the damage has an area character (that is, that the risk has not affected only one individual farmer) and it is also necessary that the insured or guaranteed yield can be corrected according to the productive conditions of the insured farm. This difference is important: the European-Spanish model has higher loss-adjustment costs, but it helps to avoid moral-hazard, which constitutes one of the big problems for the US insurance system.
In the next table we can see different insurance products for crop and livestock and wich risks are covered.

Table 22. Insurance products and insured risks in Europe

Country	Insurance product name (Type)	Products covered	Risks covered
Austria	"Hail"	Arable crops	Hail
	"Multi-peril" (Yield)	Arable crops	Hail, storm, frost, flood, rain, drought, drift, sprouting, pests, etc
	"Wine" (Combined and quality)	Wine	Hail, frost and additional expenditure after hail
	"Fruit" (Hail and quality)	Fruit	Hail
	"Grassland" (Combined)	Grassland and silo foils	Hail, flood
	"Livestock" (Combined)	Cattle	Stillbirth and death (epidemic disease excluded)
Belgium	"Fire group insurance" (Single-risk)	Field crops, vegetables, vineyard, fruits and livestock farms	Fire, windstorm, floods, earthquakes, theft, working conflicts
	"Hail insurance" (Single-risk)	-	Hail
Bulgaria	"Crops" (Combined)	Winter cereals, maize, sunflower, fruit trees and vineyards	Hailstorm, thunderstorm, torrential rain, fire on roots, ground frost, flood (sludge, freezing and withdrawal for winter cereals)
	"Livestock" (Combined)	Cows and buffalos, sheep, goats, poultry	Death and compulsory slaughter from: fire and natural catastrophes; parasitic and infectious diseases (OIE list B & others)
Cyprus	"Crop insurance" (Combined)	Fruits Citrus Grapes Cereals Potatoes Beans Artichokes	Hail, frost, rain windstorm Hail, frost windsorm, water spot, dry wind Hail, frost, heatwave, rain, windsorm, dry wind Hail, rust, drought Hail, frost, flood Hail, frost, flood, warm dry air Hail, frost
Czech Republic	"Crop insurance" (Single-risk)	All crops	Hail, fire
	"Crop insurance" (Combined)	Crops except fruits	Hail, fire, Storm, flood, landslide, spring frost and frost
	"Livestock insurance"	Livestock	Contagious diseases, death by electrical injury, flood, poisoning, overheating, individual losse (non infectious)

Country	Insurance product name (Type)	Products covered	Risks covered
Denmark	"Aggregated insurance" (Single-risk)	Acreage and crops, livestock, operating equipment and buildings.	Crops: Fire, theft, water and hail damages Livestock: Fire, theft, water, operating losses, accident and a few diseases (such as botulism) Machines: Fire, theft, water and operating losses (damage to running machinery as supplement)
Estonia	"Cattle insurance"	Cattles	Fire and natural disaster, accident, theft, diseases
Finland	Salmonella insurance (group insurance)	Pigs, poultry, hatcheries, milk and beef cattle	Damage covered include costs due to eradication of salmonella and losses in production for a period of six months
	Group insurance for pig diseases	Pigs	Salmonella, PRRS (porcine reproductive and respiratory disease syndrome), enzootic pneumonia, swine dysentery, scab, and atrophic rhinitis
	Livestock insurance	Livestock	-Death of an insured animal -Severe illness or accident, which according to a veterinary specialist, results in the inevitable and premature culling of the animal - Animal is lost or stolen for a longer time period than one month
	Extra security: Livestock insurance	Livestock	- Basic insurance compensates damages when animal dies or it needs to be emergency slaughtered - Slaughter value insurance for cattle compensates damages when animal dies or it needs to be emergency slaughtered - Slaughter value and business interruption insurance - Accident insurance for cows covers damages due accident - Catastrophe insurance for production animals

Country	Insurance product name (Type)	Products covered	Risks covered
France	A: "Hail"	All vegetal productions	Hail and wind
	B1: "Hail and frost on fruits" (Combined)	Revenue from fruit production	Hail, wind and frost
	B2: "Hail and frost on wine grapes" (Combined)	Wine grapes	Hail, wind and frost
	C: "Combined on COP" (Combined)	Cereal, oilseed and protein crops	Hail, wind, frost, flood
	D: "Combined on tobacco" (Combined)	Tobacco	Hail, wind, frost, flood
	E1: "Combined all crops" (Yield)	All crops except forage land	Hail, wind, frost, flood, drought, etc
	E2: "Whole- farm combined" (Whole-farm yield)	All crops except forage land	Hail, wind, frost, flood, drought, etc
Germany	"Hail"	Arable crops, wine, fruits, vegetables	Hail
	"Livestock"	n.d.	n.d.
Greece	"Public hail" (Combined coverage, but is not insurance)	All crops	Hail, windstorm, frost, snow, excessive heat, rains, Flood, seawater, bears & wildboars
	"Public livestock" (is not insurance)	All farm animals (voluntary for pigs % poultry)	Climatic, wild animals, diseases (long list)
	"Private hail" (Single-risk)	All crops	Hail, complementary to the ELGA policy
	"Private livestock"	Bovines, poultry (also sheep-goats & pigs available)	All risk mortality
	"Private aquaculture"	All fish. Additional: for fish stock in transit, equipment, vessels, etc.	All risk mortality, theft, escape over
Hungary	"Crop insurance" (Yield) *Individual insurance schemes tailored to the demands of customers are available,* ***see Annex Fact sheet***	Arable and horticultural crops including: autumn spicate crops, autumn feed mixture, autumn coleseed, string hemp, tobacco, sugar beet, feed beet seed, sunflower, some legumes, winter apple, winter pear, corn, forest	Yield, quality, stock can be insured. There is one all risk (MPCI) insurance, the "Yield insurance of arable crops". Storm, hail, fire, snowbreak, icebreak, drought, insects, sandblast, soil alligatoring, frost riving, sore, thunder stroke, landslip, flood, standing water, snow pressure.

Country	Insurance product name (Type)	Products covered	Risks covered
	"Livestock insurance" *Individual insurance schemes tailored to the demands of customers are available,* ***see Annex Fact sheet***	Cattle, swine, sheep, goat, horse, goose, chicken, hen, turkey, galeeny, pheasant, mallard	Value of livestock is insured. Disease and accident except for: "Natural disaster and elemental loss livestock insurance" where perils are: fire, thunder stroke, storm, hail, flood, earthquake, landslip, stonefall, earthfall, cave of an unknown hole, breakdown of water and steam pipes. "Cost completive livestock insurance" where extra costs deriving from diseases are covered. "Insurance of high value horses" were the value is insured. Coverable diseases: BSE, food and mouth disease, aphthous stomatitis, oriental rinderpest, cattle infectious lung inflammation, Rift valley fever, blue-tongue disease, lyssa, SVD, African swine plague, infectious swine paralysis.
Ireland	"Farm insurance" (Single-risk)	Farm dwelling, outbuilding and stock, employers, product and public liability (livestock in transit, pedigree livestock, growing trees, etc. optionally)	Fire, lighting, storms, floods, attack of dogs on sheep
Italy	"Crops Single-risk"	All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants	Hail, wind, black & hoar frost, floods, excess rain, drought, plant diseases
	"Crops Combined risks" (Combined)	All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants	2 or more of the events covered by single-risk insurance
	"Structures Combined risks" (Combined)	Greenhouses with metal framework, tunnels and anti-hail nets	Hail, wind, black & hoar frost, floods, excess rain, drought, plant diseases
	"Crops Multiperil" (Yield)	All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants	Hail, wind, black & hoar frost, floods, excess rain, drought, plant diseases
	"Stock Farms" (Combined)	Cattle and buffalo (value, cost disposing of animals, lack of revenue for period of farm stoppage)	FMD, brucellosis, pleuropneumonia, tuberculosis and enzootic leukosis
Latvia	"Crop insurance" (Single-risk)	Arable crops, flax, fruits	-
	"Livestock insurance"	Cattle, Sheep, Goat, Horses, Pigs, Fur animals, Bees, Poultry	Disease, Accidents, Damages caused by natural disasters, Fire, Flash of lighting , Explosion, Illegal activities of third parties

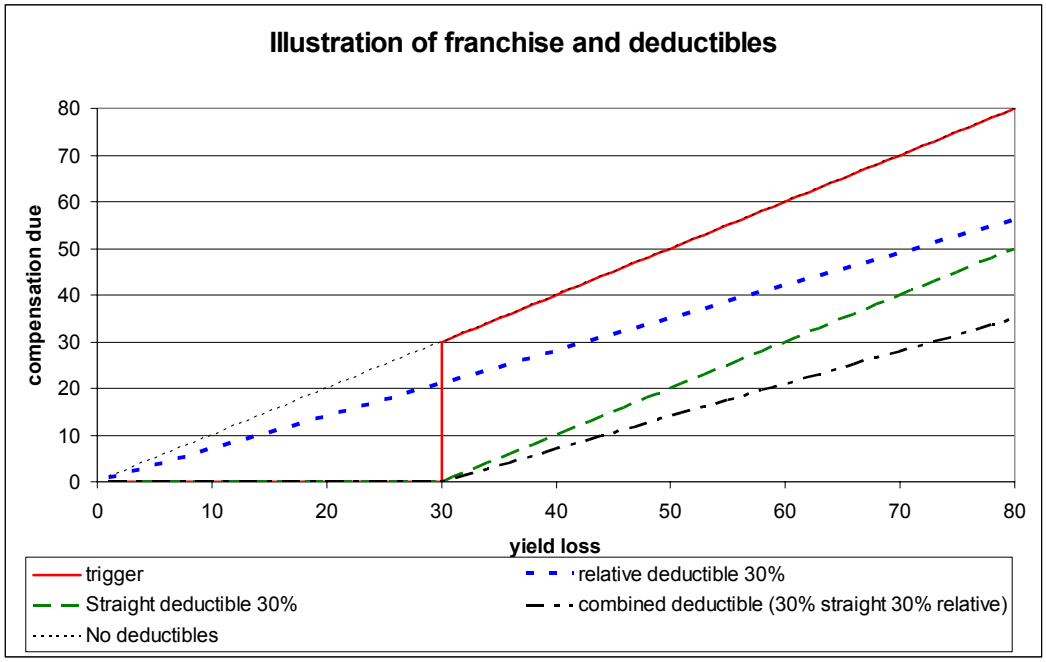
Country	Insurance product name (Type)	Products covered	Risks covered
Lithuania	"Crop insurance" (Single-risk)	Crops	Hail, rainfall, storm (spring frost, winterkilling optional)
	"Livestock insurance"	Livestock, horses, sheep, goats, pigs; several companies also include bees, birds, fishes	Noncommunicable diseases, Infectious diseases, Natural forces or accidents, Theft or vandalism
Luxembourg	"Hail"	Arable crops, wine, fruits, vegetables	Hail
	"Frost" (Combined)	Wine	Hail, frost
	"MPCI" (Yield)	Main arable crops	Hail, winter kills, stagnant water, frost, storm, heavy rainfall, drought, outgrowth
Netherlands	Hail private insurance	Crops	Hail
Poland	"Hail"	Crops	Hail
	"Livestock"	Cattle, horses swine (separate ins. for fur-bearing animals, apiary, fish also exist)	Death & forced slaughter due to non-epidemic diseases, accidents, and natural events
Portugal	"Basic coverage" (Single-risk)	Almost all vegetal production	Hail, fire, lighting and explosion
	"Complementary coverage" (Combined)	Almost all vegetal production	Tornado, waterspout, frost, snow
	"Total coverage" (Combined)	Almost all vegetal production	All risks in the other contracts (+ damages on cherry fruits +persistent rains on industry tomato)
Romania	"Crop insurance"	Almost all vegetal production	Standard risks: hail, heavy rain, storm, late spring frost, early autumn frost, land erosion, fire caused by natural forces Special risks: winter frost, flood, drought, excessive rain at harvesting
	"Livestock insurance"	Animals, birds, bees, fish	surgical diseases, obstetrics and internal diseases, wild animal attacks, fire, thunderstorm
Slovakia	"Crop insurance"	Almost all vegetal production	Hail, fire, storm, cold burst, flood
Slovenia	"Crop insurance" (Combined)	All crops	Hail, fire, thunderstorm (floods, spring frost, etc. optional)
	"Animal insurance"	Animals	ruin from disease or accident, emergency slaughter, slaughter from economic reasons

Country	Insurance product name (Type)	Products covered	Risks covered
Spain	"Combined"	Almost all vegetal production: COP, fruits, olives, etc	Hail, fire, flood, rains, frost, winds and others
	"Yield geographic basis" (Yield)	Winter cereals, proteins, grapes and Lanzarote onion	Hail, fire, flood, rains, frost, winds, drought, heat
	"Yield individual basis" (Yield)	COP, olives, wine grapes, almonds, sugar beet, some fruits	Hail, fire, flood, rains, frost, winds, drought, heat
	"Fixed costs for Associations and Cooperatives"	Fruits, citrus, grapes	The same as those covered by the individual farmers' insurance policies
	"Livestock farms"	Cattle, Horses, Sheep-goats Poultry	Accidents Also: for cattle, epizooties for poultry, asphyxia and panic
	"Dead animals disposal"	Cattle, Horses, Sheep-goats, Pigs Poultry, Rabbits	All
	"Index insurance"	Cattle, Horses, Sheep-goats Apiculture	Increase of feeding costs. Apiculture: also fire, flood and rains
	"Aquaculture"	Metrologic exceptional happenings, Chemic pollution, lighting, sea storm, flood, oil spill. Additional guarantees: diseases	Gilthead bream, bass, turbot, meager, trout, mussel
	"Forest production"	All forest trees within projects for reforestation on agricultural land	Fire, flood, torrential rain
Sweden	Crop insurance (Combined)	Arable crops, potatoes and various vegetables	Hail and re-planting costs due to drought, crust formation or soil erosion
	Animal insurance	Cattle, sheep, pigs, deer	Slaughter, death, theft (optional add-ins: veterinary treatment; milk production breakdown due to viral diarrhea)
United Kingdom	Crop insurance (Single-risk)	Crops, fruits, hops	Hail
	Livestock insurance	Livestock	Foot and Mouth Disease, Tuberculosis, Brucellosis, Classical Swine Fever

6.1.2 Deductibles in agricultural insurances

The following table shows some of the insurance characteristics in relation with coverage and the avoidance of moral hazard problems. These are the coverage level, the franchise deductible, threshold or trigger and other deductibles (see definitions of deductibles in the Glossary). The coverage level refers to the proportion of the insured value that is effectively covered by insurance. The franchise deductible is the percentage of the insured value the losses must exceed in order to trigger the payment. Once this value is exceeded, the payment of the indemnity can take place for the entire loss or only for a part of it. The straight deductible is the fixed amount of the loss (it can be expressed as a percentage of the insured value) that will always be assumed by the insured. In fact, a coverage level of 80% would have the same effect on insurance as a coverage of 100% plus a straight deductible of 20%. The coinsurance deductible is the percentage of the loss that is not covered by the insurer but is assumed by the insured. It can be observed that most insurance types have at least one of these characteristics, either a coverage level lower than 100%, or franchise deductible or another type of deductible. This avoids moral hazard because this means than whenever there is a loss the insured will have to assume at least a part of it. In this way, there are less incentives for increasing the risk exposure due to insurance.

In all cases where there is a straight deductible and there is not explicitly defined a franchise deductible, a franchise deductible of equal value to the straight deductible has been considered in the table. The reason is that the straight deductible, by definition needs that the threshold is exceeded to trigger the payment.



The losses on which the different deductibles are to be applied can be evaluated per field, per crop (all fields with the same crops in the farm), or even per farm in whole-farm insurance products. In some cases, mainly in single-risk insurance products, such as hail insurance, losses and deductibles are calculated per field.

Looking at the next table we can see, that there is a variety of different deductibles with a range from 0% to 40% and more. But some generalities can be pointed out:

- The higher the risk, the higher the deductibles. This can mean that the risk is high (high frequency in time or on area) or the products are covered have a high sensitiveness (e.g. fruits, vegetables).
- To create individual insurance schemes tailored to the demands of customers, there are different deductibles used, so it's on the farmers' judgement to choose a higher deductible and paying less of the premium.
- General new insurance products with less on experience have higher deductibles.

Table 23. Deductibles

Country	Insurance product name (Type)	Coverage	Franchise or trigger	Deductible (% of insured value)
Austria	"Hail"	100%	8 %	8%
	"Multi-peril" (Yield)	100%	8% Hail, other risks fixed by crops(as yield/hectare)	4% Hail, other risks fixed indemnities/hectare
	"Wine" (Combined and quality)	100%	8% for hail and 35% for frost	8% for hail and 35% for frost
	"Fruit" (Hail and quality)	100%	From 10% to 30% depending on the last 10 years loss ratio	From 10% to 30% depending on the last 10 years loss ratio
	"Grassland" (Combined)	100%	Hail: 8% Flood: 0%	Hail 8%, fixed indemnity for flood (max. 440 €/cut/ha)
	"Livestock" (Combined)	100%	0%	From 0 to 15 €/Cattles on farm, depending on farm loss ratio / Fixed indemnities depending on the age of the animal
Belgium	"Fire group insurance" (Single-risk)	100%	-	-
	"Hail insurance" (Single-risk)	100%	5%	5%
Bulgaria	"Crops" (Combined)	100%	5%	5%
	"Livestock" (Combined)	100%	Infectious diseases 10% Non-infect. diseases 30-40%	Infectious diseases 10% Non-infect. diseases 30-40%
Cyprus	"Crop insurance" (Combined)	-	15%: hailfrost, wind 20%: rust, flood, heatwave, dry wind, warm air 35%: water spot 40%: drought	12%: hail, flood, drought 15%: wind, heat, rain, water spot, dry wind, warm air 25%: rust 30%: drought
Czech Republic	"Crop insurance"	100%	8-10% of sum insured per damaged field	8-10% of sum insured per damaged field
	"Livestock insurance"	-	0%	0%
Denmark	"Aggregated insurance"	-	-	-
Estonia	"Cattle insurance"	-	-	-

Country	Insurance product name (Type)	Coverage	Franchise or trigger	Deductible (% of insured value)
Finland	Salmonella insurance (group insurance)	-	€1000 and 5-20% of the amount of damage	€1000 and 5-20% of the amount of damage
	Group insurance for pig diseases	-	€1000 and 5-20% of the amount of damage	€1000 and 5-20% of the amount of damage
	Livestock insurance	-	variable e.g. 3% of cows lost within 10 days, €200 per event	variable e.g. 3% of cows lost within 10 days, €200 per event
	Extra security: Livestock insurance	-	variable 0%-50% See Annex Fact sheet	variable 0%-50% See Annex Fact sheet
France	A: "Hail"	100%	15% average	15% average
	B1: "Hail and frost on fruits" (Combined)	100%	15% average	15% average
	B2: "Hail and frost on wine grapes" (Combined)	100%	15% average	15% average
	C: "Combined on COP" (Combined)	100%	15% average	15% average
	D: "Combined on tobacco" (Combined)	100%	15% average	15% average
	E1: "Combined all crops" (Yield)	100%	15% average	15 % average straight deductible (25% for subsidy)
	E2: "Whole- farm combined" (Whole-farm yield)	100%	15% average	15 average straight deductible (20% for subsidy)
Germany	"Hail" Arable crops, wine	100%	8%	8%
	"Hail" fruits, vegetables	100%	Standard 10% Optional: 0-25% depending on loss ratio	Standard 10% Optional: 0-25% depending on loss ratio
Greece	"Public hail" (Combined coverage, but is not insurance)	75%	20% (some exceptions)	Straight ded: 13.2% + Deduct % loss: 12% (some exceptions)

Country	Insurance product name (Type)	Coverage	Franchise or trigger	Deductible (% of insured value)
	"Public livestock" (is not insurance)	80% (100% for damages caused by bears)	0-12%	Straight ded.: 2.4-20% + Ded % loss: 0-20%
	"Private hail"	25%	15%	15%
	"Private livestock"	100%	1-2%	1-2%
	"Private aquaculture"			
Hungary	"Crop insurance"	100%	general 5% Yield-insurance 10%	general 5% Yield-insurance 10%
	"Livestock"		general 0%; specific products where dieing off of animals exceeds the 1% (cattle), 4% (sheep) and 2% (goat) of the quarterly average number of animals	general 0%; specific products where dieing off of animals exceeds the 1% (cattle), 4% (sheep) and 2% (goat) of the quarterly average number of animals
Ireland	"Farm insurance" (Single-risk)	100%	100 €	100 €
Italy	"Crops Single-risk"	100%	10-30%	10-30%
	"Crops Combined risks" (Combined)	100%	20%	20-30%
	"Structures Combined risks" (Combined)	100%	-	10-30%
	"Crops Multiperil" (Yield)	100%	20%	20-30%
	"Stock Farms" (Combined)		-	-
Latvia	No Information	-	-	-
Lithuania	"Crop insurance"	-	10-12% (rape, flax) 6-7% (cereals)	10-12% (rape, flax) 6-7% (cereals)
	"Livestock insurance"	-	10-30%	10-30%
Luxembourg	"Hail" arable crops	100%	8%	8%
	"Hail" fruits, vegetables	100%	10%	10%
	"Frost" wine	100%	10% (min. 2%, max. 5% per farm)	10% (min. 2%, max. 5% per farm)

Country	Insurance product name (Type)	Coverage	Franchise or trigger	Deductible (% of insured value)
	"MPCI"		8% frost, storm, flood; Drought 20-40% depending on loss ratio, Outgrowth 20% (fixed indemnity)	8% frost, storm, flood; Drought 20-40% depending on loss ratio, Outgrowth 20% (fixed indemnity)
Netherlands	Hail private insurance		Depends on the insurance company	Depends on the insurance company
Poland	"Hail"	100%	10%	10%
	"Multiperil"	100%	10%	10%
	"Livestock"		20%	20%
Portugal	All three types	100%	0	Relative deductible: 20% of loss
Romania	"Crop insurance" "Livestock insurance"	-	10%	10-15%
Slovenia	"Crop insurance"	-	mostly 5%	mostly 5%
	"Animal insurance"	-	-	- No franchise for death from accident. - Death from illness 15 % franchise. - Slaughter of irreproachable animal (accident) 50 % franchise. - Slaughter of irreproachable animal with minor restrictions 40 % franchise. - Slaughter with total restriction 15 % franchise. - Slaughter from economic reasons 60 % franchise.
Spain	"Combined"	100%	10-30%	10-30%
	"Yield geographic basis" (Yield)	Hail and fire: 100% coverage Other risks: 65% coverage	Hail and fire: 10% Other risks: 35%	Hail and fire: 10% of loss relative deductible Other risks: 35% straight deductible
	"Yield individual basis" (Yield)	Hail and fire: 100% coverage Other risks: 70% coverage	Hail and fire: 10% Other risks: 35%	Hail and fire: 10% deductible % of loss Other risks: 35% straight deductible
	"Fixed costs for Associations and Cooperatives"	100% of fixed costs	20%	20%

Country	Insurance product name (Type)	Coverage	Franchise or trigger	Deductible (% of insured value)
	"Livestock farms"	100% Fattening catlle: 90%	10%	10% For some risks or for some farmers it can be up to 50%
	"Dead animals disposal"	100%	0%	0%
	"Index insurance"	100%	0%	0%
	"Aquaculture"	100%	Up to 20%	Up to 20%
	"Forest production"	100%	10% of surface	0%
Sweden	Crop insurance	100%	0% except: Hail- vegetables: 15 % Re-planting-carrots: 15 %	0% deductible except: Hail-various vegetables 15 % Re-planting-carrots: 15 %
	Animal insurance	-	-	- For milk production breakdown insurance: 10% deductible (covers 90% of the loss due to viral diarrhea)
United Kingdom	"Hail" Crops, hops	100%	0%	0%
	"Hail" Fruits	100%	10% applied to the whole production	10% applied to the whole production
	"Livestock" Foot and Mouth Disease, Classical Swine Fever	25% of the Government compensation to provide "consequential loss" coverage to the farmer following compulsory slaughter; limited to £250,000 per farm	0%	0%
	"Livestock" Tuberculosis, Brucellosis,	25% of the value of the animal to provide "consequential loss" coverage to the farmer following compulsory slaughter; limited to £250,000 per farm	0%	0%

6.1.3 Loss assessment

Usually the loss assessment is done by loss adjusters in the field. To estimate the loss they use standardized directives developed for different crops. These directives are discussed on annual meetings organised by AIAG (International Association of Hail Insurers).Thus it can be assumed, that loss assessment for single risk insurance is international comparable
The loss assessment for indirect index insurance is based on independent indices. These insurance products did not reach yet the operational stage in Europe.

There are two different approaches for the assessment of loss.

1. Based on loss:
   In the single risk insurance, the loss adjuster estimates a percentage of the loss. For this procedure they take samples in the field and use standardized directives for different crops. The estimated percentage minimized with the deductible is the result for the indemnity, as a percentage of the insured value (sum insured).
2. Based on yield:
   The loss adjuster estimates the yield by taking some samples in the field or in another way for example in indirect index based insurances (e.g. meteorological trigger, vegetation index). The estimated yield will be referred to an average yield in time on farm or on area level.

The losses on which the different deductibles are to be applied can be evaluated per field, per crop (all fields with the same crops in the farm), or even per farm in whole-farm insurance products. In some cases, mainly in single-risk insurance products, such as hail insurance, losses and deductibles are calculated per field. This is the case in Austria, Greece, Poland and France.

However, in other cases, mainly in combined and yield products, losses and deductibles are calculated per crop. Examples of this are the combined insurance products in France, or the combined and yield insurance in Spain

Least, the whole-farm insurance scheme in France evaluates the losses and deductibles at farm level (addition of all crops produced on the farm). A particular case is the insurance of “Fixed costs for Associations and Cooperatives” in Spain, which calculates the deductibles on the losses of all the farmers in the Association.

6.1.4 Premium rates

In Table 24. different premium rates specified to existing insurance products in several countries are shown together with the granted subsidies,. The premium rates vary a lot, depending on the insurance system and other technicalities, so it’s only possible to give examples of them.
Besides the geographical variability inside each country, there is a high variability of the insurance products across Europe, depending on the risks and products (type of crops) covered.

So we find low premium rates for hail insurance (2.3% in Greece), for some livestock insurance, depending on the risks that are covered (1% for poultry in Greece) and for aquaculture (1.5%). The insurance policies for hazards causing greater or more frequent losses can be of 7-8% (Italian multi-peril or yield insurance) and of 8 % for livestock (cattle in Greece). The premium rates for hail in Austria are around 2.8% for arable crops, 6.5% for wine and in average 14% for fruits. Unfortunately these rates have not been provided for Spain. Multi-peril (yield) insurance premiums in France are quite low. This is due to the fact that the main production insured under this policy are field crops (cereals and oilseeds).

Amongst others, general the altitude of premium rates in crop insurance depends on:

- The frequency of risks in time and on area
- The type of risk (e.g. hail as a very local risk, drought as a large area risk)
- The sensitiveness of crops
- The number of risks are covered (single- risk, multi- risk insurance)
- The number of insured, to spread the risks
- Other technicalities like deductibles

Looking at the table “Insurance products and covered risks in Europe” we can see high variability of insurance products, which explains the difficulties in comparison of premium rates on the one hand and to compute average premium rates on the other hand.

Geographical level for rating

As can be seen from the information provided in the Fact sheets, the unit used for the calculation of the premiums in most cases is an area unit, like a commune, a zone or a typical agricultural production area. If the farms within this area are not very homogeneous, and are subject to different risks, then the premiums will not correspond to the average indemnities paid. The area-based rating means that most insurance policies are prone to have adverse selection problems, because the same premium rate applies for all the farmers within the same area, so those with higher relative risks will get insured, and those with lower risks not. Only in the Spanish yield insurance product we find the farm level as the basis for the premium rating.

6.1.5 Level of Subsidies

The subsidies on the premiums vary a lot depending on the country’s policy in order to promote some particular type of coverage, to help some agricultural sub-sector or to give facilities to some types of farms from a sociological point of view. For instance less-developed areas, young farmers or women farmers, associations or cooperatives, etc. can apply for higher subsidies in some countries.

Mainly in countries where public support is given to the agriculture insurance, the systems are well developed. Countries with public insurance systems or with support to the private insurance sector have integrated it as an essential agriculture policy instrument for the stabilisation of

agriculture income. With such a support to the insurance premium it seems easier to encourage farmers to take an active role in risk management and participate in insurance. From economical point of view these tools seems to be better, than public ex-post payments for compensation after natural disasters.

In following countries subsidies available:

- **Italy:** around 67% of total premium; 64% for the multi-peril yield-type product
- **Spain:** around 49% including the regional subsidies
- **Austria:** around 46% of total premium; 50% for hail and frost
- **France:** only around 2.5% of total premium; 40% for young farmers (for the amount of premium corresponding to a franchise of 20 or 25%);
- **Portugal:** around 68% of total premium; subsidies vary from 35% to 75%
- **Czech Republic:** Subsidies from 15% for Livestock and 30% for Crop insurance
- **Slovenia:** In the year 2006, subsidies of insurance premium in crop production were available for the first time. Level of subsidy was set at 30% - 50% for the basic risk coverage (hail, fire and thunderstorm)
- **Latvia and Lithuania:** 50%, but less introduction on insurance
- **Cyprus:** 50% for all insurable risks in the compulsory scheme
- **Luxembourg:** 50% for all insurable risks

In the case of France we can see in chapter 4.2 “Ad-hoc Aids” that there are very high Ad-hoc payments (2000-05: 1.167 M€) contrary to Spain with low Ad-hoc payments (2000-05: 22,5 M€) but there are higher subsidies for insurance in Spain (around 230M€ in Spain and 5 M€ in France).

Total amount of subsiedies to insurance in Europe: around **500 M€ (32%)**

Next we can see insurance products from several countries, the risks are covered in the products, the currently premium rates on product level and the level on subsidies.
You will see that the premium rates differ a lot, depending on the insurance product. Premium rates grouped more in general you will find later in the chapter 9.6 where we have computed some fasibility studies for different insurance types on EU-level.

Table 24. Premium rates and subsidies for some insurance products in selected countries

Country	Insurance product name (Type)	Products covered	Risks covered	Premium %	Subsidies %
Austria	"Hail"	Arable crops	Hail	2.8 %	50%
	"Multi-peril" (Yield)	Arable crops	Hail, storm Frost Flood, rain Drought Others	3.6 %	50% for hail and frost 0% for other risks
	"Wine" (Combined and quality)	Wine	Hail, frost and additional expenditure after hail	6.5 %	50%
	"Fruit" (Hail and quality)	Fruit	Hail	14 %	50%
	"Grassland" (Combined)	Grassland and silo foils	Hail, flood	1.5 %	Hail: 50% Flood: 0%
	"Livestock" (Combined)	Cattle	Stillbirth and death (epidemic disease excluded)		0%
Belgium	"Fire group insurance" (Single-risk)	Field crops, vegetables, vineyard, fruits and livestock farms	Fire, windstorm, floods, earthquakes, theft, working conflicts	-	0% (15% taxes but not personal income taxes)
	"Hail insurance" (Single-risk)	-	Hail	-	0%
Bulgaria	"Crops" (Combined)	Field crops, fruit trees and vineyards	Hailstorm, thunderstorm, torrential rain, fire on roots, ground frost, flood (sludge, freezing and withdrawal for winter cereals)	4.8%	0%
	"Livestock" (Combined)	Cows and buffalos, sheep, goats, poultry	Death and compulsory slaughter from: fire and natural catastrophes; parasitic and infectious diseases (OIE list B & others)	0.8%	0%

Country	Insurance product name (Type)	Products covered	Risks covered	Premium %	Subsidies %
Cyprus	"Crop insurance" (Combined)	Fruits Citrus Grapes Cereals Potatoes Beans Artichokes	Hail, frost, rain windstorm Hail, frost windsorm, water spot, dry wind Hail, frost, heatwave, rain, windsorm, dry wind Hail, rust, drought Hail, frost, flood Hail, frost, flood, warm dry air Hail, frost	7.2%	50%
France	A: "Hail"	All vegetal productions	Hail and wind	2% average 7.6% fruits & vegs.	0% (7.5% for fruits and vegetables until 2006)
	B1: "Hail and frost on fruits" (Combined)	Revenue from fruit production	Hail, wind and frost	8.6%	0% (25 % until 2006)
	B2: "Hail and frost on wine grapes" (Combined)	Wine grapes	Hail, wind and frost	2.15%	0% (10% until 2006)
	C: "Combined on COP" (Combined)	Cereal, oilseed and protein crops	Hail, wind Frost Flood or too much water	7%	0% (10% until 2006)
	E1: "Combined all crops" (Yield)	All crops except forage land	Hail, wind Frost Flood or too much water, drought, etc	1.6 %	35% (40% young farmers) for a franchise of 25%
Greece	"Private hail"	All crops	Hail, complementary to the ELGA policy	2.3%	0%
	"Private livestock"	Bovines Poultry (also sheep-goats & pigs available)	All risk mortality	Cattle: 8.3% Poultry: 1%	0%
	"Private aquaculture"	All fish. Additional: for fish stock in transit, equipment, vessels, etc.	All risk mortality, theft, escape over	1.5%	0%

Country	Insurance product name (Type)	Products covered	Risks covered	Premium %	Subsidies %
Ireland	"Farm insurance" (Single-risk)	Farm dwelling, outbuilding and stock, employers, product and public liability (livestock in transit, pedigree livestock, growing trees, etc. optionally)	Fire, lighting, storms, floods, attack of dogs on sheep	-	0%
Italy	"Crops Single-risk"	All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants	Hail, wind Black & hoar frost Floods, Excess rain Drought Plant diseases	7.7%	54% (50% of Minister parameter)
	"Crops Combined risks" (Combined)	All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants	2 or more of the events covered by single-risk insurance	6.1%	59% (80% of Minister parameter)
	"Crops Multiperil" (Yield)	All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants	Hail, wind Black & hoar frost Floods, Excess rain Drought Plant diseases	11.4%	64% (80% of Minister parameter)
	"Stock Farms" (Combined)	Cattle and buffalo (value, cost disposing of animals, lack of revenue for period of farm stoppage)	FMD, brucellosis, pleuropneumonia, tuberculosis and enzootic leukosis	-	50% of Minister parameter
Portugal	Average three products: "Basic coverage" + "Complementary coverage" and + "Total coverage"	Almost all vegetal production	Hail, fire, lighting and explosion + Tornado, waterspout, frost, snow + All risks in the other contracts (+ damages on cherry fruits +persistent rains on industry tomato)	Average 8.66 %	Average: 67.7%

6.1.6 Bonus- Malus system

The bonus-malus system or system of deductions and penalties on the premiums due to former results is also used to avoid for moral hazard and also adverse selection problems (Austria, Bulgaria, Estonia, Finland, Germany, Hungary, Lithuania, Luxembourg, Netherlands, Romania, Spain). In Greece this does not exist for the compulsory public insurance, but it does for private insurance. In Denmark, the United Kingdom, Ireland and in Portugal there is no bonus/malus-system. In Belgium, there is no bonus-malus system applied by the Belgian companies, but it is applied by the Dutch company OFH who is the main insurer for apples and pears. In France and Italy no information was provided about it, and in Poland Slovenia and Sweden, it seems not to be applied in crop insurance, but it is applied in livestock insurance.

