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Study on environmental consequences of Sheep and Goat farming and of the Sheep and Goat premium system

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List of acronyms

AEM	Agri-Environmental Measures
AES	Agri-Environmental Scheme
ASL	Azienda Sanitaria Locale
a.w.u.	Annual Working Unit
BSE	Bovine Spongiform Encephalopathy
C.A.	Compensatory allowance under LFA scheme
CAP	Common Agricultural Policy
CC	Cross-Compliance
CCW	Countryside Council for Wales
CMO	Common Market Organisation
EC	European Community or European Commission (depending on the context).
EU	European Union
FADN	Farm Accountancy Data Network
F&M	Foot and Mouth disease
FS	Farming System
FSS	Farm Structure Survey
FVO	Food and Veterinary Office
GATT	General Agreement on Tariffs and Trade
GHG	Green house gas
HNV	High Nature Value
Kg	Kilogramme
LD	Livestock density
LFA	Less Favoured Area
LIFE	Financial instrument for the environment
L.U.	Livestock Unit
M	Million
MFA	Main Forage Area
MS	Member State
MTR	Mid Term Review
N.A.	Non applicable
NDB	National Data Base (Identification)
RWP	Rural World Premium
SAC	Special Areas for Conservation
SD	Stocking density
SFP	Single Farm Payment
SPA	Special Protection Area
S&G	Sheep and Goat

UAA	Usable Agricultural Area
UK	United Kingdom
USL	Unità Sanitaria Locale
WTO	World Trade Organisation

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Executive summary

Introduction

This study was undertaken for DG AGRI of the European Commission to examine the environmental effects of sheep and goat (hereafter S&G) farming and of the EU premium system for supporting S&G farming (Council Regulation 2529/2001). It focuses on the six main S&G producing countries of the EU (France, Greece, Ireland, Italy, Spain and the United Kingdom), from 1999 to 2005.

During this period the mid-term review of the CAP (Council Regulation 1782/2003) introduced the option of decoupling sheep and goat support payments, one objective of which was to promote more environmentally sustainable agriculture. This mechanism, along with other policy measures that affect S&G farming (such as Less Favoured Area and Agri-environmental payments) are also considered, resulting in an ex-ante analysis which tries to anticipate the consequences of the new set of interacting rules that will affect the S&G sector in the future.

The study also reviews the implementation of the S&G identification and registration system introduced in 2005 (Council Regulation 21/2004) and its implications for the environment, for example as a cross compliance measure that might replace the monitoring of sheep numbers where support is no longer paid on a headage basis (i.e. where it is fully decoupled).

Methodology

The study was built around a simple zoning of the study area, into Mediterranean, Continental and Atlantic zones, on the basis of very broadly characteristic environmental conditions and the resulting farming systems.

Expert knowledge was used to develop a typology of S&G farms in two parts, one for the Mediterranean region and one for the Atlantic and Continental regions. These reflected the ecological differences of the zones and the production systems. The typology uses the predominant animal feeding system as the defining characteristic (e.g. sedentary grazing on permanent grassland, pastoral grazing of semi-natural vegetation or arable stubble/fallow, indoor systems using purchased feeds, etc.). This approach reflects two of the most relevant aspects for the environment – the forage and fodder resources and the intensity of management, including stocking density and the need for supplementary concentrated feedstuffs.

The fact that many farms combine sheep with other production sectors (beef, dairy, arable) was a complicating factor, especially in the Atlantic and Continental regions (see Appendix 3), both for the typology and the environmental analysis.

The analysis drew on literature, EU-level data bases and expert interviews. It was intended by the project brief to take account in particular of reports made by Member States on the implementation of policies, as provided for under Article 3 of Council Regulation 1259/1999. However, most countries were found not to have produced such reports on the S&G premium system.

Existing literature sources were found to be extremely limited in some areas, especially on the environmental effects of S&G policies in the Mediterranean region. Even in the Atlantic region, where the over-grazing issue is well known, there was surprisingly little published information available.