6.1.7 Compulsory insurance on crop level

In most countries and for most insurance products, it is compulsory to insure all the fields with the same crop, so as to avoid that only those with higher risks are insured (another type of adverse selection). However, there are some exceptions, for example the French hail insurance and the Polish insurance products.

6.1.8 Loss ratios

The loss ratio was already commented on country level in Section 5.

6.2 The role and cost of reinsurance at Member State level

Table 25. Reinsurance in European countries: types and characteristics

Country	Private or public	Main reinsurers	Reinsurance type & rates
Austria	Private	12 national companies + international market: Munich Re, Scor Germany, Hannover Re, Swiss Re Germany, Sirius Re,…	25% proportional & stop- loss (rates 5-8%)
Belgium	Private	Swiss Re and Munich Re	-
Bulgaria	Private	-	Proportional & stop-loss
Cyprus	-	-	No reinsurance
Czech Republic	Private	Swiss Re, …	-
Denmark	Private	-	-
Estonia	-	-	-
Finland	Private	-	“Group insurance”
France	Private	Swiss Re, Munich Re, Scor…	-
Germany	Private	Munich Re, Swiss Re Germany, Axa Re, Partner Re, GE Frankona, …	Quota share & stop-loss
Greece	Private for Agrotiki (ELGA not reinsured)	Munich Re, Mapfre	Hail stop-loss (rates around 4.5% until 2002, 14.5 in 2003)
Hungary	Private	-	Stop-loss
Ireland	-	-	-
Italy	Private + Public for new insurance products	? + FRR (Risks Reinsurance Fund). A reinsurance consortium is in project	60% quota share & stop-loss + Stop-loss for combined risks & quota-share for multiperil (80% is stop loss)
Latvia	-	-	-

Country	Private or public	Main reinsurers	Reinsurance type & rates
Lithuania	Private	International re-insurance	-
Luxembourg	Private	Munich Re, Swiss Re Germany, Axa Re, Partner Re, GE Frankona, …	Quota share 40% for fruits 20% for wine and vegetables; Stop-loss
Netherlands	Private for hail insurance (Public for some pilot experience)	Munich Re, Swiss Re, Hannover Re, Scor, Mapfre, Partner Re, GE Frankona, Lloyds, etc	-
Poland	Private	Swiss Re, Partner Re	-
Portugal	Public-private	Government	Stop-loss with deductible (rates 6.3 – 10.8% of the premiums).
Romania	Private	International re-insurance	
Slovakia	-	-	No information
Slovenia	Private	-	Stop- loss
Spain	Public by CCS + Complementary insurance by intl. companies + private reinsurance of CCS	CCS (Consorcio de compensacion de seguros) + Partner Re + Swiss Re (reinsures CCS)	CCS: 10% quota-share & stop-loss (rates: special policies 23% or 19% & classic policies 14% or 2%)+ Compl. Ins. Stop-loss (rate 2%) + Stop-loss for Swiss-Re (rate 6%)
Sweden	Private	-	-
UK	Private	-	Stop- loss

6.2.1 Public and private reinsurance

In most countries, reinsurance is undertaken by private companies. However, there are some exceptions in which insurance is partially managed by the Government or public companies. It is the case for Italy, Portugal and Spain.

In the case of Italy, there is a Public Fund of Reinsurance. It was introduced in order to help the development of the new multi-peril insurance products (and for the pluri-peril with more than a couple of perils included), so, it only works for these insurance types. It appeared in the 2000 budget law, but its first year of implementation was 2004 (this delay was due to the notification to the EU). It works within the Reinsurance Plan (Ministerial Decree general for all reinsurance).

In Portugal, the main part of reinsurance is made though a public reinsurance system. It undertakes the 85% of the losses above a certain threshold. The adhesion to this mechanism is voluntary but, up to date, all the insurance companies selling crop insurance have adhered to this system.

In Spain, there is compulsory public reinsurance, undertaken by the Consorcio de Compensacion de Seguros. The CCS is a public company but it functions as a reinsurance company from an economic point of view. This public company is itself reinsured by private companies. Also, private companies can freely reinsure the share of risk they assume through the international reinsurance market.

The main reinsurance companies throughout Europe are Munich Re, Swiss Re, Hannover Re, Partner Re, SCOR and Mapfre.

6.2.2 Quota-share and stop-loss reinsurance

Regarding the reinsurance types and rates, information is missing for many countries. Nevertheless, we know that both stop-loss reinsurance (above a threshold the reinsurance pays) and quota-share reinsurance (the reinsurance takes charge of a percentage of the loss) are used in most countries.

In Austria there is proportional reinsurance from the insurer companies founding the special agricultural insurance as a mutual organisation. By this proportional reinsurance agreement, the founder companies get the 25% of the profits on the years when the loss ratio is lower than one, and on those years when the loss ratio is above 1 they assume the 25% of the losses exceeding the 100%. In all cases the "provision" (premium that the insurer gets from the reinsurer for the administrative costs, around 20%) additional is to be considered (from the profit or from the losses). The annual loss ratios (including the expenses of damage survey) vary from 38% in 2001 to 140% in 2000. The average of the last ten years is approximately 74 %.

There is quota-share insurance in Italy, about 60% for privately reinsured policies; and in Spain, where the CCS participates in the coinsurance pool taking a share of 10% (in 2006).

Stop-loss reinsurance is used in the most cases of private reinsurance. In Austria for example it is provided by the international reinsurance market and works as follows. There are three layers of coverage, and to each of them corresponds a premium rate and deductible conditions. These

layers are based on the ratio of due indemnities plus damage survey expenses over premiums collected (loss ratio). If this ratio is below 110%, no reinsurance applies. When it is between 110 and 150%, reinsurance applies with a deductible of 10%. The other two layers are from 150% to 200% and from 200 to 250%. In these cases, there are not deductibles, but the rates paid for these levels differ. For all levels the rates are in between 5 and 8%.

In Italy, there is both private and public stop loss reinsurance. Private stop-loss reinsurance applies to 40% of the risks taken directly by the companies, that is, the share that is not passed over to the reinsurers as quota-share reinsurance. In a general way, companies pay indemnities every year up to a maximum of the money they get from premiums (which can be 110%, so that the quantities over this 110% are assumed by the stop-loss reinsurance). They also have an upper threshold of 5 million euros for the hail policies. As mentioned before, public reinsurance in Italy applies only to the new insurance products. It works in a different way for the multi and for the pluri-peril insurance products. The pluri-peril ones have right to stop-loss reinsurance and the multi-peril ones to quota-share. But in general 80% of the public reinsurance is “stop-loss”. The percentage reinsured is different for each company.

In Portugal, the companies pay to the Government a percentage of their premiums as reinsurance premiums. Reinsurance is stop-loss with a relative deductible.. The trigger for the stop-loss is a percentage of the premiums which varies from 65% to 110% depending on the crops and regions. When the indemnities are above this percentage, the public reinsurance systems assume the 85% of the indemnities above the trigger.

In Spain, there is public stop-loss reinsurance of the pool of insurance companies by CCS, and also private stop-loss reinsurance for the share of risk assumed directly by the companies

7. Livestock sanitary risks and crises

7.1 Literature survey on sanitary risks and crises in EU livestock

This section of the report is a synthesis of the approaches and aims to analyse different methods to address the economic impacts of animal disease in order to assist in defining future research.
The objectives of this section are:

1. to summarize past work on animal disease,
2. to provide a framework to show the complexity of defining impacts,
3. to present some potential synergies for integrating work done in various fields and at different levels,
4. to provide richer findings.

The coming pages review a recent publication: "*The Economics of Livestock Disease Insurance*"[25]. The book's contents are also a result of two conferences. "The Livestock Insurance Products International Conference and Forum: Discovery of Ideas and Issues" which was held November 2002 in Colorado and the second conference focus on the "Economics of Animal Health", held in July 2003 during the Western Agricultural Economics Association meeting in Denver, Colorado.
A huge number of experts in animal disease management, insurance, and public policy contributed to this book.
It's also analysed a report made in 2003 by the Institute for Risk Management in Agriculture (IRMA) from Wageningen University in The Netherlands for the European Commission.

Livestock epidemics can result in substantial losses for governments, farmers and all the other participants of the livestock production chain involved. Governments (national and European) generally support the largest part of the direct losses, such as the value of destroyed animals and organisational costs. Consequential losses, such as losses resulting from empty buildings and movement standstills, are almost always completely borne by the farmers themselves if not insured privately.
Due to various developments (enlargement of the European Union with acceding countries, budgetary constraints, possible interest of farmers to cover consequential losses by means of insurance), the current risk financing system for livestock epidemics is being reconsidered.
Let's list and analyse the existing risk financing systems in the Member States.

[25] Edited by S.R. Koontz et al, and published by CABI in 2006

7.1.1 Direct Losses

As it is shown later in tables 25 and 26, some member states finance the non-EU compensated part of the *direct losses*[26] entirely from the national budget. Other member states have set up some form of statutory system to co-finance the direct losses. These Public-Private financing schemes have a compulsory fund structure in which all farmers pay a tax. In case of co-financing to complement the public part, the amount that is financed by the sector is either proportional or non-proportional.

Only a limited number of countries apply free public disaster assistance.

Some EU member states partly compensate consequential losses on basis of actual incurred losses (also a form of *ad hoc relief* program exists). In some countries the government compensates above the value of the animals which are forcibly slaughtered to cover part of the consequential losses. In some other EU member states the absence of public assistance has led to the creation of private insurance schemes for some types of livestock production. The current applied consequential loss coverage can be based on the actual losses incurred or an estimation of the loss based on the period with business interruption[27] or a fixed amount[28]. Not all the cases are eligible for compensation; there are some parameters to respond to.

Member states are obliged to apply the control measures establish in EU directives[29] if an outbreak arises of so-called 'List-A diseases' (Office International des Epizooties, 1998).

[26] Direct losses due to disease: Direct financial loss due to mortality or morbidity of livestock or crop plants can vary from insignificant to catastrophic. In many cases the direct losses would be modest and would fall on a small number of farms. One of the major determinants of the magnitude of the direct losses will be the rapidity with which the disease is noticed and diagnosed.

27 i.e., fixed sum per day times the duration.

28 i.e., 10% of the animal value.

29 The basis for these measures originates from EU Council Directive 85/511/EEC and 80/217/EEC respectively. Measures include: 1) stamping-out of infected herds; 2) Pre-emptive slaughter of contact herds; 3) the immediate establishment of surveillance zones around such herds. In these zones, animal movements are restricted and to a large extent prohibited.

Table 26. Classification of animal diseases

List A diseases	List B diseases			
		Cattle diseases	*Swine diseases*	*Avian diseases*
Foot and mouth disease	Anthrax	Bovine anaplasmosis	Atrophic rhinitis of swine	Avian chlamydiosis
Swine vesicular disease	Aujeszy's disease	Bovine babesiosis	Enterovirus encephalomyelitis	Avian infectious bronchitis
Peste des petits ruminants	Echinococcosis/ hydatidosis	Bovine brucellosis	Porcine brucellosis	Avian infectious laryngotracheitis
Lumpy skin disease	Heartwater	Bovine cysticercosis	Porcine cysticercosis	Avian mycoplasmosis
Bluetongue	Leptospirosis	Bovine genital campylobacteriosis	Porcine reproductive and respiratory syndrome	Avian tubercolosis
African horse sickness	New world screwworm (Cochliomyia hominivorax)	Bovine spongiform encephalopathy	Transmissible gastroenteritis	Duck virus enteritis
Classical swine fever	Old world screwworm (chrysomya bezziana)	Bovine tubercolosis		Duck virus hepatitis
Newcastle disease		Dermatophilosis		Fowl cholera
Vesicular stomatitis		Enzootic bovine luekosis		Fowl pox
Rinderpest		Haemorragic septicaemia		Fowl typhoid
Contagious bovine pleuropneumonia		Infectious bovine rhinotracheitis/infectious pustolar vulvovaginitis		Infectious bursal disease
Rift Valley fever		Malignant catarrhal fever		Marek's disease
Sheep pox and goat pox		Theileriosis		Pullorum disease
African swine fever		Trichomonosis		
Highly pathogenic avian influenza		Trypanosomosis (tsetse-borne)		

Source: http://www.oie.int/eng/maladies/en_classification.htm

List A disease considers transmittable diseases which have a very serious and rapid spread potential, irrespective of national borders

After obtaining EU approval, countries may take additional control measures. These livestock epidemics can have large economic consequences not only for farmers but also for other various parties of the production chain in terms of direct or consequential losses.

Direct losses comprise the value of animals destroyed under depopulation and welfare control measures and the costs of organisational aspects, such as the monitoring of farms in restriction zones.

The veterinary budget of the European Union refunds 50% of the costs of compulsory and pre-emptive slaughter, 70% of the costs of welfare slaughter and 50% of the organisational costs.[30]

As it has been already said certain member states finance entirely the direct losses using the National founds. On the contrary, others have set up a kind of statutory system to *co-finance* what is considered not-EU subsidised part of the direct losses (Austria, Belgium, Germany and The Netherlands). In this case all the farmers have to pay a compulsory tax.

The levy system is based on pooling over time within the sector. Payments to the fund can be organised through up-front payments (deposits) or through payments after an outbreak, or both.

Austria, Belgium and Germany have a proportional levy system to establish emergency founds.

[30] Council Directive 90/424/EEC, Ministry of Agriculture, Nature Management and Fisheries, (1998)

Table 27. Direct livestock losses and the contribution of the sector in case of calamity

Contribution	no levy	(partly) levy or compulsory insurance scheme
Austria		x
Belgium		x
Denmark	x	
Finland	x	
France	x	
Germany		x
Greece		x
Ireland	x	
Italy	x	
Luxembourg	x	
Netherlands		x
Portugal	x	
Spain	x	
Sweden	x	
United Kingdom	x	

Source: "A risk financing model for livestock epidemics in the EU.

Let's examine the table above.

Austria: Establish levies for the fund.

Belgium: The government has set up a fund that it is used to finance various animal health and quality improvement measures. The levy can vary depending on the level set by the government. The levy is differentiated on basis of species and farm size.

Denmark: The government pays only for the value of the animals which are compulsorily slaughtered. If a whole herd is slaughtered, a further 20% is paid to cover the loss of income from the herd. No statutory or voluntary levies are operated to establish an emergency fund.

Finland: No statutory or voluntary levies are operated to establish an emergency fund. The government reimburses farmers.

Germany: There is a national framework but each Bundesland is responsible for running the program with own rules of the application. The scheme is compulsory. The administrative council is made up of farmer and ministry representatives and decides the import of the levy. The compensation payments are made from the available funds and the Ministry of Agriculture pays for the costs if the fund runs out of money. To pay

back the loan to the Ministry the levy increases over the following years after an outbreak.

No compensation is paid to farmers in the surveillance zones.

Greece: The government operates a compulsory agricultural insurance scheme via the Greek Agricultural Insurance Organisation "ELGA". ELGA does organise and implement programmes of proactive protection and insures the production. ELGA is funded by an 'income from special insurance contributions' (of which the fee is 0.5% of the value of the sold livestock production) and this constitutes the major financial source.

Italy: No government compensation is available other than for slaughtered animals. No statutory or voluntary levies exist. Same as Spain: not so complete coverage as for other countries e.g. UK.

Luxembourg: The Luxembourg government pays compensation when animals are compulsorily slaughtered. No levy for farmers.

The Netherlands: The producers and the Ministry of Agriculture have agreed on a system where a bank guarantee is supplied and producers will have to pay the levy mainly after the epidemic. The amount of the levy will depend on the actual cost of the epidemic.

Spain: No government compensation is available other than for slaughtered animals. No statutory or voluntary levies exist.

Sweden: If a 'production unit' is closed during an epidemic of a notifiable disease the government can compensate the farmer for the destruction of the animals, animal value, decontamination and for production losses. Compensation for certain notifiable diseases can cover till 100% for both animal value and decontamination costs. Veterinary costs caused by an outbreak are not compensated. No levy for farmers.

U K: For FMD in cattle, sheep and pigs and for CSF and Swine Vesicular Disease (SVD) in pigs the government compensates destructed animals at 100% of the market value. There is no levy for farmers. The UK government also pays some compensation for animals slaughtered due to Bovine Tuberculosis, Brucellosis and BSE in cattle. As far as poultry diseases are concerned, such as Avian influenza and Newcastle disease, the government only pays compensation for birds slaughtered which are non-diseased (at 100% of their market value). For Aujeszky's disease in pigs the government will also pay 100% of the animal's market value[31].

Thus, in conclusion, direct losses are (partly) compensated by governments (national or European) and there are mainly three types of financing schemes adopted by the member states; let's visualize them in the table below.

[31] The only difference with Aujeszky's is that when the disease was in the country a levy was paid on all pigs at slaughter to cover the compensation costs. This levy is no longer collected but the legislation is in place to collect it again should the disease come in to the country again.

Table 28. Financing schemes covering direct losses in livestock epidemics in the EU.

EU budget	National budget	EU budget	National budget	Levy	EU budget	Levy National budget
Country 1		Country 2			Country 3	

Source: CABI 2006. The Economics of livestock Disease Insurance (eds S.R. Koontz et al.)

7.1.2 Indirect or consequential losses

In insurance contracts, consequential losses are indirect losses, a reduction in the value of property that is a result of a direct damage loss. Usually are associated with time element or other remote or indemnification type losses. Consequential losses are different than ensuing losses since consequential losses are indirect losses not direct damage losses, whereas following losses are further or additional direct damage losses that have been initiated by the original direct damage cause of loss.

Consequential losses are almost always completely supported by the farmers themselves if not insured privately. In fact, we can say that in some member states, the consequential loss risk is transferred by means of private insurance systems.

Consequential losses that arise at farm level can comprise one or more categorises:

- Business interruption
- Losses related to establish restriction zones
- Additional repopulation
- Losses from emergency vaccination
- Price effect

So, the absence of public assistance in some member states it has been solved with the creation a private insurance scheme for some types of livestock production. Exist also a sort of public-private partnership in which the government can plays the role of the insurer or of the reinsurer for the subsidised consequential loss policy. In such a partnership the government functions either as an insurer or as a reinsurer for the subsidised consequential loss policy, another option is that the government subsidises the premium directly. In the case of a Public-Private partnership with governmental reinsurance, the private insurer both retails and services the insurance policy, while retaining a part of the loss risk (Meuwissen et al., 2003).

However, the policies are reinsured not solely through the reinsurance market but also or only by the government, either as a quota share or stop loss provision. Quota share provisions specify which percentage of premiums and loss exposure the private company will retain.

Stop loss provisions specify the maximum amount of loss that the company will have to cover before the reinsurer covers the additional losses (Skees and Barnet, 1999).

Governments can also financially assist farmers for consequential losses. This kind of programme can be formalised by a public insurance scheme or by ad hoc relief payments. In case is the first one: risk covered is decided a priori; in case is a relief programme, generally functions after the outbreaks.
Many standard livestock insurance policies in Europe indemnify farmers for animal losses as a result of a number of perils, but some have been extended, sometimes as an option, to cover at least a part of consequential losses.
The indemnity of additional consequential loss coverage is based on:
1) a percentage of the insured sum (for example 10% of the value of the livestock)
2) duration of business interruption
3) actual losses.
In most cases the farmer chooses, within a certain range, the value of the livestock and the daily gross margin.
All private insurance policies exclude direct losses that are met by the public sector.
Additional constraints include a probationary period, a maximum coverage period, a multi-year policy term, a maximum insured amount, a maximum indemnification amount and a deductible.
In the table below the current EU financing schemes covering consequential livestock diseases are reviewed. The results are obtained from literature and a survey among members of CEA representatives (Comité Européen des Assurances) of the Agricultural Risks Insurance Committee. (CEA 2005, 2005a)
Few private insurance schemes exist on the European market to cover the risk of consequential losses from livestock epidemics.

Table 29. EU financing schemes covering (part of) consequential livestock losses resulting from livestock epidemics

Financing system			
	Private	Public-Private	Public
Austria	-	-	-
Belgium	-	-	-
Denmark	-	-	+
Finland	-	-	+
France	-	-	+
Germany	+	-	-
Greece	-	+	-
Ireland	-	-	-
Italy	+/-	-	-
Luxembourg	-	-	-
Netherlands	+	-	-
Portugal	-	-	-
Spain	-	+	-
Sweden	+	-	+
United Kingdom	+	-	-

Legend: - : not available, +: (partly) coverage and 1% maximum participation (head insured/head registered). +/-: it depends from the disease and from species bred.
Source: "A risk financing model for livestock epidemics in the EU.

Let's analyse briefly the situation in these member states regarding the consequential losses coverage.

Denmark: The government supports a further 20% to cover the loss of income from the compulsory slaughter of a herd.

Finland: The government is authorized to compensate consequential losses (via ad hoc payments) for farmers who suffer substantial income losses. There are no commercial insurance companies offering insurance programs for consequential losses caused by epizootic.

France: No insurance for cover epidemic losses. When an outbreak occurs the losses are paid by public authorities following a certain priorities scheme.

Germany: The private "Ertragsschadenversicherung" indemnifies farmers against the full range of consequential losses as one of the coverage options.

Italy: The additional coverage is only available for dairy cows and sheep. The level of participation is very limited (<5%).

The Netherlands: The additional coverage (only for cattle) can be or a proportion of the insured sum of the culled animals (ranging from 10% to 30%), or is based on the duration of business interruption. In certain specific cases also a mutual insurance scheme covers the consequential losses.

Spain: Farmers can insure against disease outbreaks, although only for cattle, sheep and goats (AGROSEGURO). The insurance covers the difference between the actual level of aid farmers receive when an animal is slaughtered and its real value (which is another approach to direct loss compensation). These policies are government subsidised.

Sweden: The compensation that a farmer receives from the government is calculated as the difference between the actual profit and the expected profit if the farm was still engaged in production. Compensation for consequential losses can vary from 50% up to 100% in case certain defined diseases.

UK: There are insurance schemes which would pay consequential losses, but they are not set as typical business interruption covers, but merely pay a selected percentage (usually 25%) of the direct loss compensation. This means they only pay out when animals are slaughtered and do not cover losses in restricted zones or price effects.

Few private insurance systems exist in Europe to cover the consequential losses due to livestock epidemics (e.g. Germany, Italy, Sweden, The Netherlands and the UK).
Most general livestock insurance schemes cover death and emergency slaughter because of the illness.

7.1.3 Main conclusions on the current financing schemes

The main conclusions rising up from the IRMA Report "*A risk financing model for livestock epidemics in the European Union*" (2003) with respect to the current applied risk financing schemes are:

- Direct losses. Only the values of the animals that are compulsorily slaughtered of the non-EU compensated part are compensated by means of a public or statutory private financing schemes. The amount that is payable by the farmer depends mainly on whether or not there were major outbreaks in previous years. To share the risks between the national government and the sector proportional as well as non-proportional schemes exist.

- Consequential losses. Livestock producers in Europe can currently obtain only limited coverage (private, Public-Private or public) for consequential losses as a result of an epidemic.
A widely adopted EU insurance scheme covering all epidemic diseases for all types of livestock is absent.
In some countries the government compensates above the value of the animals which are compulsorily slaughtered to cover part of the consequential losses.
Some EU member states partly compensate consequential losses on basis of actual incurred losses (also a form of ad hoc relief program exists). In some other EU member states the absence of public assistance has led to the creation of private insurance schemes for some types of livestock production.

The current applied consequential loss coverage can be based on the losses incurred or an estimation of the loss based on the period with business interruption[32] or a fixed amount. In general, farms that are confronted with losses as a result of decreased market value of their products but are not infected with an epidemic disease or are not in a movement standstill zone are not eligible for compensation.

- Producers do not commonly take up private policies that are specifically designed to cover on sequential losses. Only the German “Ertragsschadenversicherung” has a relative high level of participation.

Perspective for financial schemes

Given the specific risk under research, a mandatory system to finance direct losses will facilitate alertness and rapid alarm in case of an outbreak of an epidemic. In contrast, a consequential loss compensation scheme might be voluntary (producers can cope with this business risk in alternative ways). Compensation of direct losses can either be based on a pre-set animal value or actual market value at the moment of culling. Compensation for consequential losses can ideally be based on actual losses incurred. However, basing the indemnity on a fixed sum per day times the duration of business interruption is probably a more feasible solution (for example those countries joining the EU in the near future and those with inaccurate farm records). Farms that are confronted with losses as a result of decreased market value of their products but are not infected with an epidemic disease or are not in a movement standstill zone should not eligible for compensation.

The largest involvement of farmers is likely to be achieved by organising a levy system that is organised (partly) by the farmers themselves and a mutual insurance scheme.

The (prospective) schemes should as much as possible fulfil the following requirements:

1) No disturbance of markets;

2) Compatible with WTO agreements;

3) Run by the private market, without official EU participation; and (4) applicable to the whole of the EU.

The IRMA Study concludes by facing that the schemes should be applicable to the whole of the EU. A levy scheme and a insurance scheme can be implemented in all EU member states.

[32] Fixed sum per day times the duration.

7.2 The Expert Workshop on Options for Harmonised Cost-sharing Schemes for Epidemic Livestock Diseases

Recently[33] the European Commission asked to the Community Animal Health Policy (CAHP) and the Food Chain Evaluation Consortium (FCEC) to conduct a pre-feasibility study on cost-sharing schemes for epidemic livestock diseases.
The aim of the Commission is to further increase the level of responsibility of stakeholders regarding the prevention, the detection and control of major epidemic animal diseases.
The Commission suggested that the potential of different options should be assessed to replace current ad-hoc emergency measures, including with the support of private insurance schemes.

7.2.1 Criteria for harmonised cost-sharing schemes

I. *Categorisation of animal diseases.* Cost-sharing schemes have to take into account that the public interest in managing risks associated with a particular disease depends on the possible impacts on public health, animal health and/or the economic impacts of the disease.
II. *Incentive compatibility*. Incentives provided by cost-sharing schemes, in particular by their monetary flows, have to encourage efficient risk-reducing behaviour of all parties involved, in particular through preventive measures. Incentives for preventive measures to reduce risks and avert crises, and to minimise their effects, must be provided.
III. *Balancing costs and responsibilities*. The financing of cost-sharing schemes has to reflect the responsibilities of the parties involved.
The costs of disease control, eradication and prevention should be shared.
IV. *Prevention of distortion of competition*. State intervention should not lead to a distortion of competition between Member States.
V. *Compatibility with EU financial instruments and ongoing initiatives*. Cost sharing schemes should operate within a framework for state-support that takes into account EU financial instruments (including use of funds from modulation, if appropriate), cross-compliance requirements and WTO requirements. Cost-sharing schemes have to be seen in the ongoing discussion on risk and crisis management in the agricultural sector and the ongoing CAHP evaluation.
VI. *Harmonisation and flexibility of implementation*. Cost-sharing schemes should be harmonised to the extent necessary to fulfil the above criteria, while taking into account existing systems.

7.2.2 Main alternatives for cost-sharing schemes

Four main alternatives are available to finance prevention, the detection and control of outbreaks of major epidemic animal diseases at the Community / Member State level in the future.

[33] (17 March 2006, Brussels)

(A) Continuation of the current system of expenditure in the veterinary field.

The current financing of control measures in case of a disease outbreak is focus on compensation of direct losses[34] (mainly related to the slaughter of animals and their destruction). This provides adverse incentives under certain circumstances (and therefore could be not fully in line with criteria II). Also, the current level of financial responsibility of the parties involved (criteria III) is very different in Member States.
In some Member States the compensation of direct losses is fully paid by the government (in combination with EU-Cofinancing), no cost-sharing scheme exists. In other Member States stakeholders have to finance compulsory cost-sharing schemes that cover a part or even the whole national contribution (up to a certain limit). This lack of harmonisation might lead to a distortion of competition between Member States (criteria IV)[35].

(B) Financing costs of disease control through ad-hoc measures in case of a disease outbreak.

Ad-hoc compensation rules are usually developed after a disease-outbreak, either on national or Community level or both. This involves, however, uncertainty for farmers regarding how much compensation is being paid to them, if at all.
No incentives are provided to encourage efficient risk-reducing behaviour of all parties involved (criteria II), on the contrary it could motivate risk-increasing behaviour in certain cases because compensation in case of a disease outbreak is taken for granted. This also could imply adverse incentives to inflate aggregate losses.

(C) Setting up a unified cost-sharing scheme at the European level.

A possibility for providing compensation in the case of a disease outbreak that fulfils most of the above listed criteria could be to set up a European cost-sharing scheme, following as possible example an existing national model such as a public Animal Health Fund (NL), to which every farmer would have to contribute. A unified cost-sharing scheme at the European level would per definition not allow flexibility of implementation by the Member States and would also not take into account existing systems (criteria VI). Thus setting up a EU wide cost-sharing organisation could be out of line.

(D) Defining a harmonised Community framework for national or regional cost-sharing schemes.

The initial analysis of the evaluation team indicates that this is the preferred alternative that can be brought in line with the above criteria. The main element of this alternative is to resort to existing national schemes, and to require other Member States to set up similar systems.

[34] Definition of direct losses - Cross reference in the glossary
[35] Cross reference - Chapter 4, paragraphs 4.1.1 and 4.1.2 of the Report.

National cost-sharing schemes could have a different institutional set-up but would have to function according to common rules. This would allow for flexibility of implementation by the Member States and at the same time likely increase acceptance of stakeholders, as participation mechanisms are easier to implement at the national or regional level. Harmonised at the EU level should be:

-The obligation of Member States to introduce a cost-sharing scheme at the national or regional level;

-The objective of the different schemes, i.e. providing efficient transfer of animal health risk from farmers to a cost-sharing scheme;

-And the basic principles for efficient schemes, involving organisational principles like the responsibility for certain diseases only, and operating principles like conditions for incentive compatibility and covered risks.

This last proposal seems to be the favourite. Let's go further, studying the details of this document we are here summarising.

7.2.3 Categorisation of animal diseases (Criteria I)

Epidemic livestock diseases may involve large externalities, i.e. costs resulting for third parties. An animal health standard is efficient if it does not only account for the losses of the individual farmer but takes into account losses that may result for third parties such as farmers in the neighbourhood.

When an efficient standard is implemented, the total costs of disease over time are minimised. When efficient standards are lower than legal standards, this has no effect on prevailing animal health standards, because legal standards have to be met. When efficient standards are higher than legal standards, however, a cost-sharing scheme should require the implementation of these standards as a pre-requisite. For example, it might be efficient to have regular health checks of farm animals for all farmers (not required by law) instead of indemnifying the costs of large-scale disease outbreaks that could possibly have been prevented by such checks.

Certain animal diseases require significant public involvement in a cost-sharing scheme and participation of farmers in a scheme needs to be compulsory.

Some diseases are a large potential hazard to the economy and, or to the health of the population and are therefore normally covered by legislation.

The diseases involving large externalities are mainly extremely contagious diseases like FMD or Avian Influenza, which are referred to hereafter as Diseases with High Externalities (DHE).

Efficient animal health standards to manage the risk of these diseases are relatively high and an efficient cost-sharing scheme has to consider an effective mechanism that ensures implementation of these standards. Extremely contagious diseases are very difficult to be covered on unregulated private insurance markets because of their loss accumulation potential.

There is a public interest to cover this type of diseases in a cost-sharing scheme. A cost-sharing scheme for diseases with high externalities (DHE-scheme) should be compulsory. (With compulsory levy, like exist in some MS already[36]).

Some diseases require only limited public involvement

These diseases will hereafter be referred to as Diseases with Low Externalities (DLE). They are mostly only moderately infectious (e.g. Brucellosis, Bovine Tuberculosis). The main reason for public concern is that under specific conditions they may pose some hazard to the economy and, or to the health of the population and therefore are mostly covered by legislation.
Also, if a DLE is notifiable according to Community or OIE rules, an outbreak may lead to additional externalities through potentially affecting trade in animals and products of animal origin.

Main points:
a) Also in case of Diseases with Low Externalities (DLE) participation in a cost-sharing scheme could be compulsory, as is the case for DHE.

b) Participation in a cost-sharing scheme for DLE could be voluntary.

c) DLE diseases could be left to private insurance markets (similar to DNE, see below).

Other diseases do not require public involvement and related risks should be left to private insurance markets.

These diseases will hereafter be referred to as Diseases with No Externalities (DNE). Similar to DLE a spread to other farms usually is not to be expected, and a large-scale epidemic is almost impossible. They are mostly not covered by relevant legislation. Cost-sharing solutions for DNE can be left to private insurance markets, since there is no public interest to restrict freedom of farmers' production management decisions; governments should support the development of private insurance markets to cover these risks.

Disease categorisation could take into account regional differences.

Whether a disease poses a potentially large hazard to an economy and, or population (i.e. whether it is a DHE) may depend on the infectiousness and other characteristics of the disease, but also on regional factors like climatic and other environmental conditions, prevailing farming practices, farming density, and others.
Disease categorisation could therefore differ by region. On the other hand, having different categories of diseases may also affect the free circulation of goods and animals.

[36]Cross reference: Chapter 4: see tables 25 and 26 of the Report.

Main points:
a) Disease categorisation should be done at the Community level.

b) Disease categorisation should be done by each cost-sharing scheme according to harmonized criteria.

c) Disease categorisation should be done by each cost-sharing scheme according to criteria defined by each scheme.

7.2.4 Incentive compatibility (criteria II)

Contributions of farmers to a cost-sharing scheme have to reflect their individual risks.

Whenever a cost-sharing organisation observes risk-relevant production circumstances or decisions (e.g. location, degree of vertical integration of the production chain, the intensity of livestock contacts with other farms, etc.) the contributions to a cost-sharing scheme have to be differentiated according to the effect of these risk-relevant factors on expected losses. At minimum, the contributions to a cost-sharing scheme should reflect regional differences in risk, caused by e.g. differences in livestock density.

Main points:
a) A cost-sharing organisation should be required to differentiate contributions of farmers according to the individual risk of the farmer.

b) A cost-sharing organisation should be required to provide a bonus (reduction of contribution) for farmers that take specific measures to decrease their individual risk.

c) A cost-sharing organisation should be required to differentiate contributions by taking into account regional differences in risk.

The compensation payment made by the cost-sharing scheme to a farmer for losses in case of disease outbreak has to involve a deductible.

There are costly production management decisions, which are not observable and verifiable for a cost-sharing organisation at reasonable cost. Many of these decisions influence the probability of losses caused by epidemic livestock diseases, e.g. hygienic and bio-security measures. In order to provide incentives for risk-reducing measures, loss risk should not be completely transferred to a cost-sharing organisation. Thus a farmer has to bear some financial consequences of a disease outbreak up to a deductible, which could be defined as a share of the sum assured, e.g. 10% of herd value. Losses exceeding the deductible will be indemnified.

The compensation payment made by the cost-sharing scheme to a farmer for losses in case of disease outbreak has to depend on the time of reporting the suspicion.

There are also costly production management decisions that affect loss size, which are mainly emergency reaction decisions after disease-outbreak. In order to provide incentives for loss reduction, the compensation should not indemnify high losses completely (e.g. through a proportional coinsurance rate for high losses). The most important loss size-reducing measure is early reporting of (suspected) disease outbreaks so that control measures can be applied in good time. The number of diseased or dead animals can serve as a signal for the interval between the time when first symptoms could have been detected and the time of reporting[37].