The expert interviews (approximately 12-20 in each study country) were an invaluable source of information. For the Mediterranean they were particularly useful for information on farming systems and to some extent on their environmental effects, but much less so on the specific effects of policy measures. For the Atlantic (especially for Ireland) the interviews produced much information on the systems, the role of the S&G policy and also both the environmental effects and the environmental measures introduced in response to these.

The analysis of statistics on S&G numbers at the level of NUTS2 administrative regions allowed some conclusions to be drawn about broad geographical tendencies in different periods (e.g. considerable fluctuations in animal numbers, with some marked differences between regions). However, the environmental implications of such changes are not clear without a detailed analysis of distribution and farming trends at a more local level together with the local environmental impacts, a level of research that

was not envisaged with the limited resources of this study and for which there is very limited data available.

Considerable analysis was undertaken of the data available through the FADN (Farm Accountancy Data Network). However, this data source was found to have considerable limitations for the purposes of the study, due to its particular categorisation of farm types and non-inclusion of farms below a certain economic threshold ("professional" or "commercial" farms). These minimum thresholds vary between Member States. The importance of this should not be underestimated. For example Scotland is often portrayed as a country of large commercial holding, yet as much as 30-40% of Scotland's hill land (i.e. semi-natural vegetation) is farmed by "non- commercial" holdings.

Summary of findings pre-CAP reform of 2003

Compared with other agricultural sectors, S&G farming is of relatively small economic importance for the EU as a whole and in most Member States, even those with a large part of EU S&G production, such as Spain and UK.

Yet S&G farming is a predominant land use over very large areas of land, especially in the more marginal regions of the Atlantic and Mediterranean zones, where it plays a fundamental role in issues such as landscape, biodiversity, soil, fire and human presence. The great territorial importance of S&G farming in Europe is in marked contrast to its small economic significance.

As with most farming sectors, S&G production has both negative and positive environmental effects. However, S&G stand out particularly for their potentially beneficial effects over these large areas of territory, on land that is mostly composed of semi-natural vegetation and is environmentally fragile. The beneficial effects (although not always fulfilled), include:

- Maintenance of valued open and diverse landscapes at a scale that is important for Europe's open-ground flora and fauna..
- Maintenance of pasturelands composed of valued habitats, ranging from marshes, steppelands, coastal grasslands and heaths to moorlands and alpine grasslands; as well as managed farmland components including semi-natural grasslands, hay meadows and cultivated areas.
- Fire prevention and management, especially (but not exclusively) in Mediterranean regions, and thus the prevention of a cycle of fire and soil erosion that can lead to severe land degradation.
- Environmentally positive integration with low-intensity farm management such as the dry-land arable systems of Mediterranean regions (with associated dunging, stubble and fallow grazing) and small-scale mixed livestock farming in the more remote parts of the Atlantic region.

In addition to this "maintenance" role over extensive areas, the most widespread S&G systems make relatively little use of external inputs (agro-chemicals, manufactured fertilisers and feeds) and thus have a relatively small ecological footprint compared with many farming sectors in the EU.

On the other hand, S&G farming has had negative environmental effects, in particular taking the form of:

- Overgrazing of semi-natural vegetation, including grass, scrub and forest habitats, with negative impacts on the habitat itself, as well as on species of flora and fauna associated with the habitat, and in extreme cases on soil.
- Water pollution resulting from stock concentrations and sedimentation affecting water courses (uplands) and from intensified production systems (lowlands) and cheese making may occur locally, although for this issue S&G are a far lesser concern than other livestock sectors.

With the data available it is not possible to quantify these negative effects either at an EU level or at most local levels, only to quote examples that have been documented or reported from particular areas. Especially in the Atlantic zone, it is well documented that overstocking has affected certain areas with particular environmental sensitivity, such as blanket bog in the west of Ireland, and in the uplands of Wales and England.

In the case of Ireland, the overgrazing issue is considered by the nature conservation authorities to be the most serious cause of environmental damage there over the last 20 years (loss of habitat and species, damage to soil, knock-on effects to fish species and water quality). Some overgrazed areas in the west of Ireland remain in a degraded state despite the best efforts of the special measures introduced to rectify the situation (although see below on future risk of abandonment).