Main points:
a) A cost-sharing organisation should apply current best practices and compensate only 50% of the value of diseased animals at the time of reporting, and not at all dead animals.

b) A cost-sharing organisation should further differentiate compensation rules for diseased and dead animals at the time of reporting depending on the characteristics of the disease, to take into account differences in morbidity and mortality.

c) A cost-sharing organisation should apply other compensation rules that provide incentives for early reporting.

The cost-sharing scheme has to cover all production risks to avoid providing adverse incentives

Existing cost-sharing schemes mainly indemnify direct losses such as the value of compulsory, pre-emptive and welfare slaughtered animals and organizational costs related to destruction, monitoring etc. Consequential losses such as production losses directly related to regulatory measures (e.g. movement restrictions) are not covered.
In some countries private insurance covers consequential losses, but in most countries the market is not well developed and demand is low.
The main disadvantage of compensating direct losses at a higher rate than consequential losses is that farmers may have the possibility to partly shift consequential into direct losses[38].

[37]For example, the Dutch Animal Health Fund generally compensates only 50% of the value of diseased animals. Dead animals at the time of reporting are not compensated at all. Animals that are diseased or die after the outbreak is reported to the authorities are compensated fully.

[38] For example a farmer facing production losses due to movement restrictions that are not compensated could theoretically shift these losses, through intentional infection of his livestock, into losses caused by compulsory slaughtered animals that are compensated.

Some losses may be indemnified fully without providing adverse incentives.

Losses that cannot be influenced by farmers at all should be fully indemnified in a cost-sharing scheme that aims at providing the highest possible risk transfer to farmers. This consideration is mainly relevant for losses, which are directly related to regulatory measures, e.g. costs of emergency vaccination etc.
However, if a highest possible risk transfer to farmers is not intended, it is also possible to only partially indemnify this type of losses without affecting incentive compatibility.

Main points:
a) A cost-sharing organisation could compensate fully losses, which are directly related to regulatory measures and cannot be influenced by farmers, e.g. costs of emergency vaccination etc.

Price risks should not be covered by a cost-sharing scheme.

Farmers have to bear severe price risks, as market prices for animals can drop significantly following a serious livestock epidemic.
However, price risks can be adequately managed on futures markets (make a note with the text already in the report) or other similar instruments and would therefore not have to be covered by a compulsory cost-sharing scheme.

Losses of animal value have to be indemnified not according to pre-crisis market prices, but according to replacement values.

This loss assessment rule applies to total losses of animal value due to compulsory, pre-emptive and welfare slaughtering. Also losses from a drop in value due to regulatory measures (e.g. resulting from emergency vaccination) have to be assessed according to replacement values. The currently used value assessment rule for compensation, the market value of the animal before the disease outbreak, could lead to similar adverse incentives as higher compensation rates for direct losses than for consequential losses.
Some production losses that are hard to quantify can be compensated with flat rates
Business interruption and other costs related to movement restrictions may be hard to quantify, as they often manifest in work or opportunity costs. These can be indemnified through daily rates for the time period when restrictions are in place. These rates should be negotiated ex-ante between farmer and cost-sharing organisation.

Balancing costs and responsibilities, compatibility with Community requirements (criteria III-V)

- *A harmonisation of cost-sharing schemes in the EU must avoid a distortion of competition.*

Current compensation schemes for direct losses of certain diseases differ significantly between Member States with respect to farmers' contributions (with coverage by farmers of 100% of the national share up to a certain threshold to no farmer contribution at all). This may distort competition.
Therefore any public contribution (Community and Member State national/regional contribution) to a cost-sharing scheme should be designed to avoid a distortion of competition. Guidelines on State aids have to be taken into account.

- *The level of public financial support to cost-sharing schemes and the risk transfer between regions is a political decision.*

The specific design of the proposed rules is not related to the degree to which public contributions are provided to cost-sharing schemes. An efficiency condition of a cost-sharing scheme is that it has to demand risk-adjusted contributions. This implies that the expected compensation payments of a cost-sharing scheme should be ideally covered fully by farmers' contributions (ex-ante or ex-post). On the other hand, public intervention may be required to safeguard that in the case of disease outbreak adequate action is taken immediately. Additionally, a cost-sharing scheme has to incur additional expenses for determining and implementing efficient safety standards (including prevention measures), which could be easier implemented with public support. Any approach taken has to balance these aspects.

7.2.5 Flexibility of implementation at the national / regional level (criteria VI)

Public involvement does not determine institutional arrangements of a cost-sharing scheme.

Observations

Any cost-sharing scheme has to fulfil three tasks.

1. efficient animal health standards have to be developed;
2. and to be implemented;
3. a cost-sharing scheme has to compensate losses.

These tasks can be fulfilled through one or more institutions. They can be realised in a variety, of institutional arrangements, each of which involves assets and disadvantage.
Likely options that mainly build upon institutional models already existing in some Member States include funds and public or private insurance:

Option A1 - Public fund

A fund administered through a public authority could perform all tasks of an efficient cost-sharing scheme. A public fund could be expected to be accepted among farmers. It would however require additional effort for the authority to perform all the tasks associated with an efficient cost-

sharing scheme, in particular related to risk-adjustment of farmers' contributions. A public fund can be financed through ex-ante levies, ex-post levies or a combination of both.

Option A2 - Mutual fund

A mutual fund is owned by the participating farmers, it works like a private risk pool of the farming industry. This may lead to a high acceptance among farmers.
Due to its ownership structure, a mutual fund is expected by the members to act in the interest of the farmers. A mutual fund would have similar problems like a public fund regarding risk adjustment of contributions.

Option B - Public insurer

A public insurer is an independent organisation that implements safety standards and undertakes insurance functions. Its status as an independent organisation makes a public insurer to some extent autonomous of elected governments.
A public insurer could possibly provide better incentives for risk-adjusted farm management than a fund solution.

Option C1 - Competitive insurance market

Farmers have to obtain a contract with one of a number of competing insurers. As DHE-risks pose a severe loss accumulation potential, private insurers would demand high safety loadings. In order to establish an insurance market with reasonable prices, a state-run reinsurance is necessary. Also, this option requires thorough control of the efficiency of the animal health standards, determined in the insurance contracts with farmers, through the public authorities.

Option C2 – Private insurers' pool

A private insurers' pool is cooperation among private insurers, who jointly establish and own the pool company that operates the cost-sharing scheme. Through establishing a private insurers' pool, existing underwriting awareness of insurance companies can be directly used. The pool would demand risk-adjusted premiums, thus providing incentives for considering risk in farm management decisions. As with the previous scheme, a state-run reinsurance and, or other forms of public support (e.g. financial contribution towards the premiums paid by farmers) may be required.

Observations

This chapter is a collection of ideas developed in several studies made in the last few years with the intent to analyse the costs and the impacts of recent epidemic livestock outbreaks happened in Europe.

This collection of information gives us some tool to observe that for DHE (Disease with High Externalities) is not worth and even not possible to design a cost sharing scheme at a private level. These epidemic livestock diseases can have a large potential hazard to the economy and, in the worse case, on the health of the population. Therefore, DHE are covered by legislation. Assuming that the public interest in managing risks associated with these particular high externalities diseases is very strong; it seems less practical to discuss whether a private insurance scheme can take place. Besides, the possibility of forecasting these high risks events, it's seems very hard; at least would be possible to predict or better say prevent if an efficient risk-reducing behaviour, in particular through preventive measures would systematically take place.

On the other hand, from the outcomes of the DG SANCO workshop (17 March 2006, Brussels) seems clear that it can be possible to build a cost shearing scheme for the DLE (Disease with Low Externalities) or DNE (Disease with No Externalities).

The intent of this section is to follow out a more detailed analysis of livestock sanitary risks, exploring which are the determining factors of those epidemics risks. Thus, let's use the conclusion of this section as an opening for the coming one.

Point of view: role of the public policy in controlling animal diseases.

"The Role of Public Policy in controlling animal disease" is explained in a paper published by CAB International.
The authors (Sumner, Bervejillo and Jarvis, CABI 2006) support the general economic concepts that apply to public policy in other areas apply as well to animal diseases.
The most important of these is the idea that for some goods or services, private firms will provide socially insufficient quantities due to insufficient private economic incentives.
The lack of sufficient private incentives may be attributed to "public good" characteristics or to the occurrence of external costs or benefits (Sumner, Berejillo and Jarvis, 2006).
What they most stress is this concept of considering infectious diseases management as a public good and the closely related idea of externalities related to the cost and benefits of private efforts to control infectious diseases.
In fact, they analyse if many producers may find that there is sufficient private incentive to vaccinate their animals against a serious contagious disease. Together, they may largely solve the public good problem of vaccinating against a disease.
However, if there are still a few individuals for whom the private incentive is insufficient, they may not vaccinate and thus a reservoir of infection may remain and be capable of infecting other animals.
That reservoir will require that the vaccinating producers continue to vaccinate, at significant cost, rather than be able to cease vaccinating, as would occur if the disease could be eradicated in the region. There is a reason for government animal disease control, either by requiring vaccinations or by directly carrying out the vaccinations required to eliminate the reservoir.

Private agents have adequate incentives to carry out most of the expenditures that are made for the management of animal diseases. In fact, animal disease management frequently has some externalities and, or public good characteristics, government frequently has a role in disease management.
It's observed the nature of externalities and public good characteristics, particularly whether they are large and thus warrant concern, is determined by geography and biology. Both of these affect the natural habitat for specific diseases and so the probability that a disease will spread from one region to another.
The probability of spread is a crucial consideration in government intervention, whether regarding efforts to exclude, control or eradicate the disease from a region. A further aspect to be considered is the distributional effects of disease outbreaks and how forward pricing, or the use of future markets, may mitigate risks (Sumner, Bervejillo and Jarvis). Compensation for animal destroyed during eradication or control efforts may also reduce direct losses.

Animal diseases Economic Impacts: a Survey of Literature and Typology of Research Approaches

A survey of literature and typology of research approaches was carried out in 2005 by the "*International Food and Agribusiness Management Association*[39]"(IAMA).
Animal diseases can create strong economic impacts on:
-Production
-Market and price
-Trade
-Impacts on food security and nutrition
-Human health
-Environment
-Financial costs
Disease impacts are generally easy to identify but may be difficult to quantify. (Food and Agricultural Organization, 2001)

Table 27: Economics of Animal Disease Typology Matrix

Scope of Analysis	**Research Objectives**	**Policy instruments**	**Research Opportunity**
Producer Impacts	Business Loss Incentives for control	Compensation Testing	Epidemiological & Economic models Catastrophic Insurance
Agribusiness Suppliers and Supporting Activities	Business Loss Shareholders welfare loss	Production practices Certification Traceability	Economic Geography Market Structure

[39] James Pritchett, Dawm Thilmany and Kamina Johonson (USA) International Food and Agribusiness Management Review, Volume 8, Issue 1, 2005

Consumer	Welfare loss Risk assessment	Education Certification Information	Substitution
Sector	Industry losses	Traceability Certification	Epidemiological Links Market structure Distribution
Regional	Welfare impact Industry loss	Travel restrictions Compensation Prescribed cull	Economic geography Mitigation and prevention costs
National and International	Welfare impact Distribution of loss	Regionalisation Tariffs/non tariff Barriers Restrictions	Economic geography Distribution of impacts

Source: J. Pritchett, et al IAMA, 2005

An accurate assessment of losses due to animal disease is useful for policy makers who may consider these potential losses against the costs of disease prevention and mitigation, and models that provide the most comprehensive assessment of potential losses are most useful to decision makers. (Pritchett et al. 2005)

The table above summarise the economic approaches to quantify economic loss ranging from individual agent impacts (producers, consumers, businesses) to broader, inter-sector impacts (sector, regional and national/international studies) to provide the reader a baseline of information on what is already discovered. Several directions exist for animal disease studies at each of the various market levels, which can subsequently feed better baseline data to broader sector, regional and national analyses.

Potential economic losses include higher prices or diminished satisfaction for consumers and producers. But, some individuals actually charge better after an animal disease outbreak, such as producers who are not quarantined, or consumers who are uninfluenced by animal disease outbreaks (and who are able to buy at lower prices), an issue for future researchers to consider.

Too often data limitations prevent analysis of spatial economics when evaluating outbreak scenarios. Finally, market structure plays an important dimension in determining the distribution of losses associated with an animal disease outbreak.

7.3 1st OIE International Conference on Use of GIS in Veterinary Activities

In October 2006 was organised in Abruzzo (Italy) the 1st OIE (World Organisation for Animal Health) International Conference on the use of GIS (Geographic Information System).

The exponential growth of GIS in recent years has tremendously expanded the capacities of analysis in epidemiological studies and led to the development of new powerful tools in the surveillance of animal diseases. GIS, spatial analysis and remote sensing allow precious

epidemiological investigations and data collection, correlating diseases' trends with climatic and environmental information, thus increasing understanding of the links between disease processes and explanatory spatial variables.
Until recently, the use of these tools in veterinary public health were underexploited, due to the prohibitive cost of hardware and the great complexity of GIS software that required very specialised personnel.
In the last decade, thanks to the revolutionary change in the area of computerised technology, the reduction of prices and the availability of new simple web based software, GIS tools have become more widely accessible by veterinary services at all levels. At the same time, the increased awareness of the possibilities offered by these tools has created new opportunities for decision makers to enhance their planning, analysis and monitoring capabilities. The new technologies, furthermore, offer a new way of sharing and accessing spatial and non-spatial data across groups and institutions. It seems necessary, at this point, to take a picture of the state of the art in the use of GIS in veterinary activities, in order to identify priority needs in the development of new GIS tools at international level for the surveillance of animal diseases and zoonoses and in the definition of proposals for their implementation.

Forage pastures insurance in Spain

Another kind of risk for livestock production is the productivity reduction for pastures and fodder 8.2.1).
Recently was introduced in Spain a new livestock insurance tool to prevent the possible decrease of pasture forage availability in case of adverse climate conditions.
With this type of insurance farmers get a reimbursement when, due to bad climatic conditions (ex: draught), the forage present on the pasture is reduced compared to the normal production average in the correspondent area.
The aim of this kind of guarantee is the indemnity paid to the farmer because of the increased production price, due to the necessity of feeding the animals with different modalities.
This insurance system has a specific evaluation of damage; in fact it is done by means of satellite images which are able to measure the level of forage that a determined area should produce in favorable conditions.

8. Production and income variability of EU agriculture

Climatic events and epizootic outbreaks introduce variability both in the agricultural production and in the income of the farmers. The variability is far from uniform across the EU: In some regions and sectors the production and income is relatively stable, while other regions or sectors are highly unstable. Mapping the variability level has a two-fold interest for the assessment of agricultural insurances: better understanding which are the areas and sectors for which stabilisation is more important and tuning the extrapolation of the premium rates in a hypothetical EU-wide system. The data required to analyse these phenomena come in part from statistical sources, mainly from Eurostat, but other sources are also important, in particular the FADN (Farm Accountancy Data Network). Meteorological databases and agro-meteorological models also provide tools to improve the analysis of the variability.

8.1 Concepts and scale

The variability of the farm situation can correspond to several concepts:

- Variability of farm income (e.g. by farm type, size)
- Variability of yield.
- Specific risks: meteorological, diseases, etc.

Scale of risk indicators is a delicate issue for the quantification and mapping of variability. It can be considered at two different stages: for the assessment of risk or for the presentation of results. Let us put an example to illustrate the difference. Consider the probability that the yield of wheat is more than 20% below the normal yield (long term trend).

The concept can be applied at a farm scale if we consider a farm (selected at random for example), we estimate somehow the probability of the yield reduction for that farm and we average this probability for a given set of farms, for example all the farms in a region. In this case we compute the indicator at the farm level and map the results at the scale of the region. Results are different if we first consider the average yield of the region and then we estimate the probability of a yield reduction of more than 20%. In this case the concept is applied at regional level.

For the purpose of insurances risk indicators should be computed at the scale of the farm, but at this stage we do not have suitable data for this purpose. Therefore we will apply the concepts at a coarser scale: regions, farm types, size categories or physical

geographic units. The question of downscaling data for the computation of risk indicators at farm scale can be tackled, but is out of the scope of this study.

For the maps and comparisons made below, indices have been computed at a coarse level. It is expected that the geographic comparison of a risk index computed at a coarse scale corresponds approximately to the comparison at a farm scale. For example if the probability of a yield reduction above 20% is higher in region A than in region B, it can be expected that the average probability of such a reduction for the farms will be higher in region A than in region B, although this is not mathematically sure. Data aggregation in time series has usually a smoothing effect. The result is that risk indicators computed from aggregated data, as they are in the maps below, generally underestimates the level of risk.

8.2 Specific risks

For all the maps hereafter we use CGMS (Crop Growth Monitoring System). CGMS is the kernel of the EC agro-meteorological system (MARS Crop Yield Forecasting System), that finds its legal basis in EU Parliament - Council Co-decision 1445/2000/CE for the period 1999-2003. This co-decision was recently renewed to cover the period 2004-2007 (Ref. PE/CONS 3661/1/03 OJ L 309 of 26.11.2003) and again in the FP6/JRC-Multi Annual Working Program (Action 1121: MARS-Stat period 2002-2006) for the related R&D activities. The mission of the “system” is to provide timely, consistent and reliable analysis at pan-European level on the status of the crops and on the harvest prospective. The information and the derived forecasts are used at CAP decision maker level especially to fill crop balance sheet estimates. For instance in 2003 the system contributed to assess the effect of the severe summer drought on the European crop productions. The system has started R&D in the late 80s (Genovese, 1994) and has become fully operational since 1999.
Today the system is organized around 3 internal “infrastructures”, namely a Meteorological Monitoring Infrastructure (main DB is the observed interpolated meteorological data since 1975), a Vegetation Monitoring Infrastructure (main DB is the vegetation indicators based on low resolution satellite data since 1989), Agrometeorological Infrastructure (main DBs are crop parameters, crop calendars and phenology). The DB are exploited to run a main crop growth simulation model (CGMS-WOFOST) and a pasture model (CGMS-LINGRA). The analyses consist in the integration of all of the information gathered in order to conclude on the short term climate effects on crop behaviour. Crop indicators are generated and used as predictors in statistical analyses to forecast crop yields.
The parameters simulated are aggregated at different NUTS levels and sometimes a re-calibration based on observed data is needed. This can be explained by the fact that the model assumes as constant or as not influencing biotic and a-biotic limiting factors, such

as pests and diseases, micronutrients deficiencies. This explains why for instance a simulated storage organ can not be used as it is, to explain plant yield. The quality of the re-calibration versus observed time series of yields becomes of course dependent as well on the quality of the reference data. Besides this, a time series analysis is often necessary because of the presence of trend factors in inter-annual yield variations. This can be linked mainly to technological factors (a more efficient agriculture, best variety selection).
Further than model improvement linked to the enlargement to new EU Member States, the main directions of R&D are the creation of an agro-phenology network at European level, the set up of a complete pasture monitoring system, the introduction of ensembles weather forecasts into the system (ENSEMBLE FP6-IP); the creation of a model-modular approach and the integration with other ecological modelling and DB at European level for CAP scenarios creation and analysis (SEAMLESS FP6-IP). A recent independent study showed that the system in terms of crop yield predictions is well performing and that the system evolution in the last years resulted in lower prediction errors.

8.2.1 Drought

The parameter selected to map the risk of drought is the relative soil moisture (RSM) estimated by CGMS using meteorological data interpolated in a 50-km grid focussing the estimation on the lowest altitude quartile in the cell, in which the highest share of agriculture is supposed to be concentrated. RSM integrates the information on rainfall, soil water capacity and needs of the plant, taking into account the phenological calendar, the temperature and the global radiation.

If CGMS estimates for a given crop a value 0 for the Relative Soil Moisture (RSM), this indicates a considerable water stress for that crop; if this happens during the development stages of growth, flowering or grain filling, this corresponds to a serious drought situation. The impact of a drought situation is not the same in all the development stages of the crop. We have made a first rough split before/after flowering starts. After the start of flowering (until short before maturity), a drought event is considered twice as serious as before flowering. When the grains (or other storage organs) have been filled and the plant is close to maturity, dry soil is not considered anymore a source of damage.

Figure 13. reports the proportion of situations of serious drought for wheat in the period 1975-2006. Few areas have a significant risk of severe drought measured with this parameter. These areas are generally concentrated in southern Europe. Some spots also appear in central and Northern Europe, mainly in coastal areas; they might be due to computational artefacts in the meteorological data interpolation. Since the drought indices refer to non-irrigated agriculture, for some corps like sugar beets and potatoes

threshold parameters have been introduced to exclude areas where these crops are cultivated only under irrigation. A certain number of anomalies in these maps show that fine-tuning of parameters still needs to be improved.

An alternative drought indicator has been defined considering an intermediate drought situation when the RSM <10% or the RSM < ½ min (40%, the long-term average RSM for that time of the year). This means for example that an RSM=15% in an area where the long term average is more than 30% will be considered an intermediate drought situation, but RSM=25% in an area where the long term average is more than 50% will not be considered drought at all. This indicator seems better modulated and show again most serious risks, but significant wheat growing areas appear to have drought problems in the area of northern Poland, east Germany, Baltic countries and Scandinavia, probably due to soils with relative low water retention potential (post-glacial soils, consisting of gravel, loose sands and loamy sands).
For spring barley, the geographic patterns of risk indicators are similar but slightly shifted northwards (ref. Figure 14.).

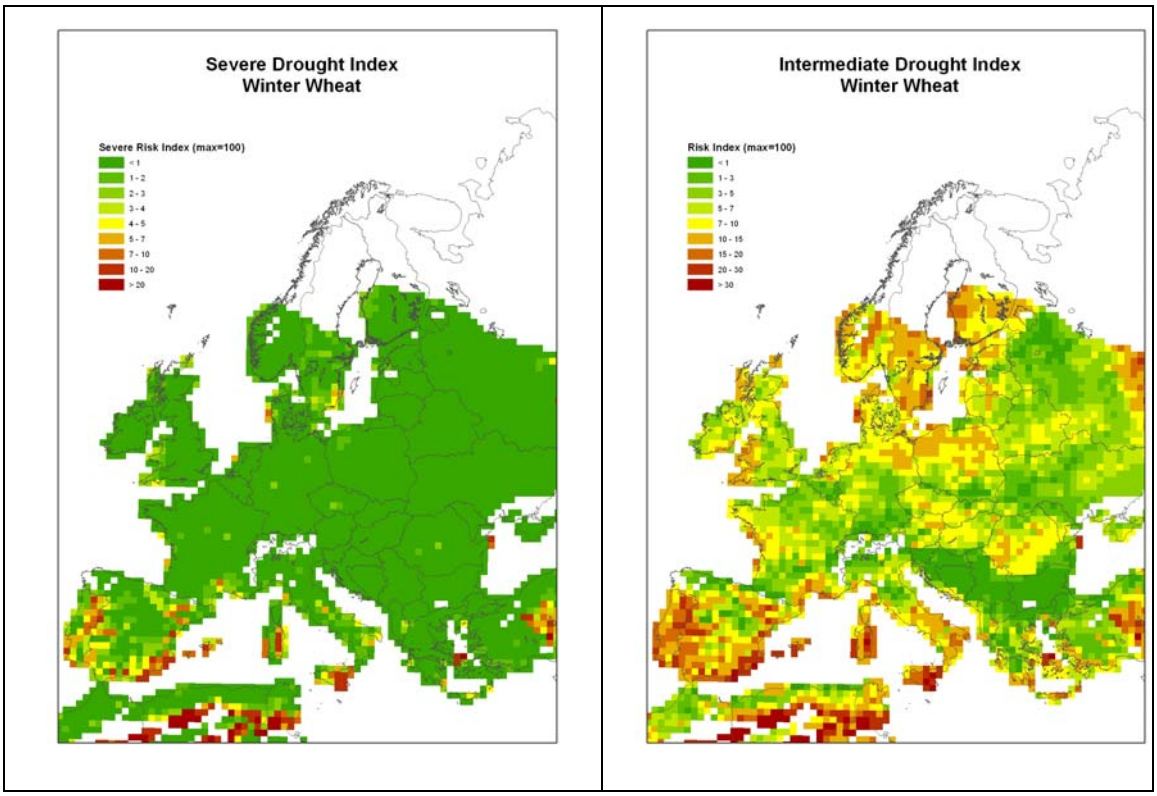


Figure 13. Common winter wheat: % of decades in crop development period of serious drought (left) and index combining severe and intermediate drought situation. (RMS=0 estimated with CGMS). Meteorological data 1975-2006.

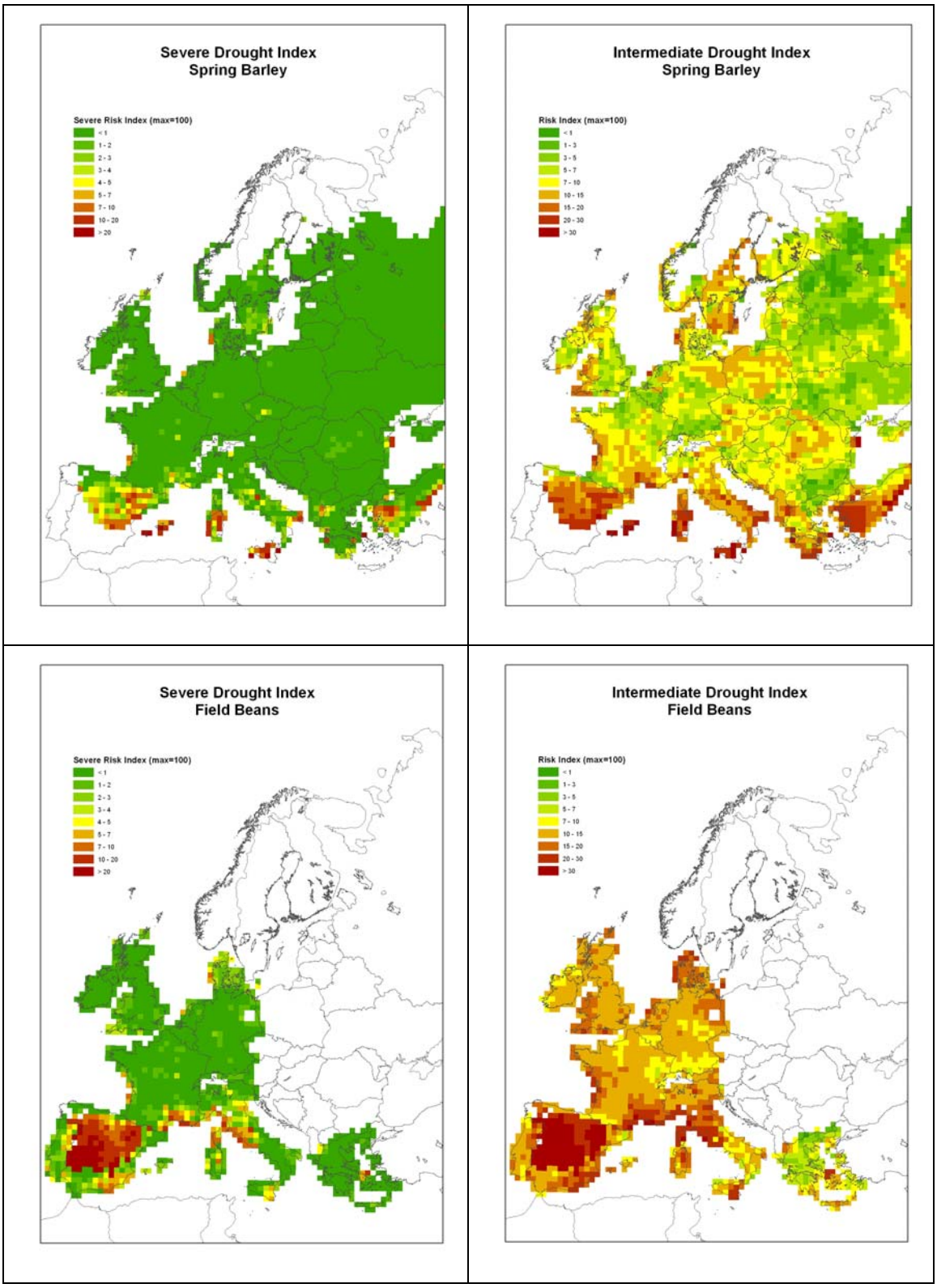


Figure 14. Drought risk indexes for spring barley and field beans.

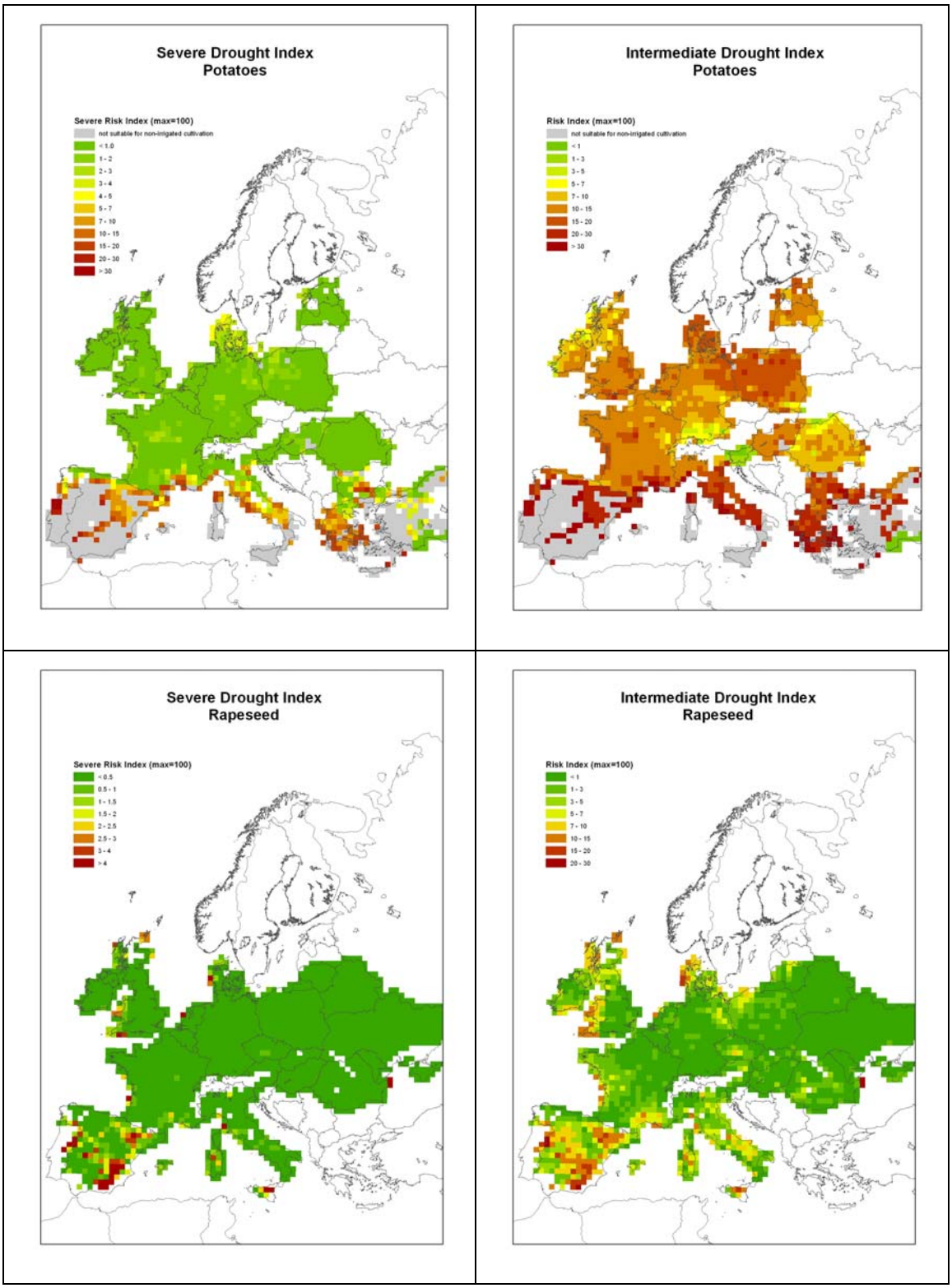


Figure 15. Drought risk indexes for potatoes and rapeseed.

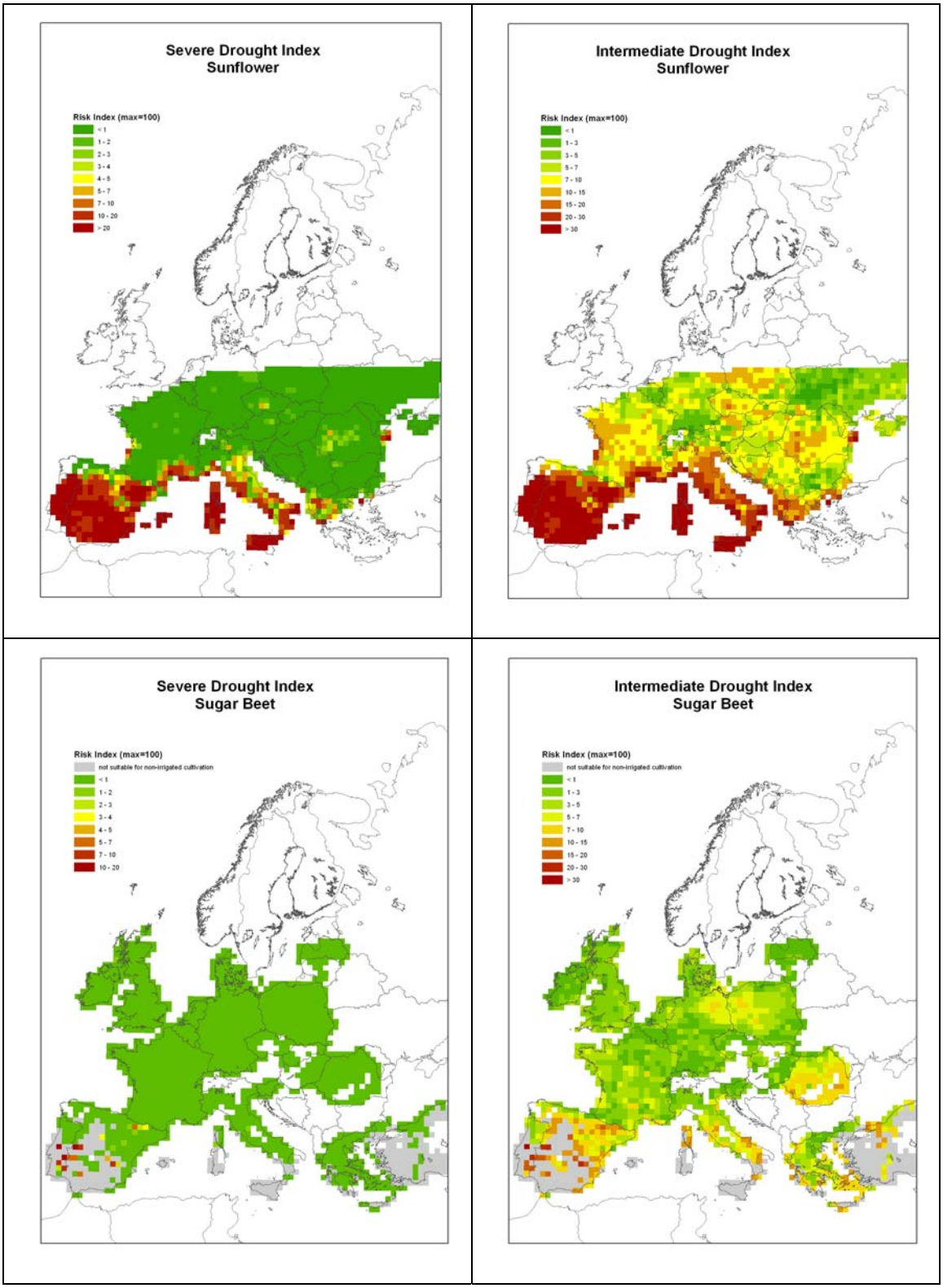


Figure 16. Drought risk indexes for sunflower and sugar beet.