In the Mediterranean zone, there is not the same level of information on such environmental effects of S&G. This may be because cases of overstocking have not been so frequent or extreme, or it may reflect the fact that environmental NGOs are far less active on such issues in the Mediterranean countries compared with in the UK and Ireland. Also, attention is drawn by other sectors and activities that are far more problematic than S&G in terms of their environmental impacts and that have been expanding at a far greater rate, such as irrigated cropping in steppelands, afforestation of grazing lands, or the impact on soils of arable and permanent crop systems.

Nevertheless, concern has been expressed since the 1990s in Spain about greatly increased stocking levels and size of flocks in some steppe areas, e.g. in Extremadura and Aragón, and about the impact of this development on bird species and soils. In Greece, cases of overgrazing are reported to occur especially on land near to villages and towns where pastoral flocks are based. In Italy, cases of over-grazing are reported from Sardinia, Puglia and Sicily.

The main negative effects reported therefore are those resulting from excessive stocking levels and concentration of stock. Although not the only factor, the present study indicates that the CAP S&G regime has played a significant role in driving up stock numbers since the 1980s. There have been notable fluctuations in some regions, but overall it seems that certain areas have been particularly affected by the incentive effect of S&G premia, such as parts of England and Wales, Ireland, Extremadura in Spain and Sardinia in Italy.

In other words, while not laying the blame exclusively at the door of the CAP regime, it is clear that the negative environmental effects of S&G farming in recent years have taken place in a particular policy context that initially encouraged high stocking levels and subsequently acted as a buffer against any downward change that might have resulted from market signals. Without this distorting factor, environmental effects related to overstocking would certainly have been less of an issue.

At the same time, environmentally positive effects result from the fact that the premium system has been instrumental in maintaining S&G farming activity in the more marginal areas. Despite the negative effects produced in certain places where stocking levels were excessive, there have also been broad benefits through the perpetuation of open-habitats and the plants and animals associated with these, as well as providing an important contribution to fire control.

Without financial support, including the S&G premium, many meat-orientated S&G production systems would make little or no net income, so that in its absence many more farmers could be expected to have ceased production. Thus, in some of the more marginal areas of the Mediterranean uplands, the policy has slowed the process of decline. The premium has helped to maintain occasional, low-intensity grazing and browsing (by both sheep and goats) with definite benefits for biodiversity and fire control. Nevertheless, the decline has continued, if at a slower rate than would otherwise have occurred, and more remote areas of vegetation continue to be abandoned.

In Member States that allocated the S&G premium on a regional basis from 1992, this “ring-fencing” put a brake on the process of concentration of production into certain regions that was beginning to happen. Although this did not prevent the concentration of production within regions nor within farms.

At the same time, it is quite clear that S&G farming systems have not involved merely in response to the premium system. Rather, it could be said that the premium has helped to prop-up the viability of S&G farms and to keep them in existence; but apart from the stimulus to have more female animals and to keep them during a fixed retention period , the tendencies in farming systems probably have been influenced more by market, technological and socio-economic drivers than by policy.

Notable examples of such tendencies include the decline of shepherding (high labour costs, poor labour conditions, low social standing) and increase in fencing, the decline of transhumance in the Mediterranean zone (for similar socio-economic reasons) and the increased use of concentrates and other purchased feeds (increased availability, convenience, enables greater control of animal nutrition, e.g. for higher fat content of milk). Although data are not available on the precise environmental effects of these tendencies, taken together they clearly imply a decline of precisely those systems and practices that are associated with the environmental benefits of S&G farming, namely the seasonal, shepherded grazing of semi-natural vegetation and arable stubbles and fallows.

The decline of shepherded and transhumant systems is a particular environmental concern in the Mediterranean zone, because of the specific environmental consequences. Sheep and goats are kept increasingly in fenced fields and/or indoors and fed increasingly with purchased feeds, resulting in trampled and exhausted pastures in summer, and the abandonment of seasonal upland and mountain grazing, leading to greatly increased fire risk and loss of natural values.

A notable change has been the steady increase in average flock size. This has been particularly notable in the UK and Spain, where sheep have become increasingly concentrated in very large flocks (over 1,000 or even 2,000 head). These large flocks are themselves an environmental concern, due to the difficulties in shepherding them and their potential impact on vegetation.

While the S&G premium system cannot be said to have caused the processes described above, it is also true to say that no mechanisms have been introduced to provide a greater level of support to less intensive S&G farming systems (as occurred in the beef sector), to farmers keeping smaller flocks, or to support such widely beneficial practices as shepherding. Most Member States have chosen not to take up options existing under the regime, such as national envelopes.

Summary of findings post-CAP reform of 2003

Environmental considerations post-CAP reform are in many ways different from those of recent years, partly due to the dismantling of the previous S&G support system but also to the introduction of new mechanisms such as the new animal identification system and cross-compliance, and the potential penalties associated with these.

In the Atlantic region, some of the more extreme cases of overstocking have been, or are currently being, dealt with by policy mechanisms under the LFA and agri-environment schemes, and cross-compliance (e.g LFA supplements in Wales, Commonage framework plans in Ireland and the use of the sheep national envelope in parts of England). Less policy action has been taken in the Mediterranean region, but in areas with a problem of stocking densities above the ecological optimum, it is possible that the CAP reforms will result in some reduction in animal numbers with a potential reduction in pressure on the environment (habitats and soils).

However, farming systems driven solely by the market are unlikely to maintain sheep grazing on semi-natural pastures at appropriate levels. Such a policy environment seems more likely to encourage an intensive use of good land, further mechanisation and housing due to the high costs of labour (where this is even available) and a cessation of labour intensive practices.

So although the problems of overstocking as driven by the premium system seem likely to decline, this does not mean that intensification will cease. In fact, it is likely that only the more rationalised farms will survive in the decoupled environment. In Mediterranean areas this will mean an on-going decline of shepherded grazing systems, and a continued increase in the use of fencing and of sedentary stock using purchased feeds.

At the same time, the decoupling of CAP payments in other sectors may lead to wider shifts in land use, including the possible decline of arable cropping on more marginal land, with sheep production as a potential new use. While the environmental effects of such a change are difficult to predict and have not been analysed in the present study, one effect of such land becoming available for sheep production may be to accelerate the process of rationalisation and concentration of the sector, thus adding to the problems of competitiveness of the more traditional, marginal systems.

Indeed, the greatest environmental concern expressed during interviews in all regions was the future threat of large-scale abandonment of the production systems that are of most benefit in environmental terms, partly because of the characteristics of the systems themselves (e.g. labour intensive, poor infrastructure), partly because of their geographical location, and partly because of increased competition from more dynamic areas and systems.

The process of abandonment in more marginal areas and concentration and intensification in areas with a comparative advantage is well known in Europe for other farm sectors. In the case of S&G farming this process will become a major concern because of the large areas of environmentally sensitive land that currently are maintained by S&G farming systems.

Identifying, achieving and maintaining an environmentally appropriate level of grazing is not simple. Clearly a decline of grazing pressure is not always detrimental for environmental values. In some areas of the Mediterranean uplands, where historically there were very high sheep and goat numbers, the decline that has taken place in the past 30 or 40 years probably has brought some environmental benefits, as semi-natural vegetation has recovered and become more diverse. Yet if grazing activity disappears altogether from these same areas, the environmental losses will start to outweigh the benefits as the landscape closes over.

In fact in some areas of the study countries, grazing has already declined to a point that raises important concerns. The study reveals under-grazing and abandonment to be a major current problem for nature conservation on the remaining areas of open-habitat vegetation in the lowlands of the UK, in areas where livestock farming has fallen below the critical mass needed for it to continue to have a beneficial effect The same situation occurs at a local level in the other study countries, for example where arable and permanent crops have squeezed out traditional mixed faming.