8.2.2 Pastures and fodder: productivity reduction risk.

Productivity reduction for pastures and fodder present a specific difficulty for insurances compared with annual field crops, such as cereals or oilseeds: In the case of annual field crops, the evaluation of damages can be made with one visit to the field just before the harvest time. In the case of pasture and fodder, grass is consumed by animals in a continuous way or has several cuts during the year, in irregular dates. On the other hand there are seldom reliable statistical data on pasture productivity. This makes very difficult the assessment on the filed of damages on pastures and fodder.

An alternative approach to overcome this difficulty is provided by vegetation indexes from satellite images. We have used the so-called “dry matter productivity index”, computed from the SPOT-VEGETATION sensor with 1 km resolution. This type of sensor has the advantage of a high repetitiveness (daily), compared with other types of images, that can have a finer spatial resolution, but for which it becomes very difficult to obtain a high number of images along the year.

Insurance products based on indirect indexes computed on satellite images are already operational in Spain. The currently used system in Spain is based on NDVI (Normalised Difference Vegetation Index) computed on NOAA-AVHRR images, but we believe SPOT-VEGETATION images are preferable for this purpose, because a better geometric co-registration of the images, even if the time series are shorter than for NOAA-AVHRR.

The map in Figure 17. corresponds to the expected payment that an insurance company would have to pay under the hypothesis of an indirect area-index insurance policy defined on the basis of these images with a straight deductible of 20%. The premium rate would be computed consequently.

The losses (above the 20% deductible) in each year are mapped in Figure 18. and Figure 19. These maps illustrate how strongly systemic is this type of risk. On the other hand it can be also seen that most of the average loss above the deductible is due to the losses in the last year; this means that there is a level of uncertainty in the estimation of the long term risk because of the short time series (8 years). A longer time series is theoretically possible by inter-calibration of NOAA-AVHRR, but the reliability of the inter-annual comparisons is not as good as with a complete series of SPOT-VEGETATION images. In terms of insurances this means that the insurance companies should probably use slightly higher premium rates.

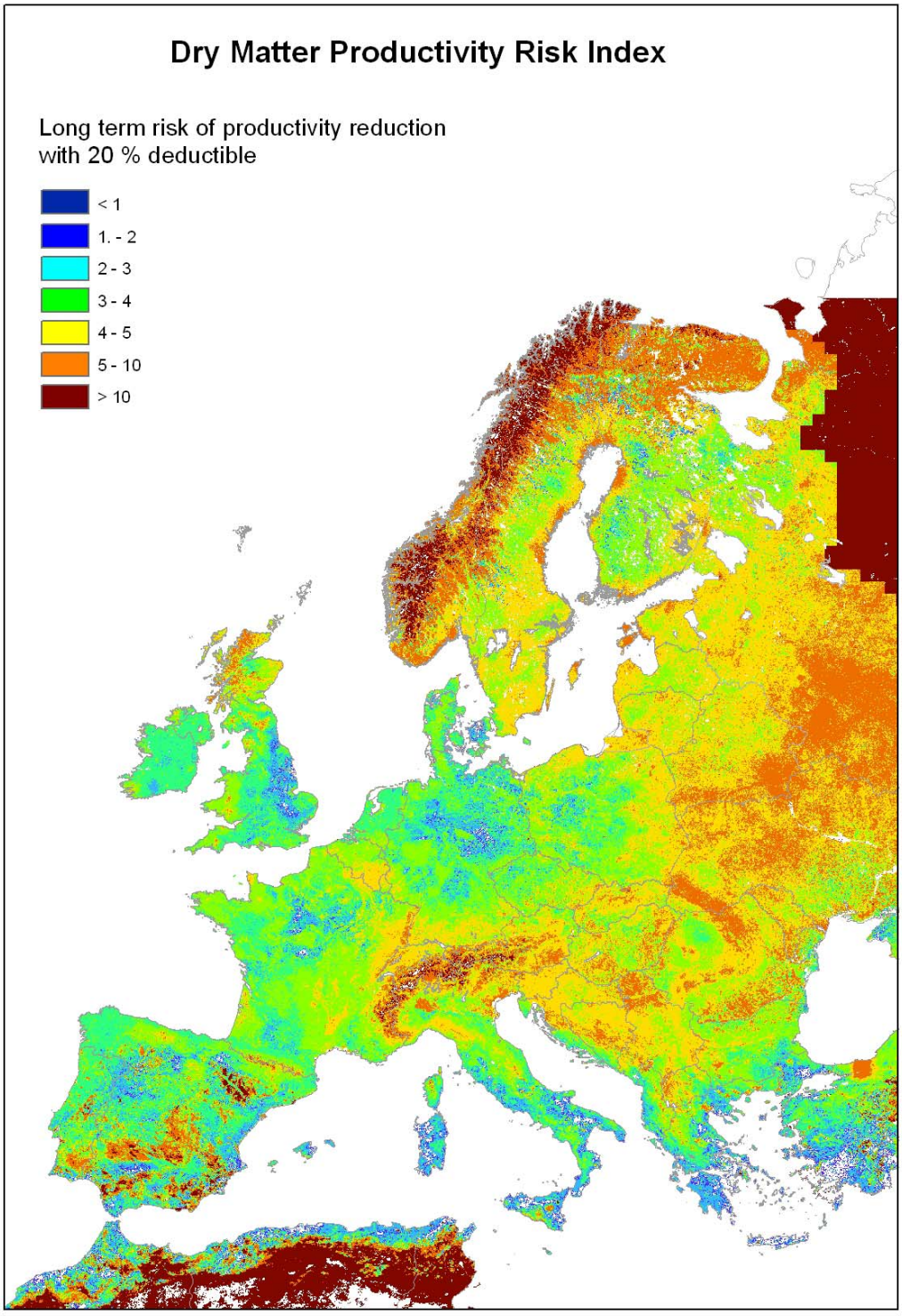


Figure 17. Risk index map for pasture and fodder computed on SPOT-VEGETATION satellite images.

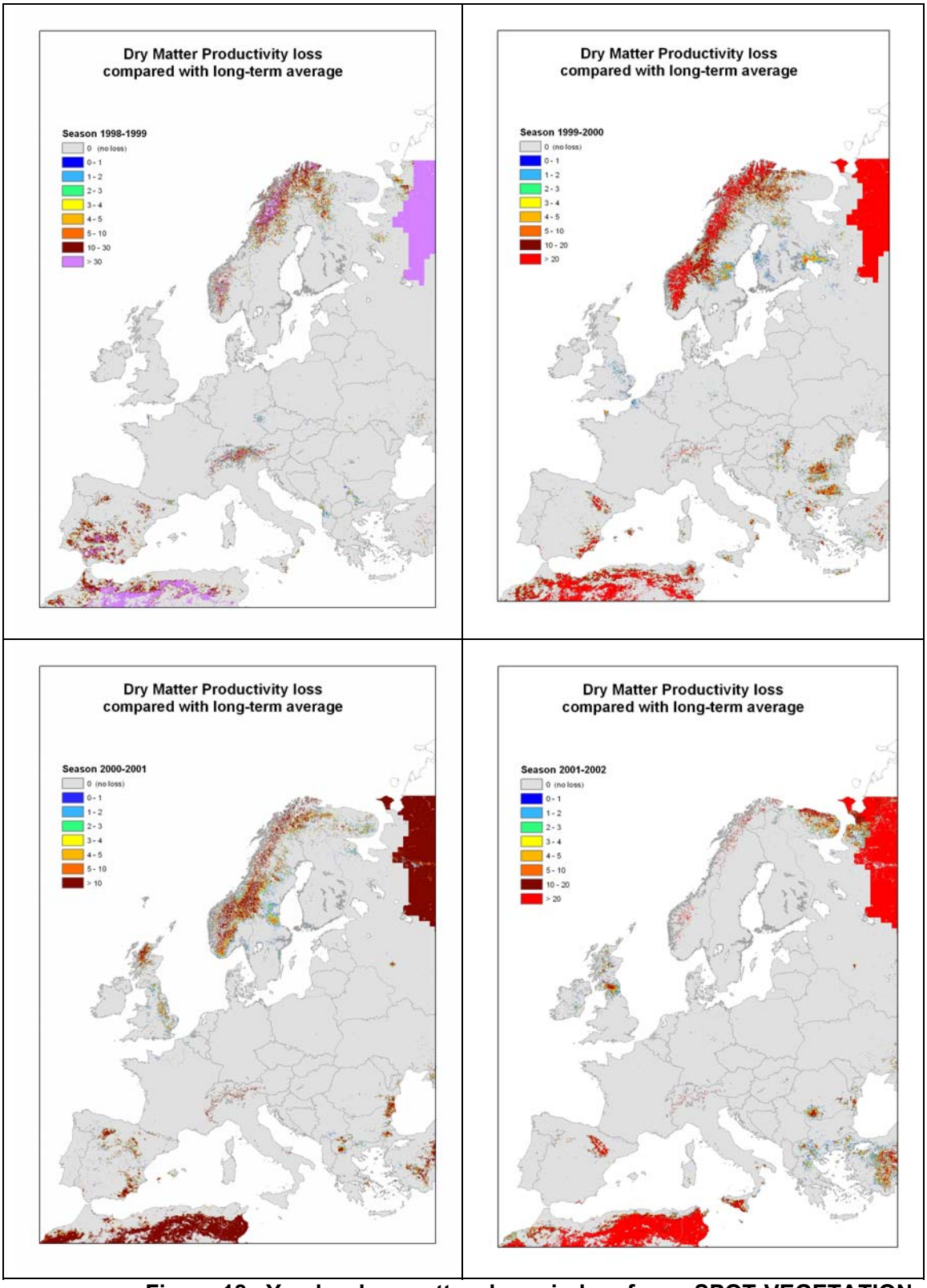


Figure 18. Yearly dry matter loss index from SPOT-VEGETATION 1998-2002.

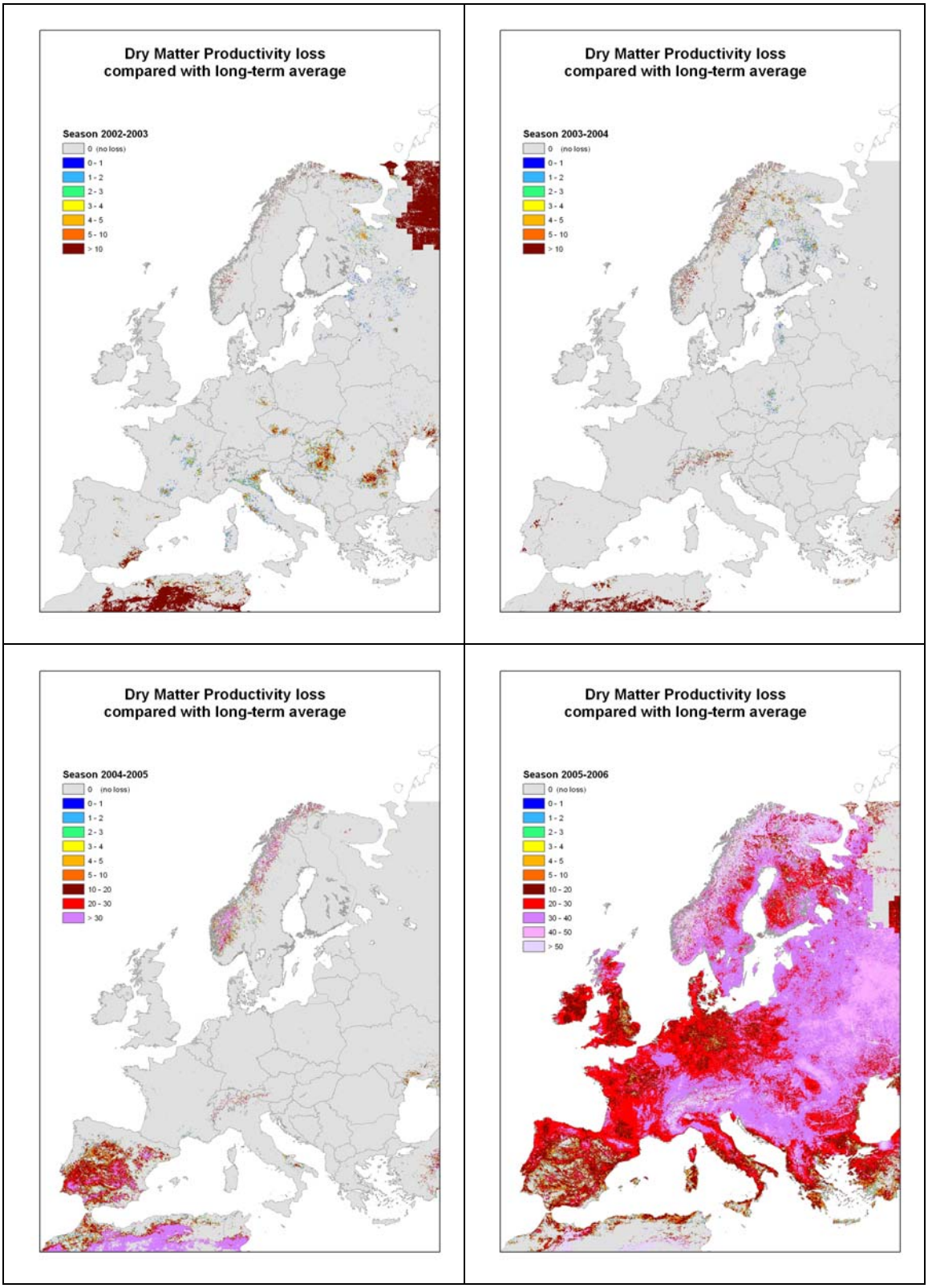


Figure 19. Yearly dry matter loss index from SPOT-VEGETATION 2002-2006.

8.2.3 Excessive rain at harvest time

We use meteorological data interpolated in the CGMS 50-km grid. Meteorological data are estimated for the lowest altitude quartile in the cell, in which the highest share of agriculture is supposed to be. For each cell *c* and each year *t*, we consider for each crop the rainfall in the decade of maturity $r_{1,t,c}$, the decade before $r_{0,t,c}$ and the decade after $r_{2,t,c}$.

$$r_{t,c} = r_{0,t,c} + r_{1,t,c} + r_{2,t,c}$$

We consider that rainfall is harmful if it is higher than the local long-term average $\bar{r}_c$ by more than 40 mm. In any case only $r_{t,c} > 80\ mm$ are considered potentially harmful. The following pages represent maps of an indicator of damage per year due to excessive rain at harvest time computed through:

$$yr_{t,c} = \begin{cases} 0 & if\ r_{t,c} \le 80\ or\ r_{t,c} \le 40 + \bar{r}_c \\ else & r_{t,c} - \max(80\ ,\ 40 + \bar{r}_c) \end{cases}$$

The long term risk indicator will be $y\bar{r}_c$. This indicator still needs to be validated. it is based on agro-meteorologist expert knowledge and we use it at this stage to get a general view of the risk. The following figures depict the regional distribution of the risk index based on excessive rain events during harvest time.

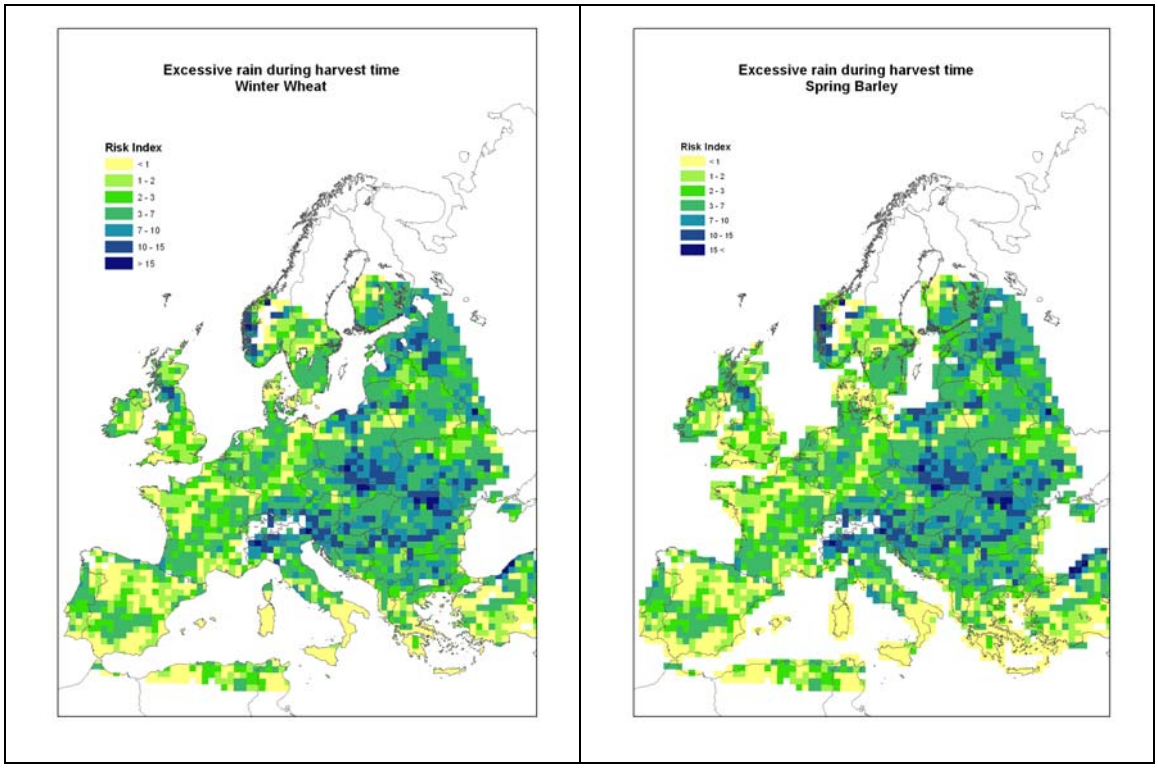


Figure 20. Risk index based on excessive rain events at harvest time; computed for winter wheat and spring barley.

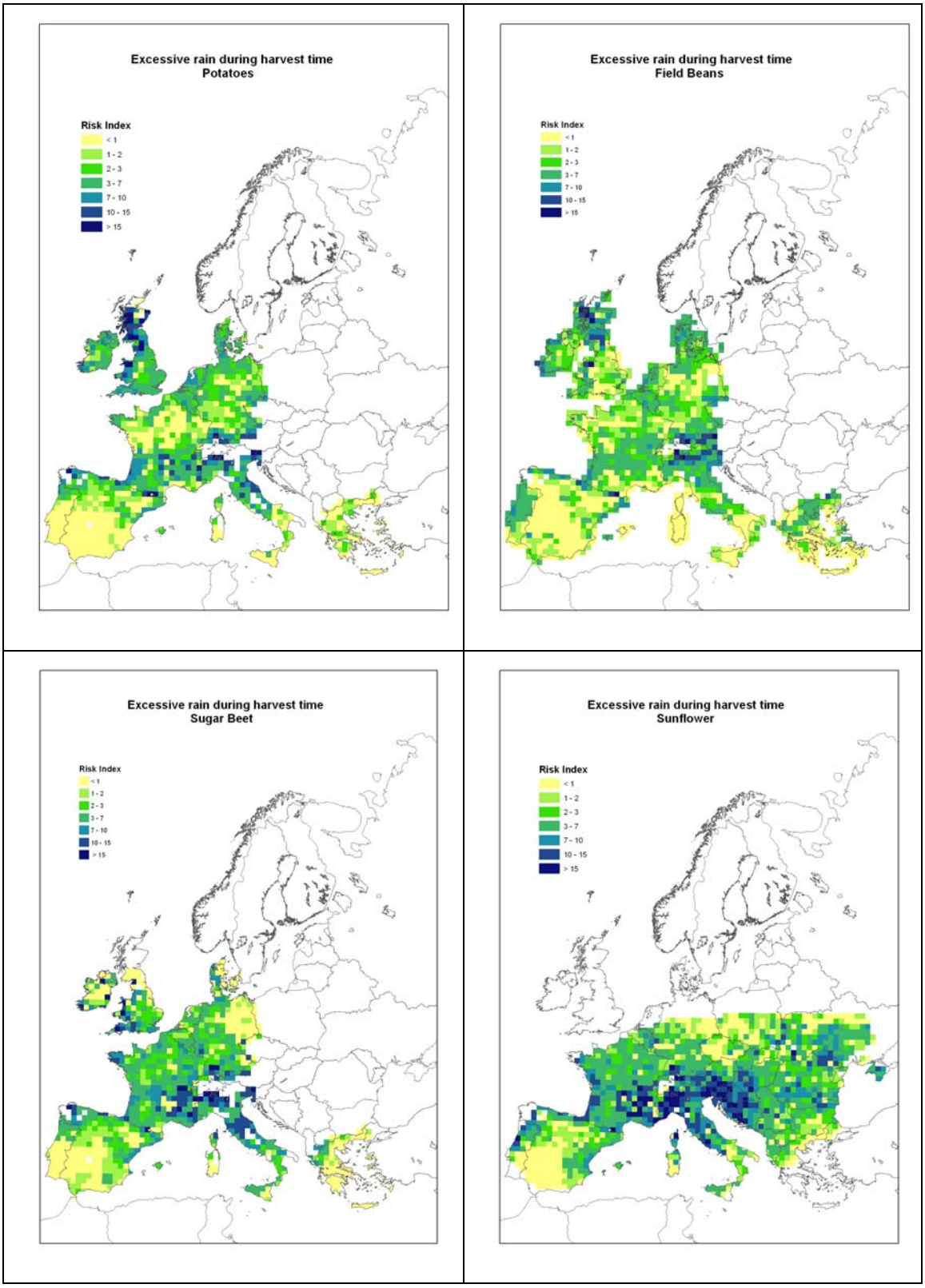


Figure 21. Risk index based on excessive rain events at harvest time; computed for potatoes, field beans, sugar beets and sunflower

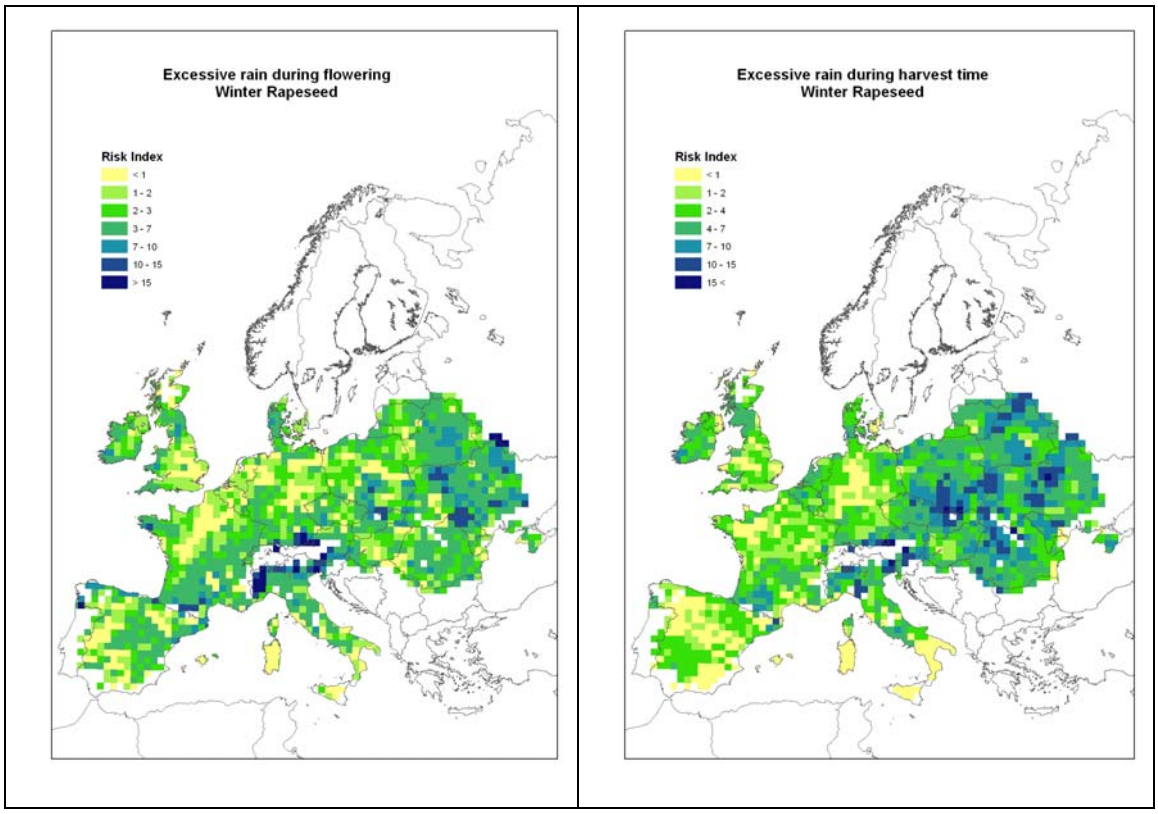


Figure 22. Risk index based on excessive rain events during flowering and harvest time computed for winter rapeseed.

8.2.4 Frost

Extreme cold in winter can make a substantial damage to crops. The level of damage obviously depends on the minimum temperatures, but should not be assessed by a straight mapping of minimum temperatures as reported by meteorological observatories (temperature of the air at 2 m above the ground). It requires some elaboration taking into account the recent thermal history (last days) and the protective effect of snow. A progressive lowering of temperatures is less harmful than an abrupt frost, because the plant has the time of protecting itself by a physiologic process knows as hardening. The following maps give an idea of the potential damage by low temperatures, but they still need some elaboration and validation for a more synthetic risk index.

A temperature of 0°C at 3 cm soil depth (crown level) doesn't represent menace for the main winter crops but it implies the stop of the growth; temperatures between -6 and -9°C at 3 cm soil depth (crown level) may affect the unhardened sensitive winter cereals (like winter barley or durum wheat). Temperatures between -9 and -12°C at 3 cm soil depth may affect medium hardened sensible winter cereals (like winter barley or durum wheat) or unhardened winter wheat corps. Temperatures between -12 and -15°C at 3

cm soil depth may reduce drastically the plant population of sensible winter cereals (like winter barley or durum wheat) or even affect the medium hardened winter wheat corps. At temperatures between -15 and -18°C at 3 cm soil depth, winter crops like winter barley or durum wheat have very low chances of survival and serious damages for winter wheat are expected (depending on cultivar and hardening index). Below -18°C at 3 cm soil depth, winter wheat crops are subject of severe to lethal damages (spring re-sowing may be necessary in most of the cases) some cultivars of rye are able to resist at -21°C.

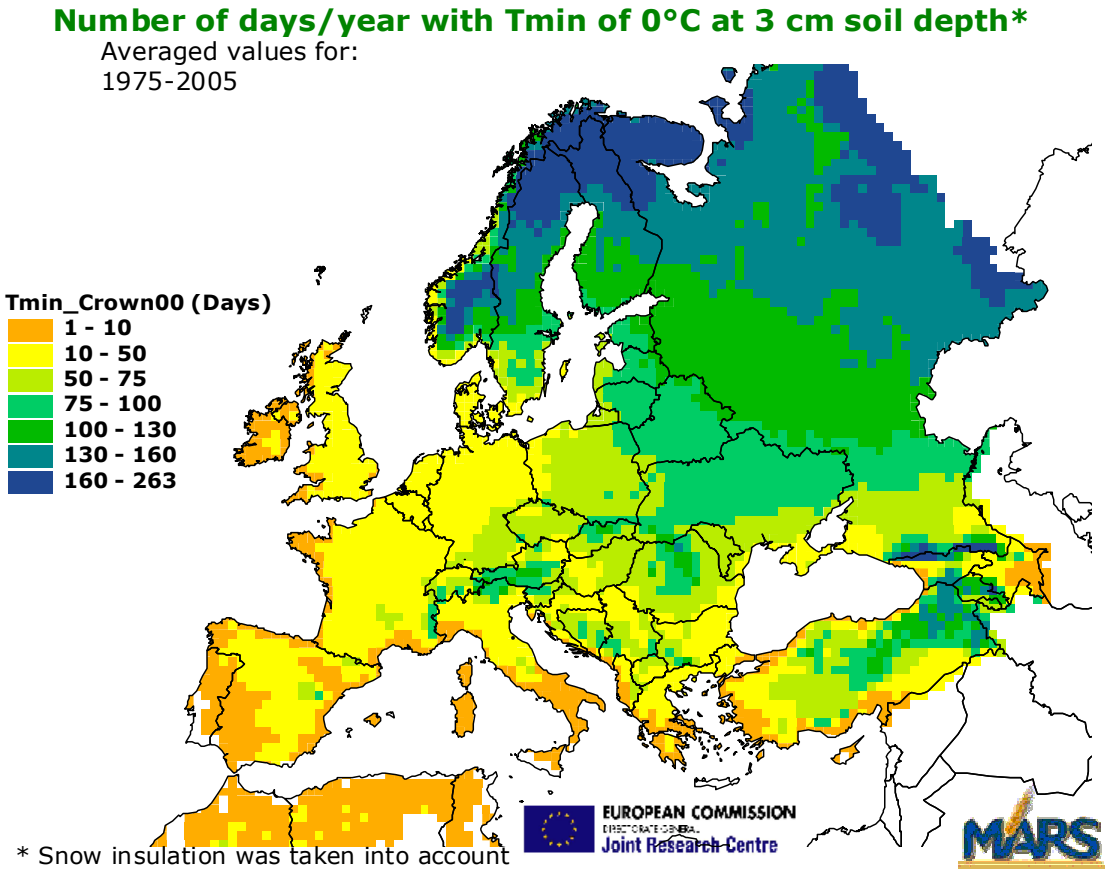


Figure 23. Long term average of the number of days/year of frost at crown level.

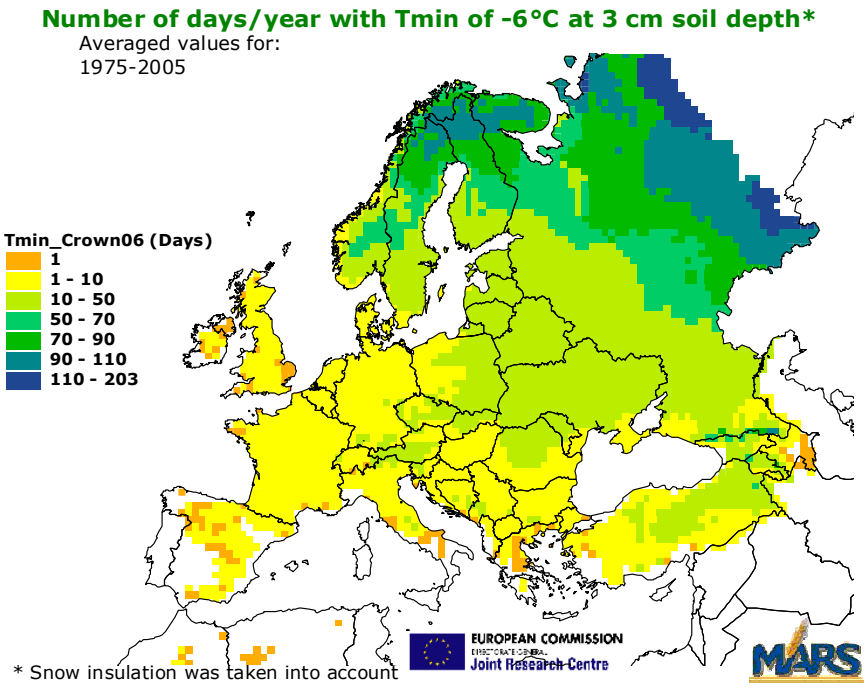


Figure 24. Long term average of the number of days/year of frost below -6°C at crown level..

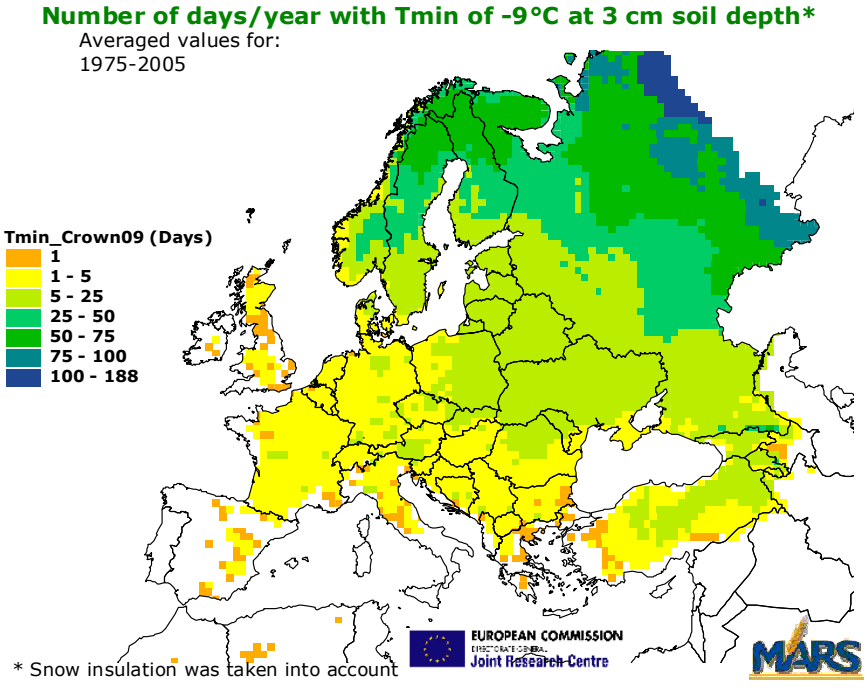


Figure 25. Long term average of the number of days/year of frost below -9°C at crown level.

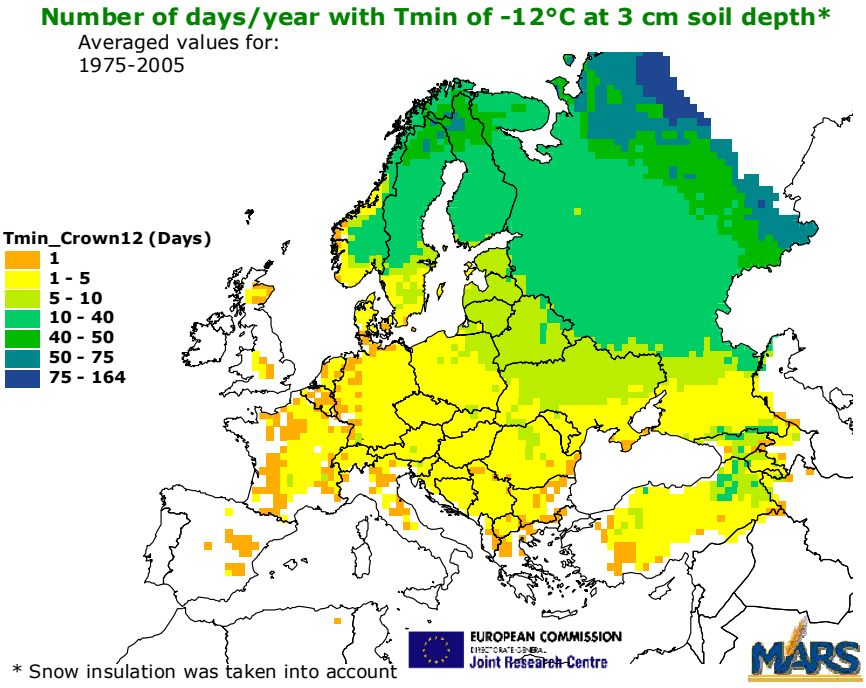


Figure 26. Long term average of the number of days/year of frost below -12°C at crown level..

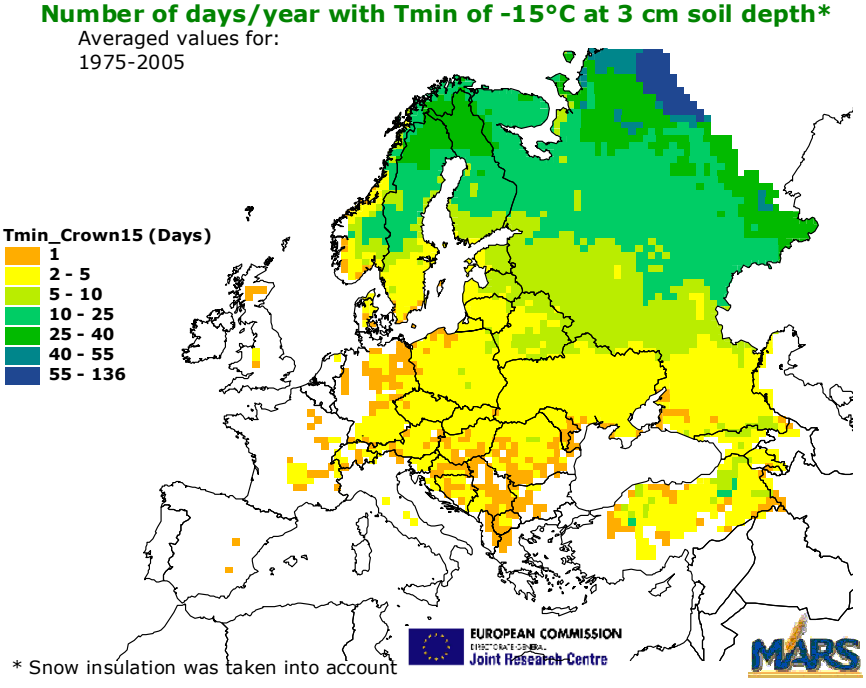


Figure 27. Long term average of the number of days/year of frost below -15°C at crown level.

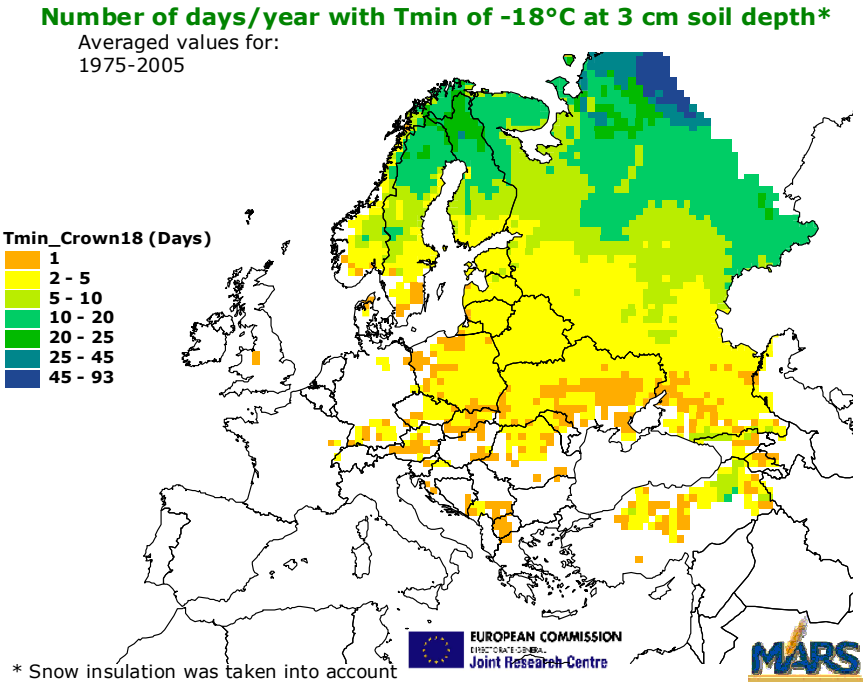


Figure 28. Long term average of the number of days/year of frost below -18°C at crown level.

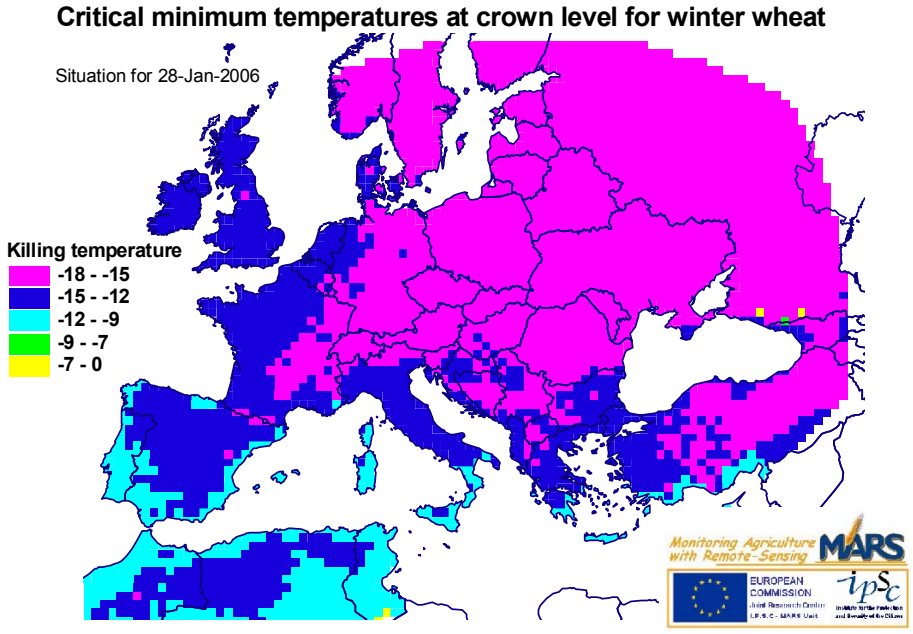


Figure 29. Critical minimum temperatures at crown level for winter wheat.

An estimation of the daily level of resistance of winter wheat may be derived from the hardening index (integrating the thermal history of the crop since emergence). This calculus better reflect the physiological status of the crop. Quality of the crop calendars used in simulation is very important. In case of uncertainty of sowing/emergence date, the run of some alternative scenarios may be necessary.

Direct frost damages represent only a part (even if it is considered the most important) of the winter kill. Further developments for simulation other aspects of winter kill like ice encasement are considered in MARS-STAT (simulation of crop height may be a necessary step).

8.3 Income variability

The Farm Accountancy Data Network (FADN) is the main source of data for the analysis of farmer's income. Let us first remind the main characteristics of FADN (sometimes known by its French name RICA: Réseau d'Information Comptable Agricole).

8.3.1 The FADN

FADN was launched in 1965. It is an annual survey carried out by the Member States of the European Union. The network collects every year accountancy data from a sample of the agricultural holdings in the European Union. Derived from national surveys, the FADN provides harmonised micro-economic data that is, i.e. the bookkeeping principles are the same in all countries. Holdings are selected to take part in the survey on the basis of sampling plans established at the level of each region in the Union. The survey does not cover all the agricultural holdings in the Union but only those which due to their size could be considered commercial. The method applied aims to provide representative data along three dimensions: region, economic size and type of farming.
The aim of the network is to gather accountancy data from farms for the determination of incomes and business analysis of agricultural holdings. Currently, the annual sample covers approximately 80.000 holdings. They represent a population of about 5.000.000 farms in the 25 Member States, which cover approximately 90% of the total utilized agricultural area (UAA) and account for more than 90% of the total agricultural production of the Union. The information collected, for each sample farm, concerns approximately 1000 variables and is transmitted by National Liaison Agencies. These variables described in a Farm Return refer to:

- Physical and structural data, such as location, crop areas, livestock numbers, labour force, etc.
- Economic and financial data, such as the value of production of the different crops, stocks, sales and purchases, production costs, assets, liabilities,

production quotas and subsidies, including those connected with the application of CAP measures

All individual data relating to individual farms received by the Commission are highly confidential. Only aggregated results for groups of farms are published at a level of aggregation, from which information relating to individual farms cannot be discerned.

To ensure that this sample reflects the heterogeneity of farming before the sample of farms, the field of observation is stratified according to 3 criteria: region, economic size and type of farming. A certain number of farms are selected in each stratum and an individual weight is applied to each farm in the sample, this corresponding to the number of farms in the 3-way stratification cell of the field of observations divided by the number of farms in the corresponding cell in the sample. This weighting system is used in the calculation of standard results and generally also for the estimations in specific studies.

The standard results are a set of statistics, calculated from the Farm Returns, which are periodically produced and published by the Commission. They describe in considerable detail the economic situation of farmers by different groups. The FADN survey covers the entire range of agricultural activities on farms. It also collects data on non-agricultural farming activities (such as tourism and forestry).

FADN provides in fact a unique source of data to analyse the income of farmers making the difference between different types of farms, size of the holding and regions. The data allow simulating to a certain extent what would have happened without insurances; in particular the costs of insurances are collected for each farm of the sample. Unfortunately the compensations received by farmers in case of crisis are insufficiently detailed for a proper analysis. We shall come later to this point.

First let's have a look at the following maps with very different types of farms (field crop specialised, mixed crops specialised and milk production specialised farm) and there variability of income. The data are shown for the so-called "FADN regions" (in general NUTS0, NUTS 1 or NUTS2 regions, depending on the country).

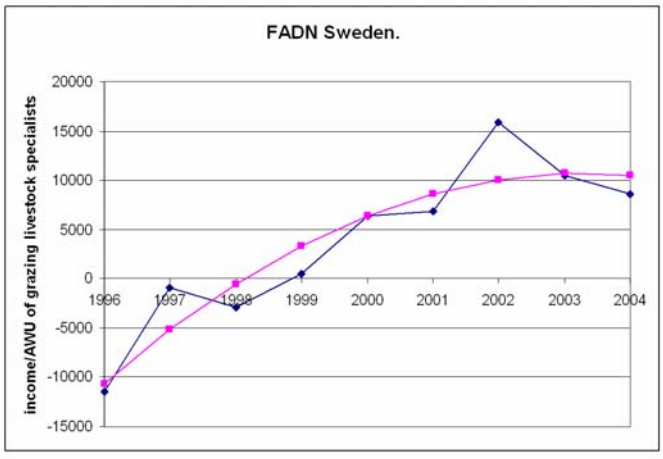


Figure 30. Example of abnormal effect in the adjustment of a quadratic trend.

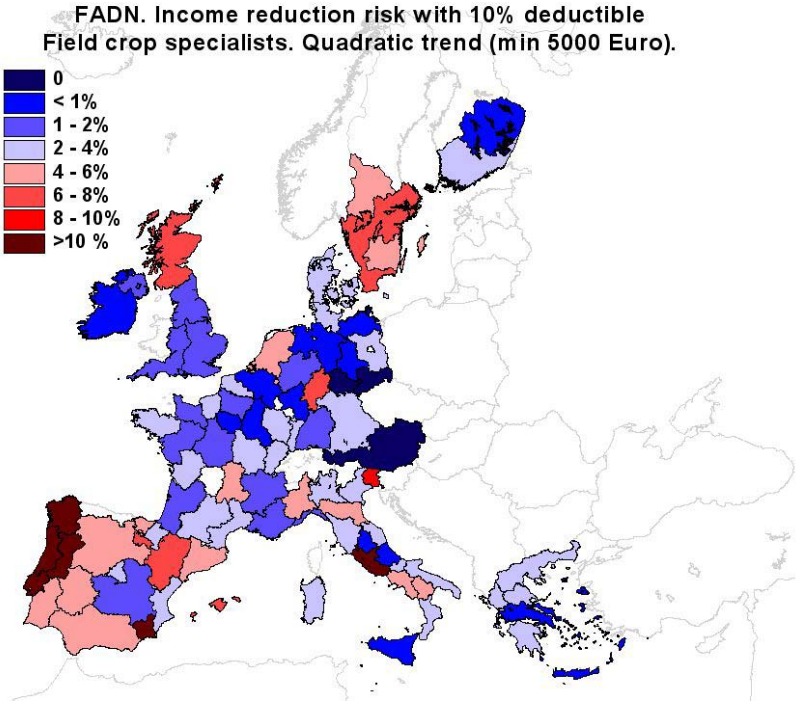


Figure 31. Risk index for income reduction: field crop specialists.

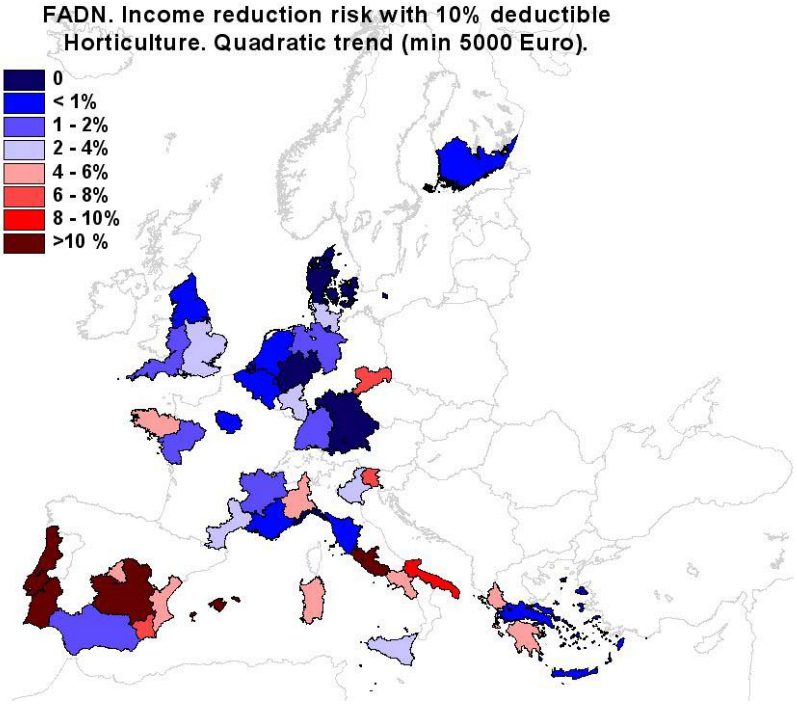


Figure 32. Risk index for income reduction: Horticulture specialists.

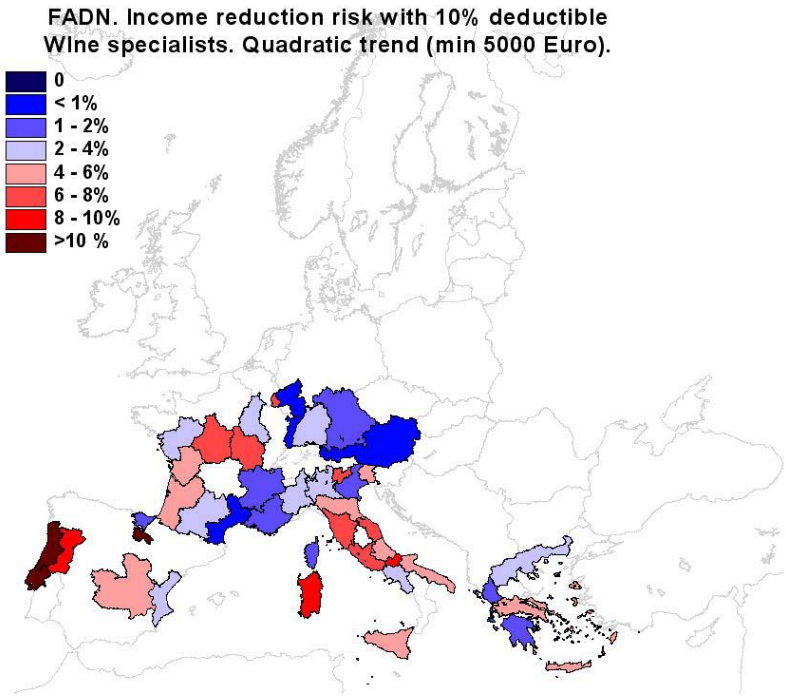


Figure 33. Risk index for income reduction: wine specialists.

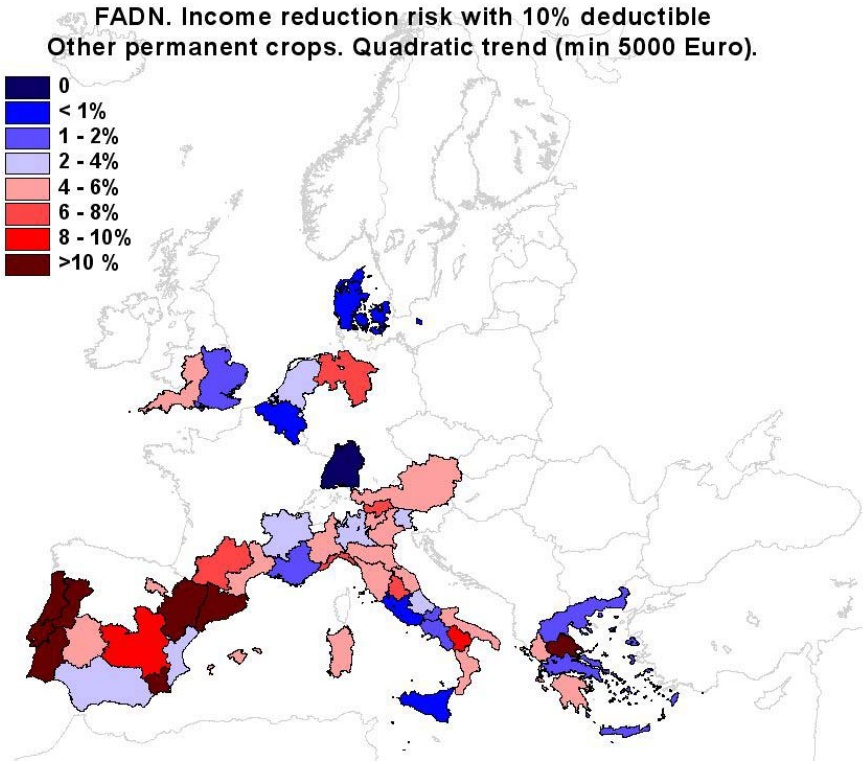


Figure 34. Risk index for income reduction: other permanent crops.

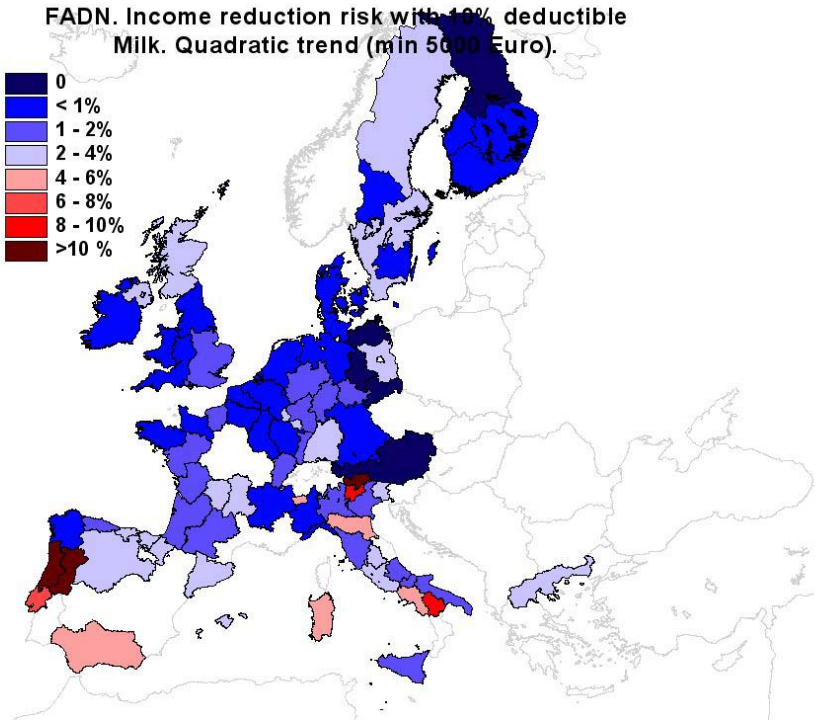


Figure 35. Risk index for income reduction: milk specialists.

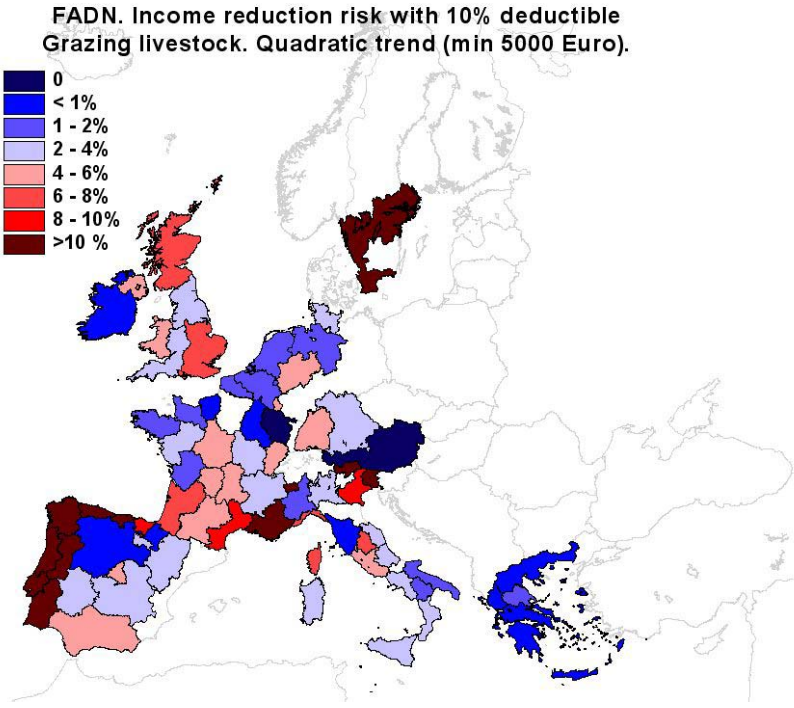


Figure 36. Risk index for income reduction: grazing livestock.

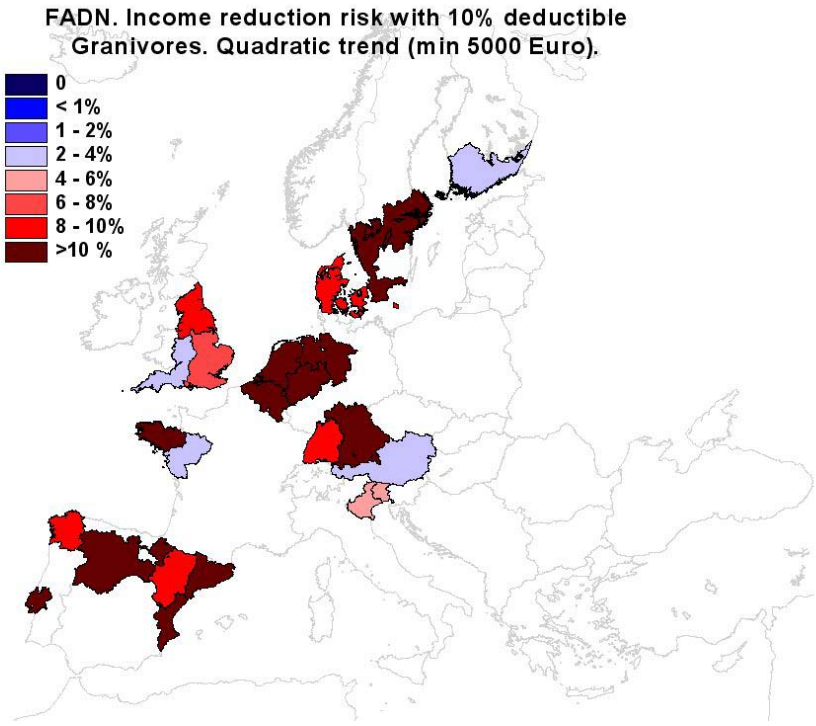


Figure 37. Risk index for income reduction: granivore specialists.

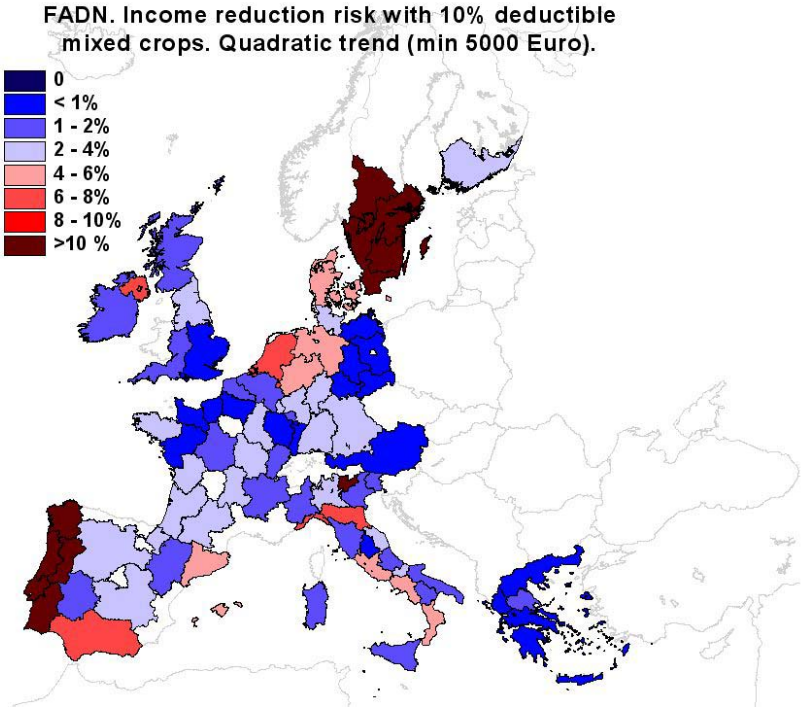


Figure 38. Risk index for income reduction: mixed farming.

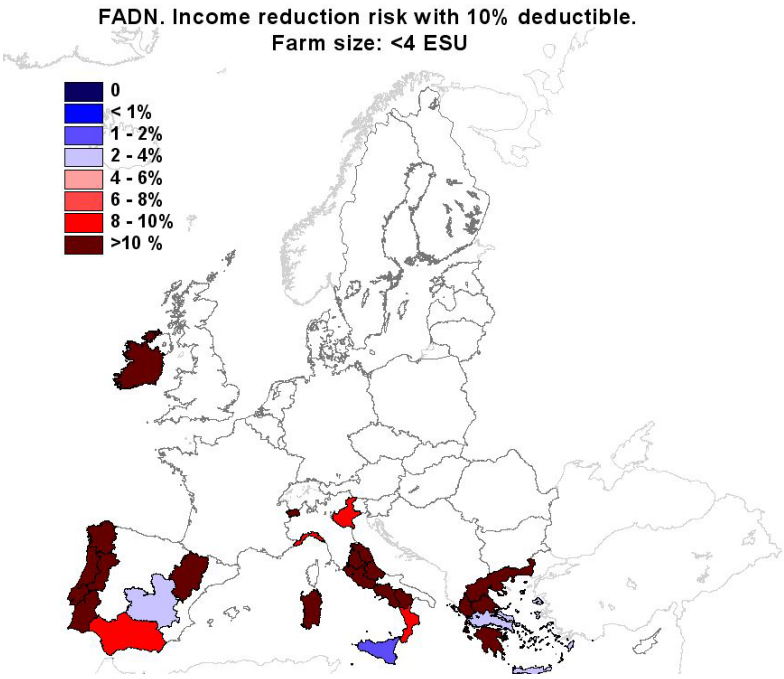


Figure 39. Risk index for income reduction: very small farms < 4 ESU.

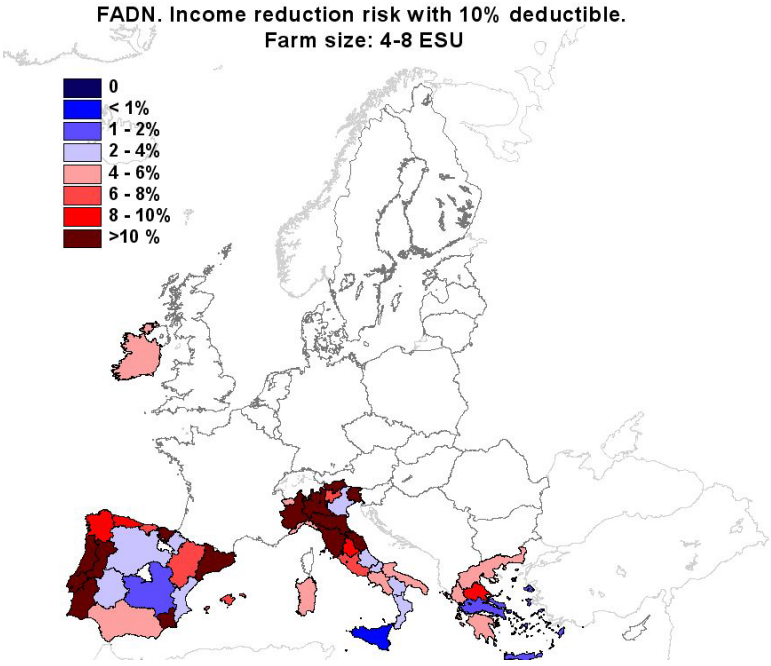


Figure 40. Risk index for income reduction: small farms 4-8 ESU.

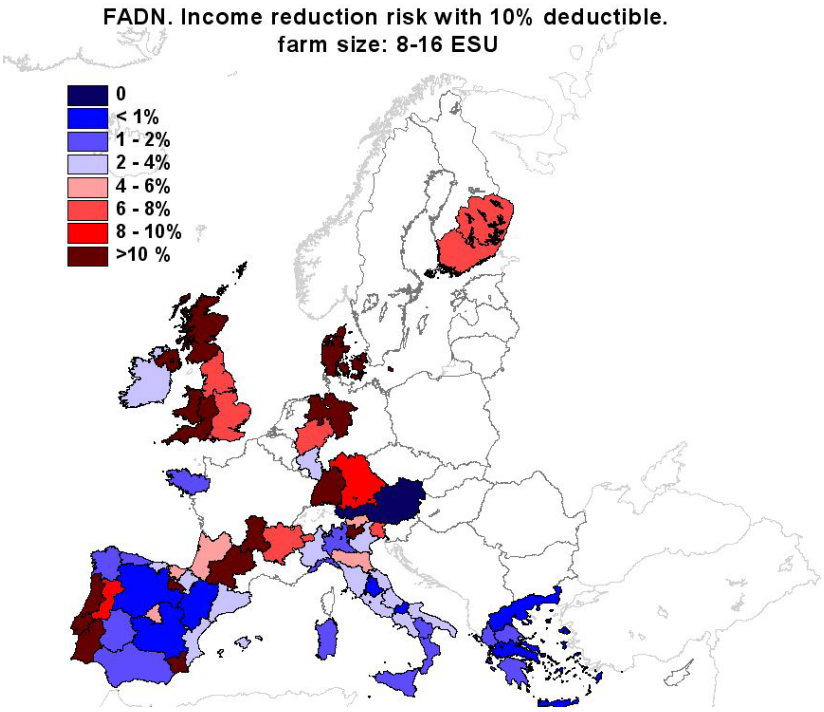


Figure 41. Risk index for income reduction: small-medium farms 8-16 ESU.

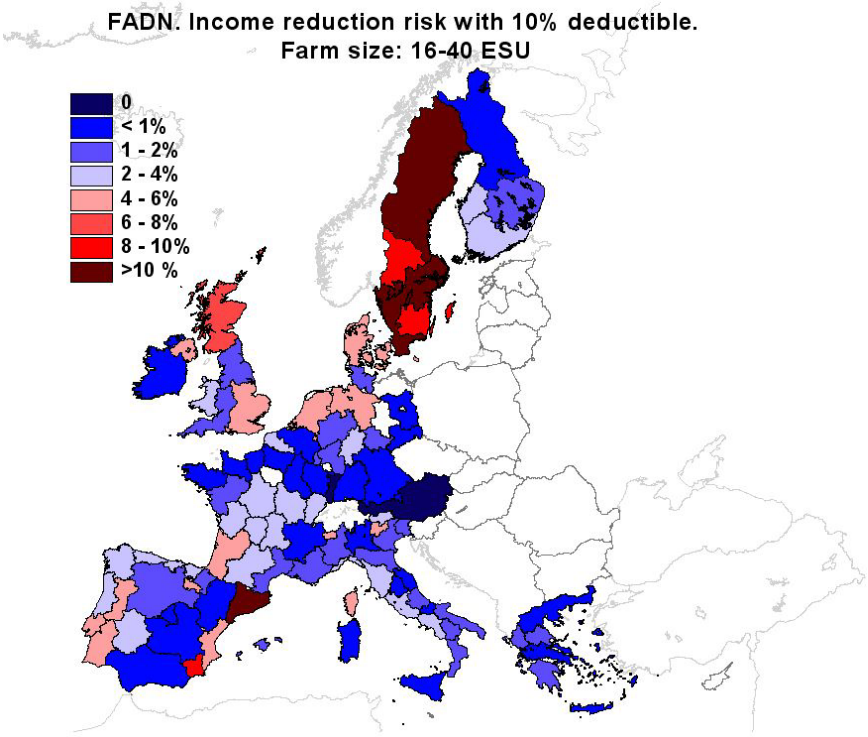


Figure 42. Risk index for income reduction: medium-large farms 16-40 ESU.

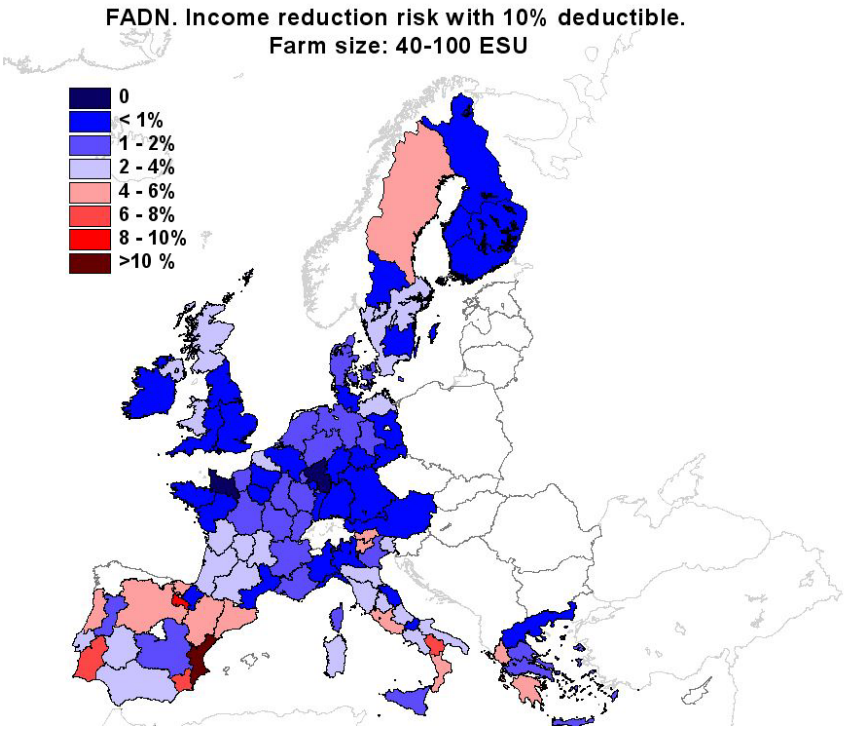


Figure 43. Risk index for income reduction: large farms 40-100 ESU.

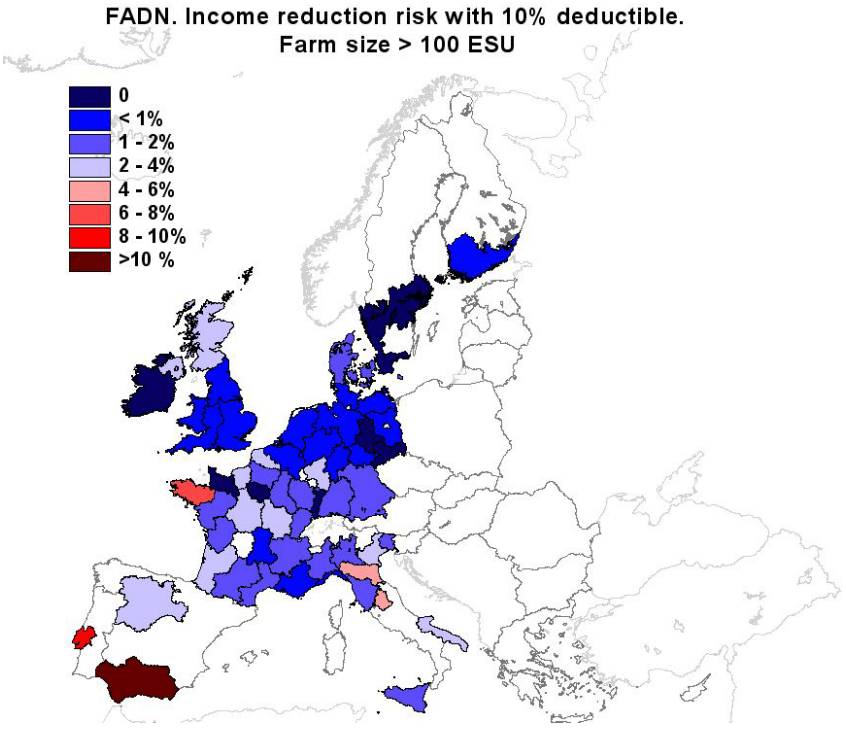


Figure 44. Risk index for income reduction: very large farms > 100 ESU

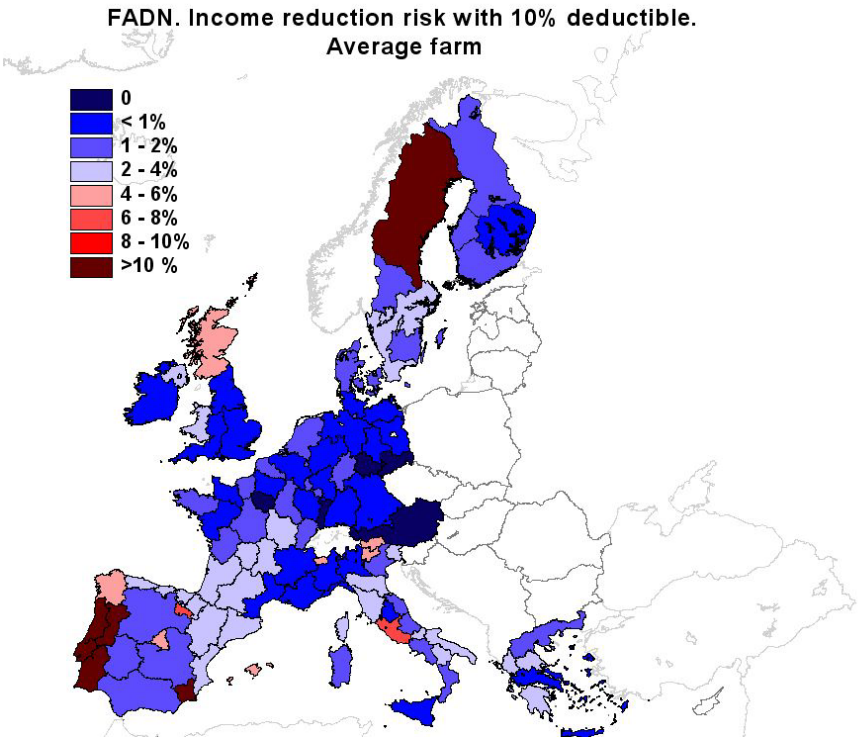


Figure 45. Risk index for income reduction in the "average farm".

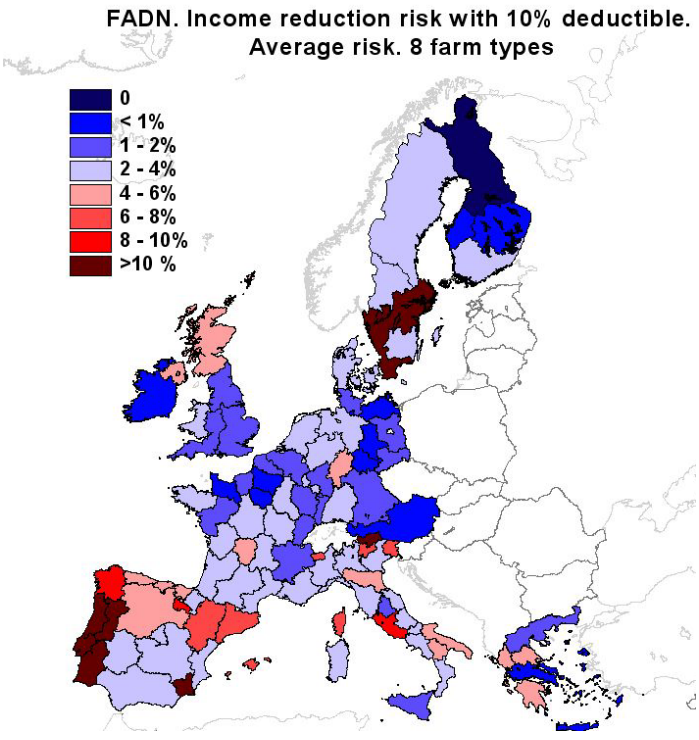


Figure 46. Average risk index for income reduction per farm type.

8.4 Crop yield variability

We consider now different possible indicators for the crop yield variability. For the discussion of the most suitable indicators, we take the example of wheat. We use the statistical yield data per year for the smallest regions for which data are available in the Eurostat REGIO database

8.4.1 Standard deviation of regional yields

A first simple way to measure the variability is computing the standard deviation of the historical statistical yields. A first attempt can be given by a map of the standard deviation along time. Figure 47. represents the coefficient of variation for the historical yield data for wheat (standard deviation / average yield).

$$std(y) = \sqrt{\frac{1}{n-1}\sum_t (y_t - \bar{y})^2}$$

For most countries data are available and therefore represented at NUTS 2 level. In case of missing data, the level NUTS 1 is represented, or NUTS0 (Member States) if NUTS1 data are also missing.

This map gives some information that is coherent with the common knowledge, such as a high variability in the Iberian Peninsula and a lower variability in most Central Europe, but the information in this map is strongly distorted by several reasons:

- the contribution of the technological trend to the variability. Figure 48. illustrates this point: in France or Belgium there is a strong tendency to the increase of yields. Therefore the standard deviation is high because the first and last values (y_{1975} or y_{2004} for example) are far from the average $\bar{y}$, but each y is not that far from the expected value for that year,
- The insufficient number of observations. This happens for example for Poland.

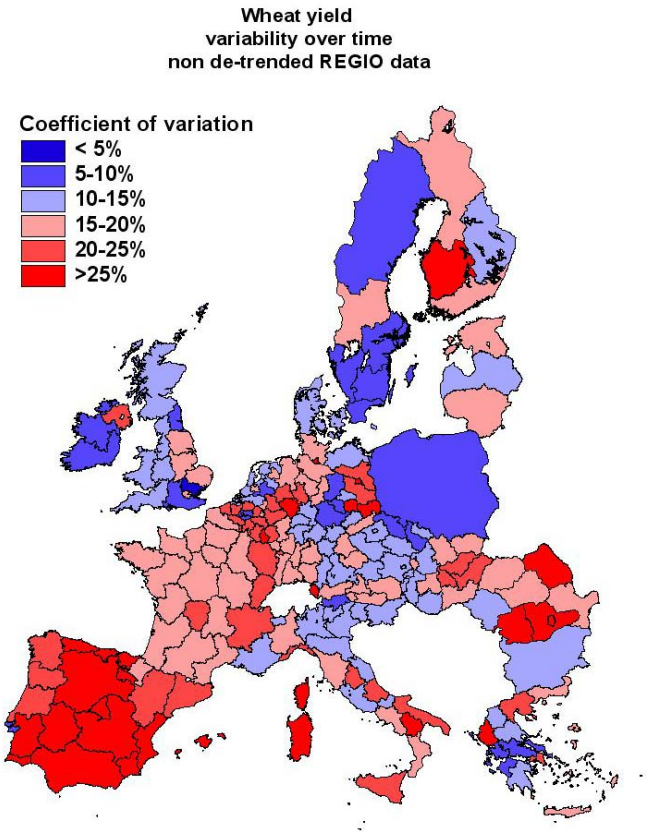


Figure 47. Coefficient of variation (standard deviation/mean) of the wheat yield data, according to the REGIO database.

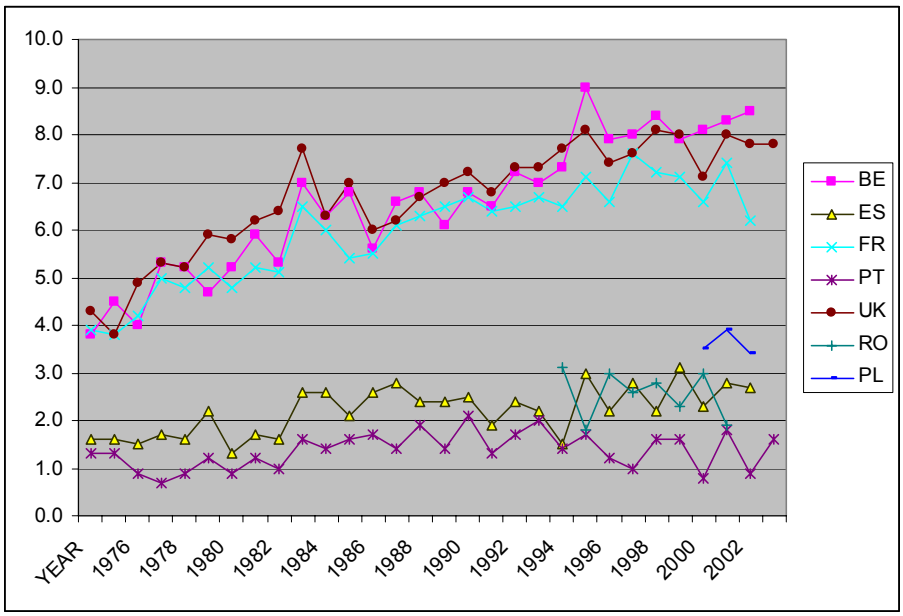


Figure 48. Some time series of yield data of wheat in the REGIO database.

8.4.2 Yield comparison with the previous years

A first alternative to represent the variability of the yield in one year compared to what can be expected. A very rough estimation of what can be expected can be given by the average of the previous years.

$$std(r_t) \qquad r_t = y_t - y_t^0 = y_t - \frac{1}{4}(y_{t-1} + y_{t-2} + y_{t-3} + y_{t-4})$$

Where y_t^0 is a sort of "expected average yield in year t" that still does not take into account the technological trend. The presence of a linear trend in the yield will have an impact on the mean of r_t, but not on its standard deviation.

Some of the time series are very short. In general the variability tends to decrease in this case. We have set a minimum threshold of 10 years of data to consider valid the parameter.

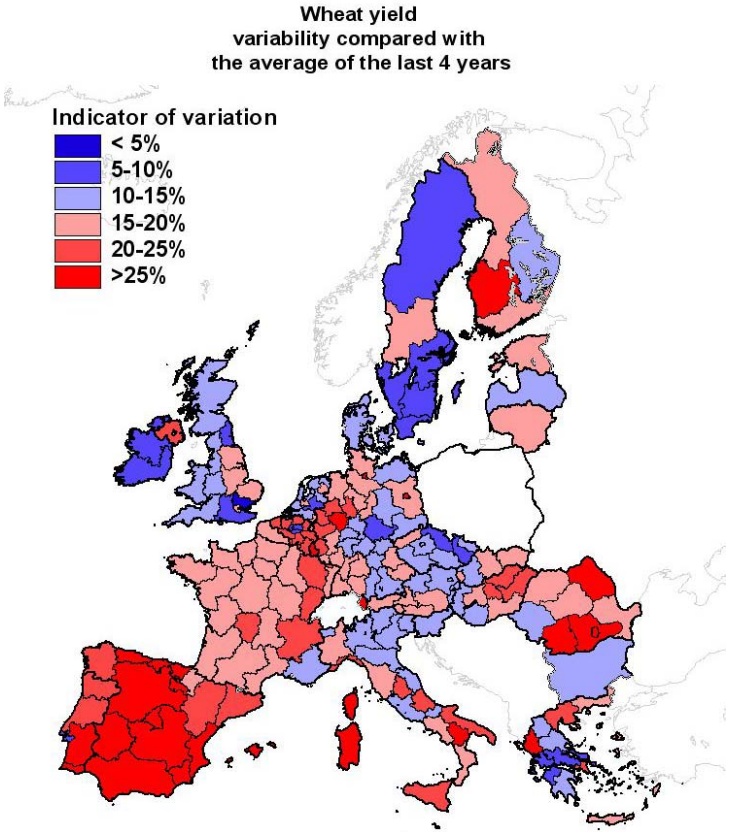


Figure 49. Relative variability of the yield evolution compared with the average of the previous four years

Figure 49. improves the representation, but some regions give surprising results that still need some analysis. On the other hand the geographic level is too coarse,

especially in countries where NUTS 2 are large. Even when long enough series are available at NUTS2 level, the situation in each region can be very heterogeneous due to the different soil. The map does not take into account where wheat is cultivated. Masks should be applied to hide the areas where the crop is not cultivated.

8.4.3 Applying a deductible

When a yield reduction indicator r_i from statistical data has been identified as acceptable, we can build an indicator, instead of *std(r_t)* , that behaves close to the insurance cost assuming a d=20% deductible:

$$\text{If } \begin{array}{ll} r_t < d & s_t = 0 \\ r_t > d & s_t = r_t - d \end{array}$$

$\sum s_t$ would be the expectation of payment that an insurance company would pay to a hypothetical farm that would have the average regional yield if this hypothetical farm has an insurance on the expected yield with a deductible d (10%, or 20% for example).

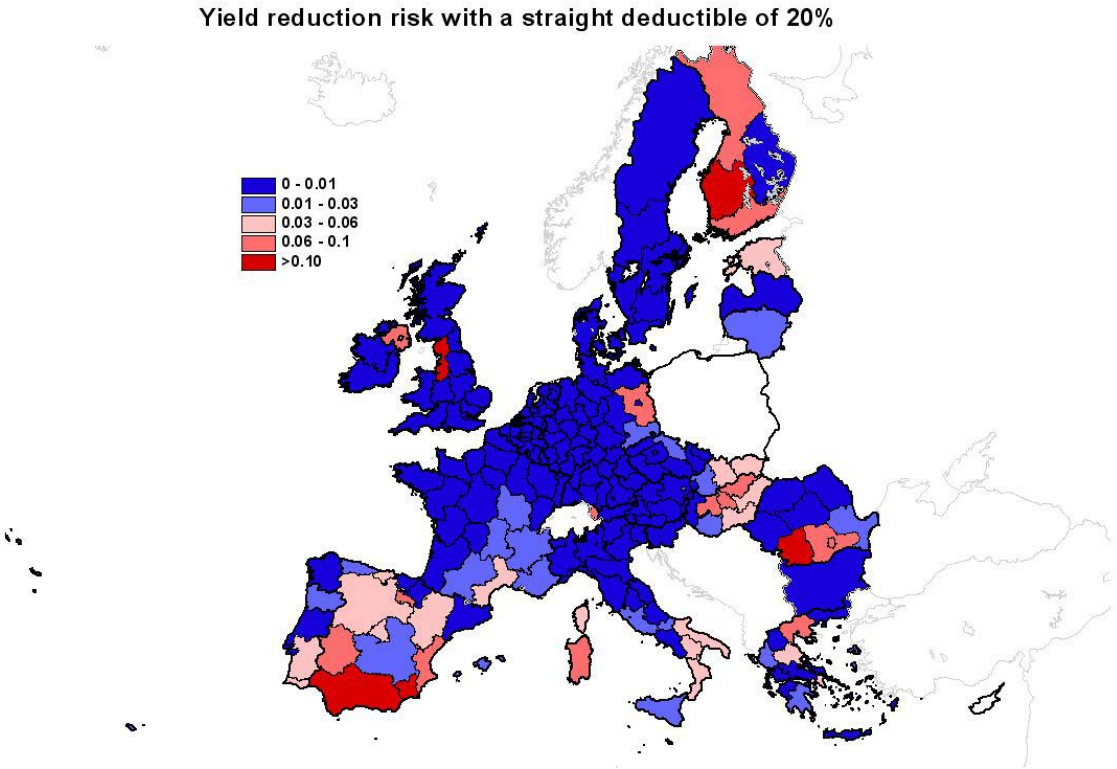


Figure 50. Yield reduction risk. Comparison with the average of the last 4 years. Deductible 20%.

8.4.3.1 Comparing with a yield trend

A better option is comparing the regional yield of each year with an adjusted trend. In order to estimate a trend we have made a quadratic stepwise regression of the time series in each region.

We assume that the trend is growing or constant and its slope is constant or decreasing. We obtain this with the following rules:

- If none of the time terms is significant or the regression-adjusted trend is decreasing, the average yield is accepted as trend.
- If the linear term is significant and the quadratic is not significant or has a positive sign, we take a linear trend.
- If the quadratic trend goes down before the end of the series, we keep it constant after the maximum value.

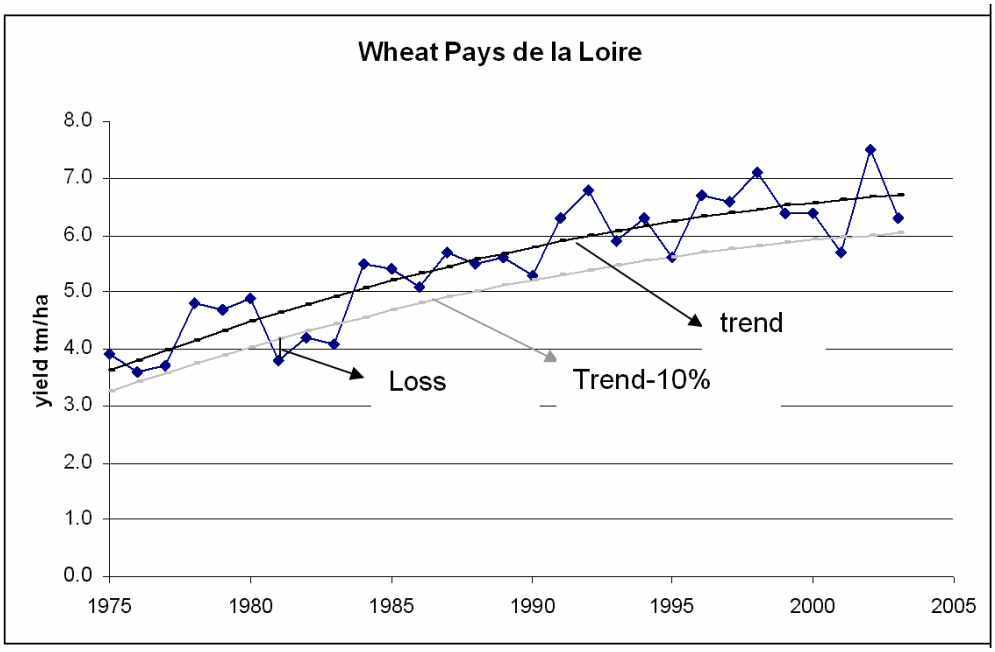


Figure 51. Illustration of the computation of a yield loss indicator with a quadratic trend and a deductible.

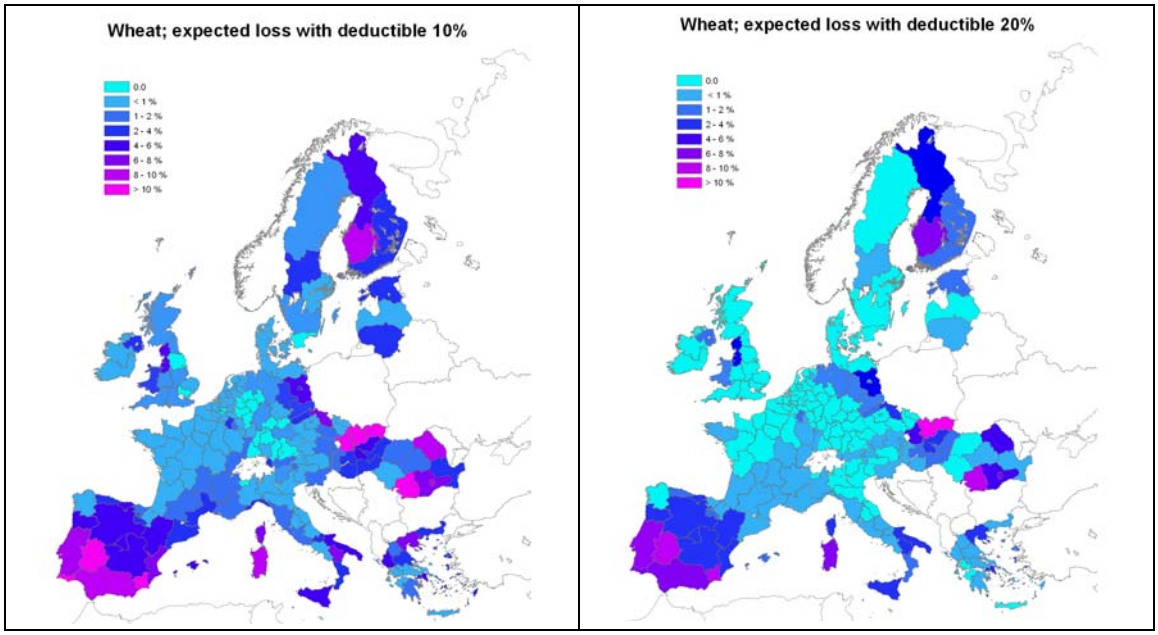


Figure 52. Yield loss risk map for wheat with a quadratic trend.

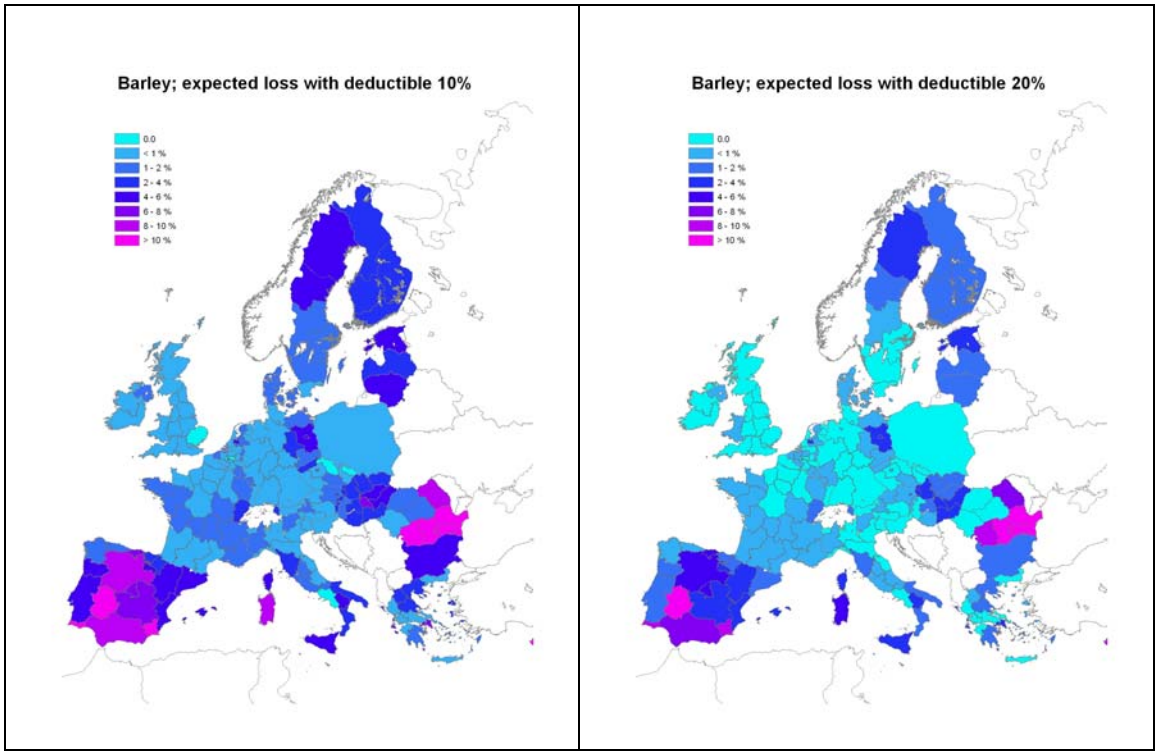


Figure 53. Yield loss risk map for barley with a quadratic trend.

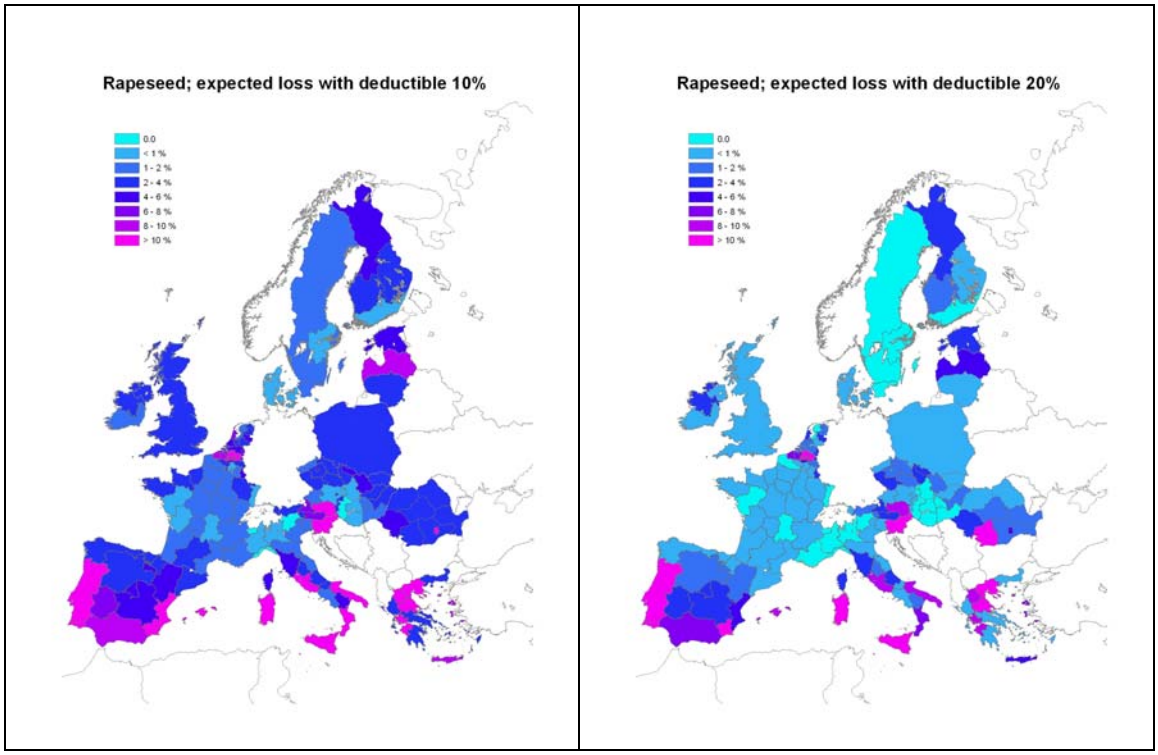


Figure 54. Yield loss risk map for rapeseed with a quadratic trend .

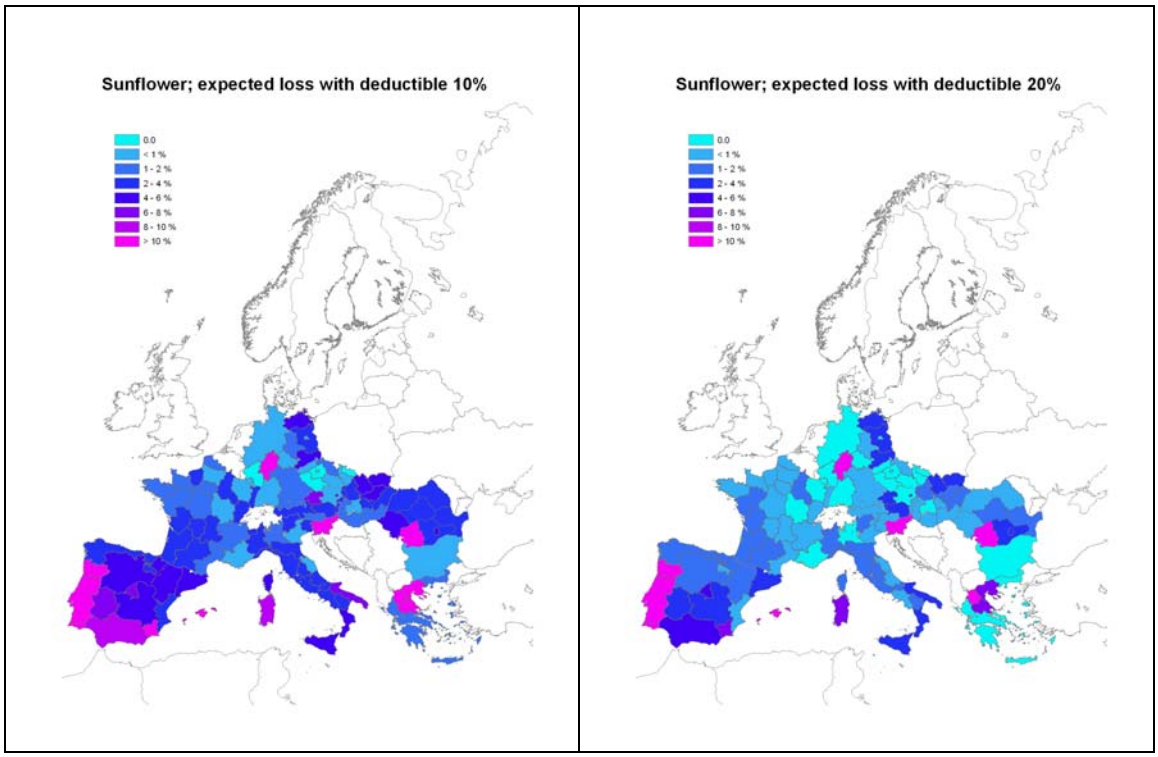


Figure 55. Yield loss risk map for sunflower with a quadratic trend.

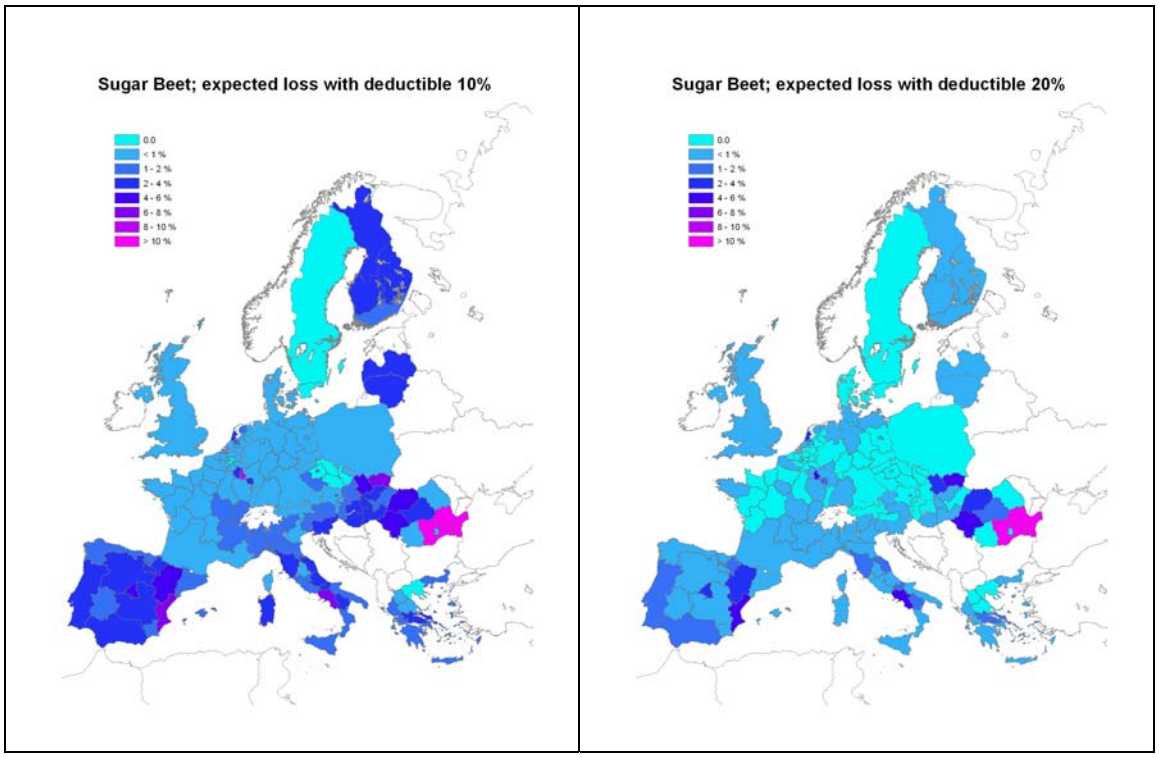


Figure 56. Yield loss risk map for sugar beet with a quadratic trend.

8.5 The use of agro-meteorological models

A possible way of mapping the variability of potential yield can be provided by agro-meteorological models, in particular by CGMS (Crop Growth Monitoring System), used by the MARS Stat group for the yield. The agro-meteorological model does not provide direct estimates or forecasts directly for yield, because it does not integrate the technological development, that can be strongly variable, both in time and space.
Among the parameters estimated by CGMS, the closest to the yield is the so-called "water limited storage organs weight". It is weaker than the yield data, because it is a model output instead of observed data, but has some advantages:
The resolution is better than the available yield data and it should make the difference, to some extent, between zones with better/worse soil inside a NUTS2 region.

A similar map can be produced for smaller geographical units, the EMU (Elementary Monitoring Units), i.e. the intersection of the 50 km grid cells with SMU (soil monitoring units).

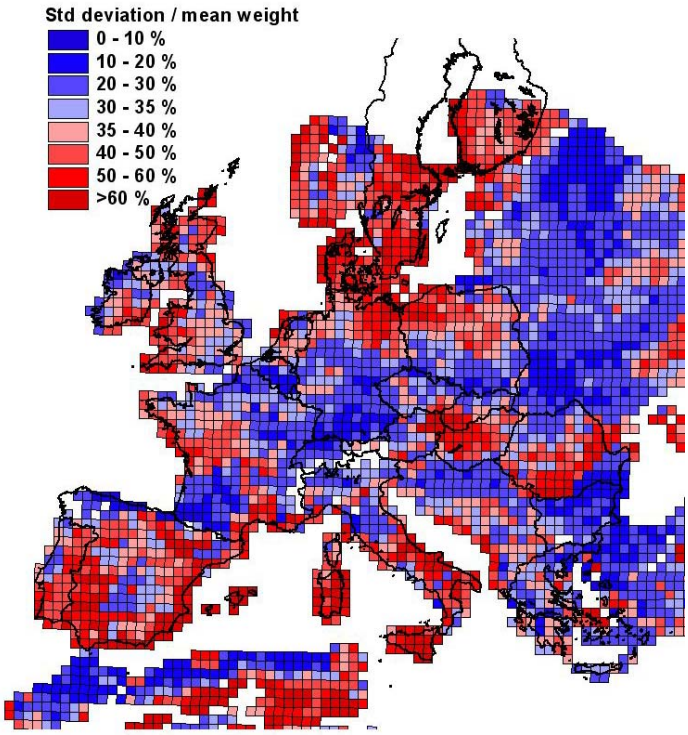


Figure 57. CGMS model for wheat: risk index on the water-limited storage organs weight.

We can downscale the yield $y_{t,k}$ for region (or country) *k* using as covariable $z_{t,e}$ the WLSOW (water limited storage organs weight) computed from CGMS in EMU ***e***. We assume that the yield inside a region *k* varies proportionally to the WLSOW.

$$\hat{y}_{t,e} = B_{t,k}\, z_{t,e}\,.$$

The average of the downscaled yield in a region has to coincide with the statistical yield:

$$\frac{\sum_{e \subset k} \hat{y}_{t,e}\, a_{t,e}}{\sum_{e \subset k} a_{t,e}} = y_k$$

Where $a_{t,e}$ is the area of the crop in EMU e for year t.

There are no suitable data for $a_{t,e}$. The best approximation we can get at the moment comes from the downscaled grid product of the CAPRI project (Kempen et al, 2005, Köble et al, 2005). This grid represents estimates of crop area for 1 km^2 cells combining the point survey LUCAS, CORINE Land Cover and soil information. However this product is only available for 2001. Therefore we should use the same weighting a_e for any year.

The formula above leads to $$B_{t,k} = \frac{y_{t,k} \sum_{e \subset k} a_e}{\sum_{e \subset k} z_{t,e}\, a_e}$$

From the downscaled yield a new yield risk indicator can be computed that should be closer to reality because it takes more into account the local variability.

$\hat{y}_t \geq \hat{y}_t^0 \qquad \hat{s}_t = 0$

$\hat{y}_t < \hat{y}_t^0 \qquad \hat{s}_t = \hat{y}_t - \hat{y}_t^0$

8.6 The impact of climate change

Climate change introduces a major factor of uncertainty in meteorological risks for agriculture. Some climate change models support the conjecture that extreme meteorological events will become more frequent. There is a general perception that the frequency of extreme events (floods, hurricanes, heat waves, severe droughts) is increasing with the ongoing climate change. The scientific community does not consider this risk increase as sufficiently proved with systematically acquired data at global level, but many studies report partial evidence of this increase for specific event types and geographical areas (Beninston and Stephenson, 2004, Church et al., 2006).

Some scenario analysis can be carried out on the basis of climatic scenarios that are being built in the framework of the ENSEMBLES project (Integrated Project of FP6). At this stage only some exploratory analysis can be carried out on this topic.

8.7 The impact of agricultural insurances on the income of farmers

The fact sheets collected gave us an approximate idea of the compensations that farmers get from insurance companies for damages due to unfavourable meteorological conditions. The data for different countries do not correspond to the same period of time, and there is a large variation of compensations from one year to another, but we can say that the average compensation that farmers obtain from insurers is around 1000 M€/year. These payments mitigate the situations of serious farmer's income reduction. In order to know which part of the problem these payments reduce, we have to quantify in some way the income reduction risk.

Quantification of the income reduction risk necessarily involves some subjectivity. We have chosen an indicator computed on an approach that is consistent with the maps of

income variability risk in section 8.3, i.e. considering the time series of average income/AWU for each major farm type (or farm size category). A trend is estimated on the basis of this time series. Any income average below the trend by more than a deductible of 10% is considered a significant loss. Tables 30, 31, and 32 report the total loss per farm size category, per farm type and per country with this definition. The total reduction is around 3000-3500 M€/year and would be around 1000 M€/year higher without agricultural insurances. This means that agricultural insurances mitigate significant farm reduction income by around 22-25%.

This approach has several limitations and needs a more in-depth analysis. The main limitation is that considering the behaviour of the "average farm" for each class and region smoothes down a lot of the irregularities in farm income. This leads to an underestimation of the reduction risk that is in part compensated by choosing a low deductible level (10%).

Table 30. "significant" farm income reduction per year by farm size class

Farm size	Income reduction risk M€
0-4 ESU	1201
4-8 ESU	487
8-16 ESU	344
16-40 ESU	359
40-100 ESU	376
>100 ESU	423

Table 31. "significant" farm income reduction per year by farm type.

	Income reduction risk M€
Fieldcrops	1109
Horticulture	193
Wine	270
Other permanent crops	526
Milk	196
Grazing livestock	310
Granivores	311
Mixed	579

Table 32. "significant" farm income reduction per year by country.

country	Income reduction risk M€
BEL	49
DAN	84
DEU	240
ELL	148
ESP	577
FRA	396
IRE	11
ITA	703
LUX	2
NED	177
OST	11
POR	864
SUO	16
SVE	45
UKI	172

9. Feasibility of an EU-wide system of agricultural insurance

The wide range of risk management tools available in the Member States could be developed further to help to improve competitiveness and the economic sustainability of farm enterprises. However, these tools cannot and are not intended to offer the kind of guarantees provided by the former CAP, but would rather help the farm business withstand temporary shocks and improve its access to finance for the development of its activities. It is with this perspective that the development and availability of risk management instruments might usefully be encouraged.

9.1 An EU-wide system of agricultural insurances or an alternative solution?

Given the big differences observed in EU countries, not only in their agricultural risks but also in their legal, social and economic backgrounds, an EU-wide system of agricultural insurances can be discussed. A series of alternatives to a common system can be proposed and analysed. In any case, any of these alternatives should be simple to manage by the EU administration and easy to control.

The Commission[40] has looked at a number of options for encouraging the development of risk management tools and providing an improved response in the event of crisis. The Commission suggests that the potential of certain possibilities should be assessed, from the point of view of individually or jointly, completely or partially replacing Community and Member States' ad hoc emergency measures.
If introduced to the menu of rural development measures, these options would be available for Member States and regions to take up and use, according to their specific priorities for the next programming period.
Independent of any decision on the following options, the causes of the rather weak development and use of market based risk management tools (insurance, futures market, contract farming) could be addressed by training measures within rural development programmes. This would help improve awareness of current risks, improve risk management strategies and provide know how, for instance on the use of futures and options, which could also lead to a wider use of contracts between the food industry, traders, and farmers.

40 Brussels, 09.03.2005 COM(2005) 74 final Communication from the Commission from the Commission to the Council on risk and crisis management in agriculture {SEC(2005) 320}
http://eurlex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=COMfinal&an_doc=2005&nu_doc=74

1: Insurance against natural disasters - Financial participation in farmers' premium payments

Insurance provides an alternative to public ex-post compensation payments for losses caused by natural disasters at EU and national or regional level. Certain Member States have already established national schemes to encourage farmers to obtain insurance cover against such events.
A new measure, eligible under the rural development regulation, could therefore provide a financial contribution towards the premiums paid by farmers for insurance against income loss as a result of natural disaster or disease.
In order to comply with the European legislation (current Agriculture Guidelines and future Regulation), the amount granted per farmer under such a measure by EU and national/regional support should not exceed 50% of the total premium cost for the insurance in question,.
To be eligible for support from rural development funding, disaster insurance schemes must comply with EU agricultural state aid guidelines and WTO green box requirements. Insurance schemes eligible for co-financing would determine the level of compensation for production losses, due to the natural disaster in question, that exceed 30% of the average agricultural production in the preceding three-year period, or a three-year average based on the preceding five-year period, excluding the highest and the lowest entry. This measure would require Member States to establish a historical reference system at farm level.
Insurance payments should compensate not more than 100% of the income loss, at the level of the beneficiary, in the year the disaster occurred. If the natural disaster, in addition to insurance, would trigger eligibility for other public compensation, the overall compensation by all schemes should not exceed 100% of the income loss in the year the disaster occurred.
As we previously discussed is Chapter 3 paragraph 3.3 of this report, in the 2002 Consolidated version of the 1957 Treaty of Rome, are listed the aids that can be granted by the states.
Article 87 (previous Article 92 of the 1957 Treaty of Rome) prohibits certain State aids, and authorises the European Commission to accept some such aids as "compatible with the common market". Among the accepted aids are aids to soothe the effects of natural disasters, and other aids. Article 87.2.b and Article 87.3.c reproduced below are the basis for aids related to risk management and safety net programs in agriculture.

Section 2
Aids granted by States

Article 87 (ex Article 92)
1.
2. The following shall be compatible with the common market:
(a)
(b) aid to make good the damage caused by natural disasters or exceptional occurrences;
(c)
3. The following may be considered to be compatible with the common market:
(a)
(b)
(c) aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest;
(d)
(e).

As many agricultural risks normally affect a large number of farms (systemic risk) insurance companies have to buy relatively expensive reinsurance. This is one of the reasons why private markets for agricultural insurance are not everywhere well developed.

Thus, a policy measure improving access to reinsurance could also help develop private agricultural insurance schemes. As an alternative to supporting insurance premiums, the encouragement of national reinsurance schemes could also be examined.

At the national level, in addition to co-insurance arrangements between private insurance companies, governments could

(1) offer full reinsurance at reduced prices,

(2) offer part of the necessary reinsurance at no cost, thus reducing the insurance company's overall need for reinsurance,

(3) be a partner for reinsurance via stop loss agreements[41].

2: Supporting mutual funds

Mutual funds represent a way of sharing risk among groups of producers who want to take their own responsibility for risk management. The fund's capital can be called on by members in the event of severe income losses to be specified by predefined rules.

Up till now agricultural mutual funds, established on private initiative, have been set up mainly at a sector-specific level, where producers share comparable risks. While they are not currently available to all agricultural holdings they have the potential to develop into a more common risk management tool to cover income losses.

[41] Cross-reference to the Glossary

With this in mind, the Community could foresee providing support for developing mutual funds in the agricultural sector. Under this option, temporary and digressive support for the administrative operation could be granted per farmer participating in funds formally recognised by the Member State's competent authority.

3: Providing basic coverage against income crises

With CAP reform focusing on income stabilisation and decoupling support from agricultural production, a generalised approach to respond to income crises seems to be more appropriate than any sector-specific approach. A more general coverage against crises that result in severe income losses would allow existing safety net provisions to be further simplified and improve the balance between different agricultural sectors.

Other alternatives to a proper EU-wide scheme can be a set of actions to foster national systems by:

- facilitating/subsidizing the composition of databases, preferably at the farm level
- reinsuring
- clarifying the framework
- partially subsidizing national systems which are within the framework.

9.1.1 Facilitating/subsidizing the composition of databases, at a detailed level

A balanced agricultural insurance system needs reliable and detailed databases in order to limit to the minimum possible level the malfunctioning due to asymmetric information that leads to adverse selection and to some extent to moral hazard: if premium rates are determined with a coarse geographic detail, only farmers with a high risk level will buy the insurance. This will push the insurer to raise the premium and the insurance will become uninteresting for most farmers. This danger can be reduced with a bonus-malus system, but it takes a long time to tune the system, and in the meanwhile the existence itself of the insurance product is jeopardized.

The public sector has developed several databases (IACS, FADN, LPIS, LUCAS, agricultural census, FSS, soil maps, interpolated meteorological data) for the management of the CAP that could provide a basis for fine-tuning premium rates. The use of some of these databases puts serious problems of principle. In other cases the approach could be debated more easily.

- FADN provides the type of data that could theoretically be more useful, although the geographic location accuracy is missing. However its content (detailed accountancy by farm) is extremely sensitive and the confidentiality is essential. A hypothesis of using FADN for fine tuning of premium rates might endanger the reliability of the data.

- Individual data in the Agricultural Census and FSS (Farm structure Survey) are also under statistical secret, but they are less sensitive than FADN data. Their use by an official body to derive geographically fine-tuned variability indicators useful for insurances might not be impossible.
- IACS (Integrated Agricultural Control System), LPIS (Land Parcel Identification System) and LUCAS (Land Use/Cover Area-frame Survey) contained very detailed geographic information, but no data on yield. They could be considered as a basis for building a database for insurance purposes, but they are not directly usable.
- Soil maps and raw meteorological observations have copyright restrictions, but interpolated products elaborated in the framework of agro-meteorological models are often free and potentially usable for insurances. Their use for yield forecasting at national level is now fully operational, but their local accuracy to estimate yield variability would still need a large volume of validation and calibration work based on field observations.

The US Risk Management Agency (RMA) determines the premium rates to be applied by companies in each county. Their approach is based on a very consistent network of field experts in the territory and is difficult to apply in Europe. A role of European Institutions similar to the role of RMA in the US is difficult to conceive, also because some national bodies (in Spain, Italy, and Greece) are already fulfilling similar tasks. However some support role of the European Institutions to encourage other national public-private partnerships could be the object of a reflection process.

9.1.2 Reinsuring

Many agricultural risks are considered non-insurable in most countries because they are too systemic, i.e. a potential damage hits a high proportion of farmers simultaneously. Insurers and re-insurers are not willing to take this type of risk. The situation changes if there is a strong public participation in the reinsurance scheme (US, Spain). If we consider the issue from the EU perspective, a major question is: can EU Institutions act as re-insurer?

Let us imagine that the EU acts as reinsurer and suppose that an extreme catastrophic event hits the whole EU reducing by 40% the crop output of the EU. We would have a loss of around 68 B€; if we assume a deductible of 30% of the production value this would correspond to 17 B€ of compensations. Assuming that the premiums paid by farmers were 6% of the insured capital (so, aprox. 10 B€) and that the EU provides stop-loss coverage above the 100% of the premiums, the liability of the EU as re-insurer might be of approximately 7B€. This extreme example is highly unlikely to happen, but it illustrates the budgetary uncertainty that this type of role would introduce under major events. This uncertainty is difficult to conciliate with a policy of budget stabilisation and the likely need of some tool to limit the expenditure.

Alternative solutions might be creating a fund regularly fed, or enlarging the role of existing institutions, as the European Investment Bank, in charge of this re-insurance role.

9.1.3 Clarifying the legal framework

In fact, the European Union is already defining a common framework for national support given to agricultural insurance, currently through the Agricultural Guidelines, and for the future, through the Guidelines and the regulation currently being discussed (see section 3.3 above). This regulation is made in compliance with WTO agreements, and with the European Treaty principles.
If this framework was to be made more constraining, in order to achieve a greater homogeneity of the national systems, it could include some reference to the compatibility of ad-hoc aids with subsidies to insurance. This could be either to forbid ad-hoc aids on insurable risks (they do not seem to be justified if the private market can cover the risk); either to require the exigency of having bought some kind of insurance for being eligible for ad-hoc aids (financial cooperation of the farmers in their own risk management); or both. Currently, these measures exist in some countries, but as we saw in chapter 5.3, there is a great divergence between countries.

9.1.4 Partially subsidizing national systems which are within the framework

An alternative to establishing a common insurance system could be to support national risk management systems. This could be either insurance models, funds or other risk management tools. In any case, they should be within a common legal framework, establishing some criteria as discussed in the previous section, and a common financing framework. The advantages of this option are that the different models could be adapted to the criteria, uses and needs of every country, permitting some flexibility.

In section 9.4.2 we discuss the possible financing sources for this support, and their compatibility with the CAP. Figure 58. gives a general overview of which could be the role of the European Commission and of the Member States. The Commission, besides establishing a general framework, should settle the protection standards for the different agricultural subsectors. This would consist on technical criteria, such as eligible risks, minimum deductibles, reference prices allowed, etc. The Member states would have to adapt their tools to this framework and develop their own model. The Commission would also have a control role.

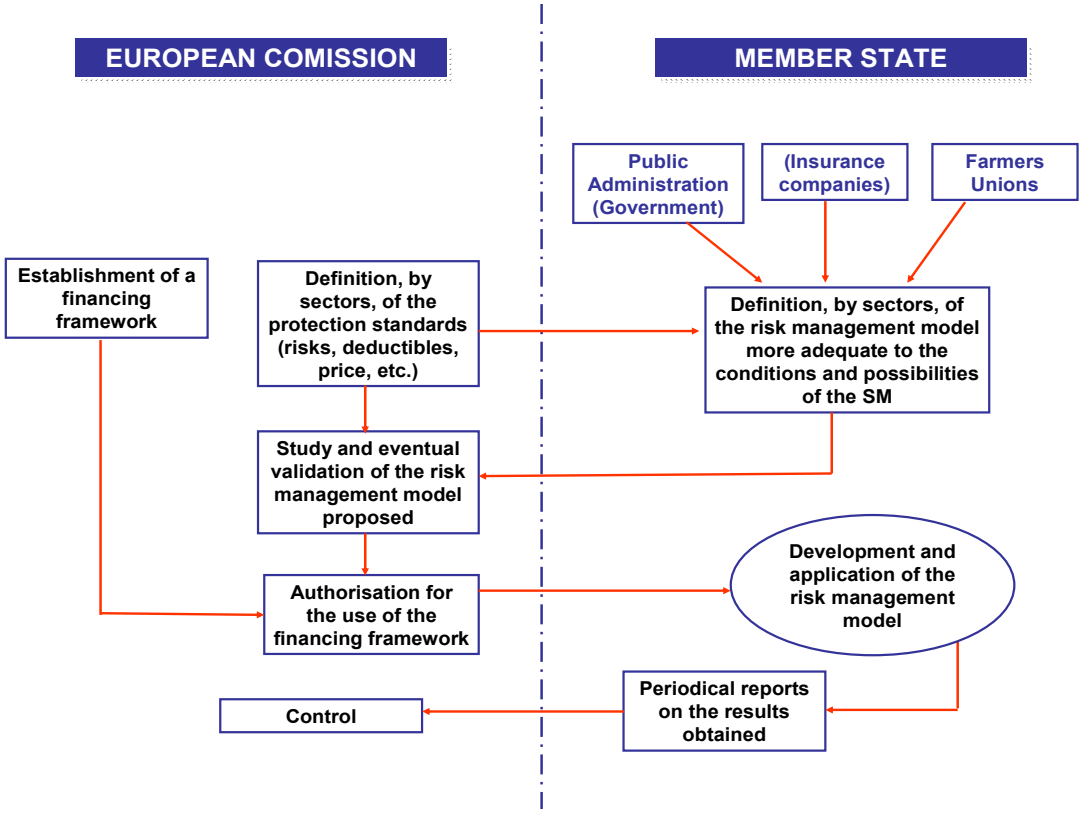


Figure 58. Support to national risk management systems under a common framework. Possible organisational scheme.

9.2 The role of the public sector

There are examples of totally private insurance in agriculture, covering in particular hail damage. Most other insurance schemes are provided under subsidised governmental schemes because the risks being covered are, in fact, not insurable in the sense that a market determined premium would be too high (Moreddu, OCDE, 2001).

EU-Member states providing insurance systems on the private sector with strong public support have integrated their systems as an essential agriculture policy instrument for the stabilisation of agriculture income. In these countries such as Spain, Austria and Italy with a high level on public support, insurance systems are well developed and most risks affecting agricultural yield are covered. Risks mentioned as not insurable on the private sector get insurable through the involvement of the public sector. On the other hand public ad-hoc payments are lower in these countries.

From an economical point of view it seems that it is easier to plan a financial support to insurance premiums on a balanced annual altitude, than make public ex-post payments for the compensation after unforeseen natural disasters.

Also we have to point out that in a private- public- partnership the farmer participate on the risk management tool and take a higher level on responsibility to manage the risks affecting the agriculture production.

9.3 Possible options of an EU-wide system of agricultural insurances

- **Single-risk or combined insurances** *(hail, drought, kill frost, excessive rain)*
- **Yield insurance** *(climatic cause of losses has to be identified, evaluation of the losses)* Similar to combined insurance
- **Yield insurance** *(no identification of climatic cause of losses, losses calculated as a difference in yields)*
- **Whole-farm yield insurance**
- **Income/Revenue insurance**
- **Area index insurance:**
- **Indirect-index insurance (meteorological indexes, satellite images):**
- **Public reinsurance**
- **Flexible system: supporting MS systems**

9.4 General assessment of the different options

9.4.1 Criteria to assess the feasibility

A feasible EU-wide insurance scheme should ideally meet several conditions. Some of these conditions, that we can call political criteria relate to decisions of the policy makers. Other conditions (socio-economic) relate to decisions of the private sector (insurers, re-insurers and farmers). A third category of conditions have a more technical nature.

- Political Criteria
  - Long-term financial perspective (linked with cost)
  - Compatibility with WTO
  - Compatibility with European legislation and CAP
  - Compatibility with EU financial regulations (re-insurance).
- Behaviour of the private sector
  - % of farmers that would buy the insurance
  - Acceptation by insurers/re-insurers
- Technical criteria
  - Meeting the needs of farmers

    - is there a need? How unstable is the income of farmers?
    - will there be a need with changing circumstances?
  - Cost/affordability
  - How feasible/simple is the control to avoid fraud/malfunctioning?
  - Technical feasibility and base information availability (need of databases for insurance types with little or no tradition)
  - Asymmetric information: potential adverse selection, moral hazard or other problems
  - Advantages compared with alternative tools

9.4.2 General assessment

The assessment related to some of these criteria is more or less common for any of the possible type of insurances (general assessment). For other criteria the assessment depends strongly on the type of option chosen.

Political Criteria

- **Compatibility with WTO, European legislation**

In general, the compatibility with the WTO and with the European legislation could be guaranteed for most risk management tools if they meet the criteria of the 30% threshold and deductibles, and if there was a declaration of calamity by the government for the (single or multi-)peril or yield oriented products. The 30% thresholds and deductibles wouldn't be a big problem for income products and for that peril/yield based products with high risks. It would be enough to leave to the private market the coverage of field crops and others with low risks, and support those products with higher risks when losses are above the 30%. However, for the support of crop insurance products, the need of an official declaration would be a hindering constraint, so, while the Green box definitions remain as they are, crop insurance would not be compatible with the Green box.

- **Compatibility with CAP and long-term financial perspective**

Let us assume that the objective is to introduce a risk management system within the current CAP framework, not having to wait for a future CAP reform. One possibility could be to include risk management among the measures of rural development in the second pillar. It can be discussed how additional risk and crisis management measures could be co-financed by one percentage point of modulation. Designed as a mechanism to strengthen the second pillar of the CAP, modulation reduces direct payments and shifts the funds saved into rural development.

Community law states that all the funds released by modulation can only be used in the context of rural development programmes - including the amount that could possibly be used for risk and crisis management measures[42].

New risk management measures co-financed from the one percentage point of modulation would aim to improve the competitiveness of the agricultural sector by strengthening the economic sustainability of agricultural holdings. It is in this context that Member States would have the choice of introducing new risk and crisis management measures into their rural development programmes.

Under the new Financial Regulation, and in particular the principle of annuality, the new regime of compulsory modulation no longer allows Member States to retain funds in view of their redistribution in later years.

Using modulation to finance new risk and crisis management instruments would not require additional Community expenditure; it would simply make it possible for Member States to use a maximum amount of rural development funds for these purposes.

The EU's rural development policy is designed to fully comply with the green box criteria established by the WTO. As a consequence, any additional measure financed under modulation must also comply with green box criteria.

In this context, in all cases, the amounts used for risk and crisis management shall be limited to one percentage point of modulation in the Member States where modulation is applied. For the Member States where modulation does not yet apply an equivalent method could be applied to set the maximum level of rural development funds that could be allocated to these measures.

Financing risk and crisis management measures through modulation

In the previous point, we have made comments on modulation as a new CAP tool. Let's spend some words on the innovative aspects of the latest CAP reform.

The Fischler reform, as we already mentioned in chapter 1.1.3, changes the frame of the "old CAP", shaking it and preparing good basis for its evolution towards a modern agricultural policy. The pillars on which the CAP is standing now are three: the decoupled payment, the modulation and the cross-compliance.

- The direct payment (Single Farm Payment) represents a farmers' income stabilisation tool.
- The modulation has the intent to give a certain priority to rural development programmes.

42 (Commission Regulation (EC) No 1954/2005of 29 November 2005amending Regulation (EC) No 796/2004 laying down detailed rules for the implementation of cross-compliance, modulation and the integrated administration and control system provided for in Council Regulation (EC) No 1782/2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers and derogating from Regulation (EC) No 1782/2003 as regards payment of the aid)

- The cross-compliance sets conditions for farmers to get the direct payment (in its totality). Farmers must safeguard the environment and accomplish other requirements set up at EU and national level.

Using the modulation of the direct payment (I pillar) to collect funds and using them for the setting up of Rural Development Plans (RDP) (II pillar) could also be done for the creation of "risk management programmes" subordinated to rural development programmes.

The single farm payment (SFP) falls within the green box. The modulation is an instrument which provides a means to ensure the transfer of CAP funds from direct aids to farmers - more specifically from SFPs - to rural development measures; also in the green box. It means that those funds could be used for risk management programmes under the name of RDP (II pillar) whenever they do not run into the WTO agreements.

Moreover, given that the cross-compliance was created as a condition to get the payment, a risk assessment plan for farms, made by public or private insurance companies, could be required as a condition to use the modulation funds, or even to get the direct payment.

An additional advantage of this approach is that it would favour a risk information process which appears to be needed. After a number of years, it would be possible to have enough information (regarding climatic/sanitary risks in specific regions/areas) to set up a more developed "risk management Programme/Insurance Scheme".

Behaviour of the private sector

- **% of farmers that would buy the insurance**

Any a priori feasibility assessment of a hypothetical EU-wide scheme of agricultural insurance has a large uncertainty. The most important source of uncertainty is probably the farmers' behaviour. Some studies report that farmer's behaviour does not always conform to theory and that there is a need to better understand farmers' attitude toward risk and the way they adjust their farm operations (Moreddu, OCDE, 2001; Meuwissen et al. 1999; Mc Carthy, 1998).

Slow evolution in farmer's mentality. In the US the system started in 1938 and only in the last years it has reached a high level of introduction. In Spain (law approved in 1978), the system offers a wide range of subsidized options, but the introduction is still less than 30%.

- **Acceptation by insurers/re-insurers**

Support to the insurance systems should be always welcome by the insurance sector. But there are two important points to take into account: Some insurance products that could be developed (index insurance, yield insurance, revenue insurance) have not already been developed by the private sector because of the systemic character of the risks involved. In these cases, there is a need of public support for re-insurance. Second,

if a common system was to be developed, there would be a cost for the companies to adapt to it, and in some cases it might not be worthy for them. For these reasons, the private insurance sector seems to back up the idea of the coexistence of national systems rather than the implementation of a single EU system (see section 3.6.2 on the position of the insurance sector)

Technical criteria

- **Meeting the needs of farmers**
  - ► Section 8.3 in chapter 8 gives an analysis of the types of farms and regions for which the income has a higher or lower level of instability. The quantitative analysis in this chapter generally underestimates the variability at farm level because of the smoothing effect of considering regional averages. However, the reported maps give a geographic picture of the existing needs in income stabilization that are not concentrated in restricted geographical areas.
  - ► Changing circumstances suggest that the needs of income stabilization tools for farmers will be growing in the next years. Market liberalization, climate change, growing concentration of retailers are growing factors of instability of farmers' income.

- **Cost/affordability**

A most important criterion is the eventual cost of the program. In general terms, the implementation of a risk management program should never imply exceeding the current agricultural budget. So, as was discussed above, any cost would have to be taken from other agricultural expenses.
Some coarse assessments of the cost of different insurance programs have been made. Their results are shown in section 9.6. These examples are: an EU-wide insurance for fruits and vegetables; an income based insurance on averages per type of farming; arable crops yield insurance and an area-index (regional) yield insurance for cereals. However, the cost of these programs would depend on the percentage of the premiums that is to be subsidized. The cost would always be reduced by reducing the subsidy rate, but however, the subsidy should be big enough as to make the product interesting to the farmers. This will be discussed in section 9.6.

- **How feasible/simple is the control to avoid fraud/malfunctioning?**

We can differenciate two types of control:
(1) the general control/management of the system;
(2) the audits/last controls that could be done on the field.

(1) In this case, we should differenciate if the system is an insurance system by private companies, or it is a public scheme. In case of a private insurance system, it seems clear the interest of the private insurance companies to follow and control the framers' declaration of losses. So, in the case subsidies are given directly to the companies, the control should be performed on the companies. These are usually quite transparent and having to yield annual repports to public organisms in each country. They are usually under the survey of the Government in those countries where agricultural insurance is subsidized, meaning that it is a realistic assumption. So, the last step to be undertaken is how the Governments are to be controlled by the EU. In case the system is not a private but public scheme, the control would have to be done entirely on the Governments.
In both cases, the control to the Government can be made within the framework of the CAP, and with the tools introduced by the Fischler reform. As the main administrators of the CAP, Member States currently play the leading role in applying CAP's management tools. Taking the cross-compliance as example, MS responsibilities include establishing the definition of good agricultural and environmental condition for their agricultural circumstances (at national or regional level), taking into account the specific characteristics of the areas concerned, including soil and climatic conditions, existing farming systems, land use, crop rotation, farming practices and farm structures. Member states must inform farmers of the definition, provide them with the list of statutory management requirements, and set up management, controls and sanctions systems for all cross-compliance. Due to the introduction of this condition a "Farm advisory system" had to be set up as an obligatory instrument and further on, a formal audit programme as well. Transferring this example to the hypothetical introduction of risk management programs it can be supposed that risk management programs can be run and controlled by the public or private insurance companies.
Summarising- if a risk management program would be introduced (parallelism with the cross-compliance), MS will be likely responsible to create the right risk information programs and support private or public insurance company in the development of tools and offers for the market. The insurance companies then would be responsible for the management of the sector, avoiding frauds or malfunctioning of it.

(2) Regarding the audits or controls that could be carried out on the field, it appears rather difficult a direct control of insurance systems like single, combined or yield insurance at a European level because the loss assessment is generally done on farm or field level. However, this control does not seem very necessary if the insurance is in the hands of private companies, because they would not permit abuses from farmers. So, it could possibly only be made in a proper way on the insurance companies. Regarding other types of products, like index and area based insurances, even if they are not yet developed in Europe, it could be possible to control them at a EU level through the use of agrometerological indicators and satellite images.

- **Technical feasibility and database information availability**

The technical feasibility of insurance products is not always possible. In theory, all that exists in one country could always be applied in others. However, there are some characteristics of some insurance products that could make them unfeasible in some countries.

One of the most important things for insurance feasibility is databases availability. The lack of historical yields data at the farm level can hinder the apparition of yield insurance as it is in the USA. For revenue insurance, there is the need of one or several markets which can provide a transparent price accepted by insurers and farmers and that cannot be manipulated. In the USA revenue insurance products are based on futures markets prices. This would not be easy in many regions in Europe, because of the lack of futures markets, and because the prices of the existing ones are not very representative of farmers prices in many regions. Income products in Canada are based on farmers' fiscal declarations. In European countries, agricultural fiscal systems may not be adequate to base an insurance product on their reports.

- **Asymmetric information: potential adverse selection, moral hazard or other problems**

Adverse selection is a problem which appears due to the asymmetry of information between insurers and insured. In order to fix the premiums of insurance types with little or no tradition, and mainly for such insurance types as yield insurance or income insurance, it is necessary to have adequate databases, with records at the farm level. Is it feasible that public databases (LPIS, soil maps…) are used to adjust premium rates which will be applied by private companies. In the US, rates are fixed by the government (RMA) and applied by insurance companies. In Spain, sometimes it is ENESA who calculates the premiums that will be then agreed by Agroseguro.

Launching new insurance systems often requires a test period in pilot areas. This can also apply to the application of systems that have been tested in areas with very different agricultural characteristics. Many insurance systems are difficult to apply because asymmetry in information leads to an adverse selection behaviour that undermines the system: Each individual farmer knows better the own risk level than the insurance company, and it can happen that only farmers with a high level of risk buy the insurance. Consequently the risk in the insured population is higher than the average.

- **Advantages compared with alternative tools**

There are several advantages of insurance over other risk management tools. One of them is that in the case of insurance the farmers have a legal title to get compensation compared to ad-hoc payments from the public sector. Insurance provides a quicker payment of compensations, that is, when the farmers need them more. The average time of payment could be around 2 months in the private option and 1-2 years in the public one. Another advantage for farmers is that private insurance gives indemnities more adjusted to the farmers' real losses, on an individual basis. An advantage for the

Government is that the premiums subsidies constitute a regular and foreseeable expense, so easier to program than the ad-hoc compensations, very irregular from one year to another. Some also attribute insurance an advantage on general economic rationality terms: via the premiums amount, it delivers farmers an information on the risks inherent to their production choices, so that it can lead to a rationalization of the latter.
However, critical views support that the global cost is higher, because of the higher cost of loss adjustment, and that subsidizing agricultural insurances means subsidizing insurance companies. But subsidizing agricultural insurance means to support a system in which the farmer participate on the premium what minimize the budgetary impact of the public sector. Both, the farmer and the government are able to calculate their budget. Also we can point out that in developed schemes like in Spain and Austria behind the public involvement there is also a high level on the involvement of the farmer's union to represent their interests.However, another point of view holds that with a public system (ad-hoc aids), the Administration (Governments) is in charge of damage assessment, etc. Supporting an insurance system transfers this responsibility to the companies that have a profit in compensation of this service. For example, in the US, the profit of companies ranges from -30 M$ to 400M$/year with an average of around 200 M$/year in a program with a total cost of approx. 4000 M$/year. The question is if this compensation is fair. Last, there is a also a cost in the political image.

The development of Agricultural Insurances reduces the public expenditure in ad-hoc aids. This reduction is difficult to estimate should be considered when total cost is computed.

9.5 Specific assessment of each option

- **Single-risk or combined insurances**
  - Single risk (Hail) and also combined risk insurance are already existing in all member states, sometimes subsidized on national level
  - Long history on data available easier to calculate
  - Control: high level on experience in loss assessment and very similar in the countries, but high loss expenses
  - Moderate risk of moral hazard
  - higher adverse selection in single risk insurance
  - Support on EU-level doubtful

- **Yield insurance** *(climatic cause of losses has to be identified)*
  - Similar to combined insurance but more comprehensive
  - Meets better farmer's needs
  - probably more expensive
  - Need of higher deductibles for systemic risks (drought)

- Lower adverse selection because more attractive in different regions
- Loss assessment more difficult
- Need of public support for development on private sector
- Support on EU-level useful

- **Yield insurance** *(no identification of climatic cause of losses)*
  - High risk of moral hazard
  - Lower acceptance by insurance and reinsurance
  - Lower costs for loss assessment

- **Whole-farm yield insurance**
  - Addresses a bit better the target (income stabilisation)
  - Heavier to control

- **Income/Revenue insurance**
  - Addresses much better the target (income stabilisation)
  - Difficult to control, unless on area index basis
  - Very systemic risks (prices): difficult to accept by insurers unless strong public support
  - Difficult to give a reference price
  - High risk of moral hazard to undermine the system

- **Area index insurance:**
  - Little risk of moral hazard and adverse selection
  - Relatively easy to control
  - Does not take into account the differences of damage inside each "presumed homogeneous" area
  - who is competent to give the official reference yield?

- **Indirect-index insurance (meteorological indexes, satellite images):**
  - Objective criteria, but some are difficult to understand by farmers (NDVI)
  - Only useful for coverage with high deductibles
  - Risk of overcompensation or contrary effect

- **Public reinsurance:**
  - Difficult to guarantee that the expenditure will be kept within a certain level (compatible with EU financial regulations?)
  - Partial public support to reinsurance as option
  - Could make risks insurable mentioned as not insurable

- **Flexible system: supporting MS systems**
  - Meets better different demands on national level
  - Breaking the difficulties in case of different systems in Member states
  - Could be a first step to harmonize the systems depending on the regulations (see section 9.1.4)

The previous chapters have highlighted how heterogeneous is the situation of agricultural insurances in the EU, ranging from countries or agricultural sectors with a very strong presence of insurances to countries/sectors in which the presence is marginal or non-existing.

The pressure in the frame of the WTO negotiations raises the question whether the CAP has a role to play in risk management and in particular on agricultural insurances. Several questions can be considered:

- Which can be the budgetary impact of a hypothetical CAP subsidy to agricultural insurances?
- Which can be the benefits of such support?
- How would be the geographical distribution of the benefits?
- How would be the distribution of the benefits for different sectors or farm sizes?
- Which type of insurance can be supported: single risk, combined, yield or income insurance?
- To which extent risk management policies can replace income support policies?
- Are the existing tools for risk reduction sufficient for income stabilisation?
- Would Community action provide value-added as compared to national or regional initiatives/action.

9.6 Possible cost of some of the options

Let us make an attempt to tackle the question of the budgetary impact or cost of a hypothetical CAP support to agricultural insurances. For this purpose we can start defining a set of scenarios for specific sectors and insurance types.

The definition of a scenario involves a number of choices. It is not always possible to support such choices on the basis of objective considerations. Ideally, each scenario should be defined by some assumptions on :

- The items covered (crops, livestock, assets, income)
- The risks covered:
- The proportion of farms/production insured
- The technical characteristics of the insurance, in particular the franchise.
- The average rates than can be applied.
- The possible subsidy rate to the premiums.

Table 33. Premiums per crops for single-risk insurance

Crop	Perils	Country	Premium	Deductible	Subsidy
Arable crops / Field crops: Cereals, protein & oil crops	Hail	Austria	2.8%	8%	50%
	Hail or frost or other	Italy	2.6%	10-30%	65%
	Hail, fire, lighting, explosion	Portugal(1)	2.2%	20% relative	68% average
Fruit	Hail & quality	Austria	14%	10-30%	50%
	Hail or frost	Italy	13.8%	10-30%	54% average
	Hail, fire, lighting, explosion	Portugal (1)	18%	20% relative	68% average
Olives for oil	Hail or frost or other	Italy	4%	10-30%	63%
Vegetables & potatoes	Hail or frost or other	Italy	5.6%	10-30%	54% average
	Hail, fire, lighting, explosion	Portugal (1)	4%	20% relative	68% average
Wine grapes	Hail or frost or other	Italy	6.2%	10-30%	63%
	Hail, fire, lighting, explosion	Portugal (1)	8%	20% relative	68% average

(1) This premiums can also include a complementary coverage (frost, snow, tornado and waterspout) that would make of it combined insurance

Table 34. Premiums per crops for combined insurance

Crop	Perils	Country	Premium	Deductible	Subsidy
Arable crops	Hail, wind, frost, flood, excess of water	France	7%	15% average	0%
	Two or three perils combined	Italy	2.6%	10-30%	75%
Citrus	Hail, fire, flood, rains, frost, winds & others	Spain	8.5%	10-30%	43%
Fruits	Hail, frost, wind	France	8.6%	15%	0%
	Hail, fire, flood, rains, frost, winds and others	Spain	11%	10-30%	43%
Olives for oil	Two or three perils combined	Italy	4.4%	10%	69%
Vegetables & flowers	Hail, fire, flood, rains, frost, winds & others	Spain	4.8%	10-30%	37%
Wine grapes	Hail, frost, additional expenditures after hail	Austria	6.5%	8% hail 35% frost	50%
	Hail, frost, wind	France	2.15%	15%	0%
	Two or three perils combined	Italy	4.8%	10-30%	71%
	Hail, fire, flood, rains, frost, winds and others	Spain	10%	10-30%	41%
Grassland	Hail, flood	Austria	1.5%	Hail 8% Flood max 440€/cut/ha	Hail: 50% Flood: 0%
	Drought, etc affecting pastures (Index insurance)	Spain	6%	0%	35%

Table 35. Premiums per crops for yield insurance

Crop	Perils	Country	Premium	Deductible	Subsidy
Arable crops	Hail, storm, frost, flood, rain, drought, others	Austria	3.6%	4% hail Other risks: max indemnity/ha	Hail & frost: 50% Other risks: 0%
	Hail, wind, frosts, floods, excess rain, drought, plant diseases	Italy	2.6%	10-30%	77%
Wine grapes	Hail, wind, frosts, floods, excess rain, drought, plant diseases	Italy	6.5%	10-30%	78%

Table 36. Premiums for livestock insurance

Animal	Perils	Country	Premium	Deductible	Subsidy
Cattle	Stillbirth & death (epidemic disease excluded)	Austria	1.5%	0-15€/head	0%
	All risk mortality	Greece	8.3%	1-2%	0%
	Accidents & epizooties	Spain	4.7%	10%	44%
Sheep & goats	Accidents	Spain	0.6%	10%	39%
Poultry	All risk mortality	Greece	1%	1-2%	0%

Source: Data from the Fact Sheets and from www.sicuragro.it

For a first and rough analysis of the approximate cost of the difference scenarios, data from existing insurance systems can be used and extrapolated to other European countries or to the EU as a whole. Table 33. to Table 36. show some of the data on premiums for different types of crops and insurance types, which could be used to estimate average values of premium rates. The risks covered and the deductibles in each case are also shown, in order to account for the differences in premium rates. The subsidy rates are shown just as a reference information.

Once, the cost of the insurance (the value of the premiums) is known, it comes to analysing how much would be the cost for the public sector. This cost would depend on the percentage of the premiums that is to be subsidized. This should be a political decision, but some discussion on the subject can be made.

The cost would always be reduced by reducing the subsidy rate, but however, the subsidy should be big enough as to make the product interesting to the farmers. This equilibrium should be found. Having a look to the current subsidy rates in Europe and in the USA, we can find subsidy rates ranging from 0% in some European countries to 72% in the USA. The European guidelines allow subsidies of up to 80% only for catastrophic risks, and up to 50% when also other risks are covered. We could think that a 50% subsidy would be the maximum reasonable and not negligible subsidy for the farmers, a 40% being a more moderate one.

Currently, many countries are already subsidizing crop and livestock insurance. A possible strategy could be a co-financing of the subsidies by the EU and the MS. Examples of this are Austria and Canada, where insurance premiums are 50% co-financed by national and provincial Governments. In Austria, the national subsidy is conditioned to the existence of the regional subsidy. In Spain, on the contrary, regional Governments do freely subsidize insurance in the percentage they choose, independently from the National subsidy.

An issue to take into consideration is the amount of the subsidies that falls on the farmers and not on the insurance company's expenses. Let us made the hypothesis of a 50% subsidization of insurance, and an average loss ratio for the insurance companies of 70%. This would mean that for a 100€ premium, the farmer pays 50€, 50€ are subsidized, and he gets back 70 € in average indemnities. So, the net subsidy received by the farmer would be 20€/70€, that is, 28.6% of his losses.

Next, we present a first, global and rough approach to a definition and analysis of several different scenarios.

9.6.1 A possible option on income insurance

Let's consider a hypothetical income stabilization tool of this type: *If the average income/AWU of a given type of farms in a given region is less than the long term trend by a percentage above a given threshold (deductible), all the farms that have bought the insurance are compensated in a quantity equal to the loss minus the deductible*.

If we think about the FADN typology of farms in 8 farm types and the FADN regions, with a straight deductible of 10%, we have estimated the risk (expected average payment by the insurer, that is, the risk premium or actuarially fair premium) to be around 3.5 B€ for the FADN observation field, i.e. excluding small producers (see section 8.3 for more details on the approach). The economic weight of farms outside the FADN observation field is small, but we can assume that the risk premium would grow to around 4 B€/year including them.
The average loss ratio (for companies) of insurances that involve individual loss adjustment is generally around 60-70%, with administrative costs (mainly adjustment costs) around 20-25% of the premiums. This type of insurance would have low adjustment costs, therefore a loss ratio of 80% would be reasonable. The total amount of premiums under a 100% coverage would be around 5 B€; but we know that the acceptation by farmers of insurances takes a long time, and it is difficult to think of more than 40-60% introduction. This makes a total premium amount of 2-3 B€. If we assume a subsidy of 50%, we would be talking of a budgetary impact of 1-1.5 B€.
This type of income insurance can be seen as an income support tool decoupled of production, and therefore might match with the WTO green box. If this was included in Pillar 1 from the current CAP scheme, a part of direct payments being shifted to provide subsidization to this insurance, it would result in a regular income loss for farmers in normal years and an additional income support in crisis situations.

Notice that this type of option does not necessarily involve the participation of insurance companies and can be managed by mutual funds or stabilization accounts.

9.6.2 Yield insurance on cereals.

Production covered: winter-spring cereals. For the analysis, we assume that the yield of wheat is a good indicator of the variability of yield of cereals in general. We consider a general insurance on yield: all climatic risks covered.
The % of production insured is likely to depend on the variability of the potential yield: A well developed scenario can assume that 90% of the production is insured in areas with very high variability of the potential yield, while only 30% of the production is insured in areas in which the variability is low.
Franchise of 30% of the "normal" yield. The compensation to the farmer will be the % of loss compared with the "normal" yield – 30% (straight deductible);
The premium rates applied depend on the yield variability as well, but also on the introduction level of the insurance products: if it is low, it is likely that the insured farmers are the ones with

the highest yield variability and therefore the insurance rates will be higher. The premiums could be subsidized by 50% in LFA and 30% in other areas. The public support to the re-insurance is similar to the support currently provided in Spain, where the public-private partnership on agricultural insurances is particularly developed.
The yield variability is a key parameter for the assessment of this type of scenario: the higher the yield variability the higher should be the demand for insurances and the higher the rates applied by the insurance companies.

At the moment the data we have are not yet detailed enough for a proper analysis of this scenario, but we can make a quantification of a more simplified scenario on arable crops.

9.6.3 Simplified quantification of yield insurance on arable crops (farm/field level)

The premium rates for yield insurance on arable crops ranges from 2.8% to 7% depending on the region, the risks included in the coverage and mostly on the used deductible.

If we consider an EU- wide system on yield insurance for arable crops covering most risks like hail, storm, frost, drought, flood and excessive rain and a deductible of 30% on farm level for specific crops and that in a EU-wide system the risks are wide spread an average premium rate of 3.5% to 5% for arable crops seems suitable.

The production value on arable crops in EU-25 is about 67,300 M€. If we assume an introduction of insurance of about 40%, we talk about an insured value of 26,920 M€. A higher introduction seems not probable in a first period in an EU-wide system that is not compulsory.

This assumption results in a total premium amount of about 940 M€ to 1,350 M€. If we assume a premium support of 50%, we would be talking of a budgetary impact of 470 M€ to 675 M€.

9.6.4 Area-index yield insurance for cereals

Let us suppose an insurance policy using the regional average yield of a given cereal as a trigger for all the farmers having bought an insurance in that region. An indication of the total premium volume involved can be computed from Eurostat data, as analysed in section 8.3. The geographical scale of available Eurostat data is generally coarse, and very specially in some countries. This aggregation effect produces a smoothing in the variability of the yield time series. To make reasonable assumptions with this geographic level we have made quantifications under two scenarios, with a straight deductible of 10% and 20%. The average risk level (expected payment due to the farmers) is 2.6% (with 10% deductible) and 1.45% (with 20% deductible) using the historical average production of each region as weight. It may happen that the acceptance of the insurance is higher in the areas with higher risk level. This would modify

the weights for the average risk level that would become higher, may be around 2% and 3% for both scenarios. The average premium rates might range between 3% and 5%.

The yearly production value of cereals in the EU is slightly above 35 B€. The acceptance level at medium term is difficult to estimate on an objective basis, but the experience in countries such as the US, Spain, Italy and Austria suggest that it would reach at most 40%. In this case the insured production would be around 15 B€ and the amount of premiums between 450 M€ and 750 M€.

9.6.5 Fruits and vegetables

In the case study on fruits and vegetables reported in the section 9.3 below, we estimate, under certain assumptions, that the volume of premiums for a EU-wide insurance system might range between 500 M€ and 900 M€ for fruits and another 500 M€ to 800 M€ for vegetables. The most important source of uncertainty in these estimates is the acceptance rate by farmers, that we have assumed to be 50% for fruits and 15% for vegetables, sector in which the acceptance is low, even in Spain, country with a well developed (and subsidised) set of insurance products available.

9.7 A case study: insurance schemes for fruits and vegetables

We consider here data on the current situation of insurances for 4 countries: Spain, Italy, Austria and France. The main types of insurance for fruits and vegetables we have identified are:

- Single risk, eg: hail, frost, floods, damage by strong rain or wind.
- Combined: covering two or more risks.
- Yield insurance for one product: covering any climatic risk.
- Whole farm insurance.

In the case of Austria, frost on fruits is considered non-insurable, and this is probably also the case in many countries of central Europe, probably because the rates would be too high and re-insurers are reluctant to take such a systemic risk. This might change if there is a support of the public sector, in particular for the re-insurance, but this needs to be discussed with the private sector.

9.7.1 Data on production and value of fruits and vegetables

There on production and value data used below have been obtained from datasets downloaded from the Eurostat intracomm site: http://europa.eu.int/estatref/download/everybody/
The data may need some corrections, partly because of the possible inconsistencies on nomenclature concepts, but such corrections should not be a major source of inaccuracy, compared to other sources of indetermination.

The production data we consider are obtained from the Eurostat table “Pvfrulea” as an average of the available data between 2000 and 2004 (the averaged years can vary from country to country). The value data come from the Eurostat table “A2acct97” (Agricultural accounts with the 1997 nomenclature) as an average of the available data between 2000 and 2003.

Table 37. Production of fruits and vegetables.

Production		Vegetables	Fruits (exc. Citrus)	Citrus fruit
eu27	Ktm	64105	24513	10429
at	Ktm	528	719	
at	%	0.8	2.9	
es	Ktm	12751	4097	5872
es	%	19.9	16.7	56.3
fr	Ktm	6226	3571	27
fr	%	9.7	14.6	0.3
it	Ktm	14125	5724	2980
it	%	22.0	23.4	28.6

Table 38. Value of the production of fruits and vegetables.

		Vegetables	Fruits (exc. Citrus)	Citrus fruit
eu25	M€	23354	11293	3329
at	M€	163	258	
at	%	0.7	2.3	
es	M€	4852	2319	1913
es	%	20.8	20.5	57.5
fr	M€	3212	2743	
fr	%	13.8	24.3	0.0
it	M€	5082	2273	1011
it	%	21.8	20.1	30.4

The relative weight of each of the 4 considered countries in each of the sectors (vegetables, citrus and other fruits) is similar in both tables, except for France. This suggests a more in-depth consistency analysis of the data for France.

9.7.2 The possible order of magnitude of a EU-wide system.

The order of magnitude of a possible EU-wide insurance system for fruits and vegetables can be measured by the amount of production insured, the total amount of premiums or the cost for the public sector if the system is subsidized. The assumptions to make an estimate on such order of magnitude have to be based on the data available for European countries in which the system is developed. However the systems existing in different countries are generally not comparable and the climatic conditions and risk level are also strongly heterogeneous. The mentality of farmers and their possible reaction to a system that has never been applied in the country is another unknown factor that cannot be forecasted on an objective basis. Therefore we need to accept a large amount of assumptions. Consequently any forecast that can be done has a very large degree of uncertainty.

We can give some indications of the order of magnitude of a an EU-wide system. Let us assume that we consider a European system similar to the “whole farm insurance” used in Spain for fruits (excluding citrus). The average cost in Spain has been 6.17 €/100 kg. The total production in EU25+2 is around 25 Mtm. A multiplication gives approx 1,500 M€. Assuming that a political priority to this type of insurance leads to a 50% coverage with this type of insurance, we would get a figure of 750 M€ for the total of premiums. This involves some additional assumptions that are not easy to accept, in particular that the level of risk in Spain is approximately the average level of risk in the EU. Additional considerations need to be integrated in this coarse computation, such as the insurability of frost in many countries. An extrapolation of the Spanish data assuming a combined option with frost (indicatively an average of 6 to 7 €/100 Kg) would result into a total of 730 to 860 M€, while an option without frost would (roughly about 4 €/100kg) would give a figure of about 500 M€, always with the assumption of 50% coverage.

Data for Italy are available in terms of average price of the premium compared with the insured value at a certain reference price. The average price has ranged in the last years between 13% and 15%; we consider 14% as indicator. This rate applied to the EU25 figure for the production value (~ 11,300 M€) gives 1,580 M€, i.e. 790 M€ for the total of premiums, assuming always a coverage of 50%. However we have to take into account that more than 70% if insurances for fruit in Italy are single-risk (hail or frost). Therefore the apparent coherence of this figure with the extrapolation of the data from Spain comes with a question mark.

In the case of vegetables the coverage rate is generally lower and the fares are also lower than for fruits, but the global value of the production is significantly higher than for fruits. The coverage figure provided by ENESA is 30%, although the insured production (973 M€) corresponds to 20% of the Eurostat production figure. The difference is probably due to the denominator used: insurable production or total production. In Italy the coverage is around 8-9% of the production (Eurostat figures). A hypothesis of a 15% coverage for a hypothetical EU-wide system seems reasonable. This would mean an insured production value of the order of 10,000 M€. Since the average premium rate ranges between 5% and 8%, the amount of premiums would be around 500-800 M€. Figures are lower for citrus, although we do not have at the moment sufficient data on premium rates.

9.7.3 Cost for the public sector

A major question on this issue is the possible cost of subsidising the insurances for fruits and vegetables at EU level. The answer obviously depends on several factors, including the type of insurance, proportion of the production insured and % subsidized.

A simplified computation of the cost for the public sector would be:

*C= ProdVal * Degint * Mrate * SubsP + PReins*

Where
ProdVal = total value of the (insurable) production.
Degint = Degree of introduction of the insurance, i.e. part of the (insurable) production that is actually insured.
Mrate = Mean premium rate applied by the insurers.
Subs = Subsidy proportion for the premium
PReins = public participation on the reinsurance.

The concept of insurable production is not necessarily harmonized across member states. Therefore it may be preferable to refer *Prodval* and *Degint* to the total production.

A similar alternative formula would be
*C= ProdW * DegintW * MrateW * SubsP + PReins*

Where *ProdW* is the production in weight.
DegintW is the degree of introduction in weight (it can be identified with *Degint*).
MrateW is the premium rate in Euro/Ton

The strongest source of indetermination is probably the degree of introduction *Degint*. It is likely to depend on two main factors: the risk level (that can be represented by the variability of yield) and the existence of subsidies on the premiums. In a first approach we consider the effect of the subsidies assuming that a EU support system would lead to an average degree of introduction comparable to the current one in countries with a national support system. Since the information we have on it is not precise because it is based on the conjecture that certain national values can be extrapolated, we will not make difference between *Degint* and *DegintW* .

The mean premium rate *Mrate* should depend on the type(s) of insurance and the risk of yield reduction above the franchise.

The interest of using one or the other formula depends on the available data. We should use statistical data for the production (weight or monetary value). In this moment we have data for the production (weight), but not for the value.

9.7.4 Available data in selected countries

In this moment we only have data for a few countries in the specific field of insurances for fruits and vegetables. The type of data available for each country is quite heterogeneous and the extrapolation to the possible behaviour in EU25 from these data becomes difficult.

Spain

For fruits in Spain there are three possible insurance modes.

- Combined per species, covering hail, frost and other risks like floods, damage by strong rain or wind.
- Combined excluding frost.
- Whole farm insurance: combined for all types of fruit in the farm. It includes hail, frost and other weather risks and the missed conversion of flowers into fruits for climatic reasons. For hail the indemnities are paid by parcel, but the rest of the damages are calculated for the whole farm.

Deductibles: depend on the product and type of insurance, but it is generally from 10 to 15% for hail and from 15 to 30% for the options including frost.

Table 39. Average cost of insurance in 2005 for fruits

	Fruits Options with frost (€/100 kg)	Without frost (€/100 kg)
Peaches	7,63	4,38
Apricot	7,81	3,69
Plums	6,56	4,68
Cherry	26,71	18,83
Table Apples (exc. cider)	4,81	3,41
Pear	5,36	3,12
Whole farm	6,17	

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Table 40. Average cost of insurance in 2005 for vegetables

	Coste (€/100 kg)
Onion	0,70
Melon	1,34
Pepperoni	2,59
Winter Tomato	1,40
Summer Tomato	0,49
Tomato Canary Islands	4,11

Table 41. Insurance for fruits and vegetables in Spain (2005?)

	Fruits (excluding citrus)	Citrus	Vegetables and flowers
Degree of introduction			
combined coverage	65	37	30
Yield insurance	6		
Insurance through producer's organisations	4		
Insured production (Multi risk)			
Area (Kha)	128	207	112
Value M€	1197	645	973
Insured production (yield)			
Area (Kha)	35	0	0
Value M€	21	0	0
Insured production (Producer's organisations)			
Area (Kha)	3.4	0	0
Value M€	3.9	0	0

Italy.

The Italian data presented in this section are obtained from a provisional report on the insurance campaign 2005 and from the risk management data base "Sicuragro" elaborated by the Institute of Services for the Agricultural and Food Market (ISMEA). In the Agricultural insurance system, ISMEA's role is to manage the public reinsurance fund and to run and keep updated the data base on agricultural risks. ISMEA conducts research and experimentation for new agricultural risk management tools. It supports the Ministry for Agricultural Policies (MAP) in preparing the annual report.

In the campaign 2005 the 74.98% of the insured value are belonging to three sectors: cereals: 958.8 million € f the insured value; vineyard: 876.6 million € and fruit with 725.8 million €. The higher costs are bear for insure the fruit sector: 13.83% the medium fare in 2005, with a growth equal to 6.17% compared with 2004.

In the table below it's possible to compare and observe the trends and the evolution of the insurance market during the past few years. We can observe that the insured volume in the campaign 2004 was especially high (915 millions Euro of insured value). The fruit sector in 2005 suffered a significant reduction compared to 2004, but the data are similar to those of the previous years.

Table 42. Fruits-Evolution of the insurance market (2001-2005)

Fruits	Unit	2001	2002	2003	2004	2005	variation 2005/2004
Contracts	n.	58,903	64,365	59,728	60,375	51,107	-15,35%
Insured Value	.000€	717,357	783,48	779,055	918,847	725,847	**-21%**
Insured Surface	ha	147,236	100,596	121,028	114,88	110,675	**-3,66%**
Insured Quantity	.000 t	2,086	2,141	1,961	2,073	1,507	**-27,28%**
Insured Quantity	.000n	6,137	5,186	4,717	5,957	7,422	-24,59%
Total Premium	.000€	94,134	115,214	108,499	119,681	100,375	-16,13%
Fare	%	13,12	14,71	13,93	13,03	13,83	6,17%

Source: Sicuragro.

Almost all the insurance contracts for the products of this specific sector are characterized by a 20-30% threshold (franchise).
The table below gives the insured value per product.

Table 43. 2005-Product with the higher insured volumes and medium fares.

Products with the higher insured value	Millions Euro	Medium fare
Apple	208,8	18,66
Pear	166,5	16,38
Nectarine	81,2	14,29
Kiwi	60,1	
Peach	46,9	
Table Grapes	39,3	
Early Nectarine	29,4	11,34
Plum	25,4	12,04
Breading fruit plants	22,9	

Source: Sicuragro

The insurance schemes can be:

1. **Single-risk** (hail and frost) which absorbs the 71.74% of the total insured value;
2. **Combined** on **yield** to which is attribute 3.64% of the total value;
3. **Pluri-risk** to which is belonging 24% of the total insure value for this sector, and those guaranties are on:
    i. hail and wind
    ii. hail and frost
    iii. hail, wind and frost
    iv. hail, wind, frost and drought.

At a regional level we can observe that the insured volumes are concentrated in Emilia Romagna, region which absorbs 40.33% of the whole insured value for the fruit sector (79.63%of the pear insured value belongs to this region). Another region which presents high volumes is the Province of Bolzano and the Province of Trento - former Trentino Alto Adige region - (19.78 of the fruit sector and 67.60% only for apples).

In 2005 (see table 3) the insured volumes for vegetables and potatoes sector were decreased in comparison with the previous insurance campaign. In terms of value (-10%), surface (-16.45%) and in quantity (-9.73 tons).
This kind of market evolution shows a decrease of the insurance demand.

Table 44. Vegetables and potatoes-Evolution of the insurance market (2001-2005)

Vegetables and Potatoes	unit	2001	2002	2003	2004	2005	variation 2005/2004
Contracts	n.	11,185	11,344	12,505	12,179	11,344	-6,86%
Insured Value	.000€	390,48	378,244	419,511	496,686	446,949	-10%
Insured Surface	ha	66,025	61,688	68,809	78,499	65,588	-16,45%
Insured Quantity	.000 t	3,196	3,421	4,313	4,578	4,132	-9,73%
Insured Quantity	.000€	71,977	84,198	111,898	102,456		
Total Premium	.000n	28,921	29,437	32,875	32,864	24,971	-24,02%
Fare	%	7,41	7,78	7,84	6,62	5,59	-15,56%

Source: Sicuragro

Almost all the subscribed policy of 2005 (98.87%) in terms of insured value, are characterized from the threshold fixed at 20-30. Only some few crops were also insurance contracts without threshold.
For what concern the insurance schemes, vegetables and fruit sectors adopt the same type, listed above.

Austria

Insurance for fruits and vegetables in Austria refers to hail. Two geographical areas are differentiated, depending on the likelihood of hail events.

Fruits:

Table 45. Main data for fruit insurance in Austria

	average	
number of contracts		3,075
average premium rate (hail) middle endangered area (33%)	15%	9%
average premium rate (hail) high endangered area (67%)		18%
insured area (ha)		7,021
insured value (M€)		59.1
amount of premium (M€)		7.54
annual average loss		6.5
Subsidies	50%	3.77

Vegetables are classified in 4 categories:

Table 46. Premium rates for vegetables hail insurance in Austria

	Middle endangered	High endangered
Asparagus, Carrots, Parsley root, Radishes, (Beer-)Radish, Beetroots, Wild horse radish,	2.1	3.4
Broccoli, Chinese cabbage, Fennel, Green beans, Peas, Beetle beans, Cauliflower, Garlic, Brassica, Cabbage turnip, Brussels sprouts, White cabbage, Industrial cabbage, Red cabbage, Parsley green, Celery, Spinach, Sweet corn,	5.1	9
Gherkins, Field cucumber, Aubergines, Melons, Hot peppers, Leeks, Pieplant, Courgettes,	6.8	12
Peppers, Tomatoes, Lettuce, Marrow, Onions,	8.5	18

France

Most of the data we have at the moment are aggregated for fruits and vegetables together. The types of insurances existing are:

- Mono-peril for all crops. Covers against fire, lighting, theft, hail. The risk of strong wind or small storm (*tempete)* seems that is not included for fruits and vegetables
- Hail and frost: vineyard and fruit trees since 2002. Insured surface for fruits and vegetables: 2-3%

- Multi-peril (Hail, storm, frost, drought, flood or excess of humidity, snow and ice weight, ravine / gully erosion). Very low demand on the first year (2005) for fruits and vegetables. From 2007 on, the subsidy will be higher for fruits and vegetables than for other crops, because fruit and vegetables premiums are far more expensive.

Premiums: Depend on the extent of the guarantee, on the culture insured and on the location.

Table 47. Premiums and production insured for fruits and vegetables

	Premiums M€	Production insured M€
1999	*44,5*	*747,0*
2000	*33,0*	*520,0*
2001	43,9	801,0
2002	39,0	730,0
2003	35,0	709,0
2004	37,0	705,0
2005		

Deductibles: Usually 10% of the damages for insurance hail-storm. Variable for the other contracts. Multi-peril “hard blow” for all crops: depend on the type of contract: Whole farm deductible = 20% and specific crop deductible = 25% (in order to get subsidies. If you want a lower deductible, you pay a higher premium for it and the difference ids not subsidized).

Level of subsidies (2005):
Mono-peril Hail & storm for fruit trees and groceries: 7.5%
Hail and frost for fruit trees: 25% (for vineyards: 10%)
Multi-peril “hard blow”: 35%.

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GLOSSARY

Adverse selection: A situation in which the insured has more information about his or her risk of loss than does the insurance provider and is better able to determine the soundness of premium rates. As a consequence, the level of risk in the insured population is higher than in the total population (Harwood et al 1999a).

Agricultural production contract is a contract by which a producer (sometimes called a "grower") agrees to sell or deliver all of a designated crop raised in a manner set forth in the agreement to a contractor and is paid according to a formula established in the contract.

Asymmetric information: relates to the problem that the buyer of insurance and the insurance company may not have the same information as regards the probability of losses occurring. Asymmetric information refers to one or both of these problems: Adverse selection and moral hazard.

Blanket insurance: A single insurance policy that covers one or more broad classes of persons or property, without identifying the specific subjects of insurance in the contract.

Bonus/malus: Premium discounts/charges when over a certain period of time no claims/claims are made.

Co-insurance or coinsurance: An insurance policy provision under which the insurer and the insured share costs incurred after the deductible is met, according to a specific formula. More generally it consists in a sharing of risk between the insurer and the insured.
It can also refer to the case where a number of different insurers subscribe to a single insurance policy.

Consequential losses due to an animal disease: In insurance contracts, consequential losses are indirect losses, a reduction in the value of property that is a result of a direct damage loss. Usually are associated with a time element, or to other remote or indemnification type losses. Consequential losses are different than ensuing losses since consequential losses are indirect losses not direct damage losses, whereas ensuing losses are further or additional direct damage losses that have been initiated by the original direct damage cause of loss.

Co-reinsurance: A requirement that the reinsured bears, in addition to the deductible, a portion of the coverage under the treaty un-reinsured and for its own account. It intends to ensure that the reinsured retains an interest in loss minimisation even after the deductible has been exceeded.

Cumulative loss ratio: means the ratio of total indemnities to total earned premiums during the base period ex-pressed as a decimal.

Deductible or excess (French: *Franchise*): The portion of an insured loss to be borne by the insured before he is entitled to recovery from the insurer. It may be in the form of an amount of euros, a percent of the value of the insured property (**straight deductible**) or a percent of the loss (**relative deductible**). // In a policy providing a deductible clause, the amount which must first be subtracted from the total damage incurred before determining the insurance company's liability. There are several types used.

Direct losses due to animal disease: Direct financial loss due to mortality or morbidity of livestock or crop plants can vary from insignificant to catastrophic. In many cases the direct losses would be modest and would fall on a small number of farms. One of the major determinants of the magnitude of the direct losses will be the rapidity with which the disease is noticed and diagnosed.

Disappearing deductible: Establishes the insurer's liability for an increasing proportion of the loss, as the total damage rises above the deductible, until the deductible finally "disappears". Then the insurer is liable for the entire amount.

Franchise or franchise deductible: Deductible in which the insurer has no liability if the loss is under a certain amount, but once this amount is exceeded, the entire amount is paid in full. Deductible below which nothing is payable and beyond which the entire amount of the sum insured is payable. The franchise deductible establishes the insurer's liability for the entire amount of damage once the deductible amount is exceeded in a loss.

Insurance policy: A contract of insurance, describing the term, coverage, premiums and deductibles.

Loss ratio: Ratio of the annual claims paid by an insurance company to the premiums received ex-pressed as a decimal.

Moral hazard: In the case of insurance, moral hazard refers to an individual's change in behaviour after having taken out an insurance policy. The change in behaviour results in an increase in the potential magnitude and/or probability of a loss.
Tools insurance companies generally use to minimise moral hazard include:

- Deductibles or co-payments (the insured has to bear part of the loss: a fixed amount or a percentage of the total loss);
- No-claim bonuses (see bonus/malus);
- Checks to verify whether the insured takes the precautionary measures agreed upon to prevent losses;
- Indemnification based on an objective index which cannot be influenced by the insured.

On Spot Market it's a market in which commodities, such as grain, gold, crude oil, are bought and sold for cash and delivered immediately.

Premium: A regular periodic payment for an insurance policy.

Quota-share provisions: specify what percentage of premiums and loss exposure the private company will retain, with the residue being passed on to the reinsurer.

Reinsurance: Reinsurance main types are two: excess of loss or stop-loss reinsurance and proportional or pro-rata reinsurance. Stop-loss reinsurance: see Stop loss provisions. Proportional reinsurance: there are four types of proportional insurance structures: quota share reinsurance, variable quota share reinsurance, surplus reinsurance and surplus reinsurance with a table of lines. Quota-share reinsurance is the most common: The reinsurer assumes a set percentage of risk for the same percentage of the premium, minus an allowance for the ceding company's expenses.

Relative deductible (French: *Franchise relative* or *Franchise proportionnelle*): Deductible consisting on a percentage of the loss to be borne by the insured

Risk: Uncertainty (i.e. imperfect knowledge or predictability because of randomness) in outcome that might involve adversity or losses. Two aspects of risk can be distinguished: variability and downside risk, i.e. the probability of extreme low values. (Hardaker et al.1997)

Risk aversion: Economic agents are risk averse when they have a preference for a certain outcome over an uncertain outcome with equal expected value. (Hardaker et al.1997)

Stop Loss provisions: specify the maximum amount of loss that the company will have to cover before the reinsurer covers the additional losses (Skees and Barnet, 1999).

Straight deductible or deductible (French: *Franchise absolue* or *Franchise déduite*): A deductible that is a constant value (as a specified amount).

Systemic risk: As opposed to risks like fire and burglary, systemic risks are dependent risks. A lot of people suffer a loss at the same time. Systemic risks result in many people making a claim at the same time with the effect that the premia paid into a pool are not sufficient to cover the loss incurred, which may threaten the solvency of the insurance pool. An example for systemic risks is price risk. All producers suffer from price downturns at the same time. Measures insurance companies can take to deal with systemic risks include re-insurance, geographic spreading and the use of capital markets.

Trigger: See franchise.

Vertical integration, in microeconomics and strategic management, the term describes a style of ownership and control. Vertically integrated companies are united through a hierarchy and share a common owner. Usually each member of the hierarchy produces a different product or service, and the products combine to satisfy a common need. It is contrasted with horizontal integration. Vertical integration is one method of avoiding the hold-up problem.