Whilst there are many parts of the uplands of the UK and Ireland that will no doubt benefit from a period of grazing cessation, in the long term large areas will require grazing to maintain nature values. To achieve nature conservation objectives, this grazing would be ideally at levels below the economic optimum, but above the cross-compliance minimum. Left to the market, such systems will not survive. So it is clear that any future policy needs a mechanism to support S&G farming at a level between the extreme limits of tolerance that cross-compliance might impose.

A common feature of the systems that are most beneficial to the environment is management of stock by shepherds. The increasing difficulties in employing skilled shepherds appear to be common to many of the areas in question. Whilst the shepherding function is regarded as essential by many environmental experts, the tendency for policy makers and agronomists is to regard shepherding as an historic curiosity whose disappearance is inevitable. This is a clear example of how the more traditional S&G production systems need to be re-evaluated by policy makers within the context of the broader objectives for agriculture that recent European Commission reforms have introduced.

If the process of rationalisation and concentration of production in intensified systems and abandonment of extensive S&G farming in marginal areas continues or accelerates, it can be expected to have several consequences for the environment:

- A decline in, or cessation of, grazing would lead to a loss of a range of habitats to scrub invasion or afforestation, especially in uplands and mountains and in poorer steppelands, probably contributing to a further decline of already endangered species.

- Declining maintenance of small areas of semi-natural vegetation (grasslands, heaths, marshes, moorlands) in primarily arable or ley grassland landscapes.

- Declining biodiversity value of semi-natural grasslands increasingly under more intensive management (divided into fenced lots, increased use of fertiliser).

- Loss of shepherded flocks on extensive arable steppes in Mediterranean areas and the loss of hefted flocks of sheep in the hills and mountains of the Atlantic region.

- Increased fire risk and increased intensity of fires, due to the accumulation of dry matter on scrub and forest land.

- Increased soil erosion following forest fires, and risk of desertification in the case of repeated fires on the same land.

- Increased use of purchased feeds, more housing of breeding sheep and more intensive, housed finishing of lambs (environmental costs of manufacture and transport and concentration of dung).

- Potential problems of waste disposal from increasingly larger-scale intensive milk systems.

The new policy situation post-CAP reform is not the only driver of the abandonment threat, perhaps not even the principle driver. Social and economic factors are of great significance. Especially in more marginal areas, fundamental issues include the advanced age of many farmers, the limited attractions of S&G farming for young people and the consequent lack of farm successors, the difficulty and expense of finding skilled labour. Partly these issues can be traced back to the farming conditions themselves (long hours of hard work, no holidays or weekends, poor on-farm and off-farm infrastructure, marginal incomes). Decoupling of CAP support adds a further level of disincentive. This socio-economic reality is a major challenge for policy makers, and one which needs to be addressed if environmental objectives are to be achieved.

The identification and registration scheme

The introduction of a new identification system does not have explicit environmental objectives. Rather it aims to be a mechanism to trace animals for veterinary purposes and provide a mechanism for monitoring the number of animals now that headage counting (for the purposes of premia) is no longer carried out in all Members States.

Animal numbers are needed to monitor compliance of minimum stocking requirements under cross-compliance and/or for LFA payments and in some cases (e.g. in the Scottish LFA scheme) to calculate the mix of livestock (i.e. mix of cattle and sheep). The report reviews the way Council Regulation 21/2004/EC has been implemented in the 6 study countries and outlines the various derogations granted.

From an environmental viewpoint the new scheme will now provide the main basis (in decoupled countries, the only basis) for making the link between the number of animals on a farm and the forage resources available to them. As pointed out above, this is essential knowledge in relation to what has been the biggest environmental issue associated with the sector. However, it is far from clear whether the new system will provide the information needed in order to monitor and control the effects of sheep and goat grazing (per se) because of the problem of mixed livestock systems and, importantly, the use of common grazings, especially in Mediterranean areas.

Many sheep farmers are elderly, and many sheep flocks are small (e.g. in 6 member states 32% of farms have less than 20 sheep) and for these small producers the new system is a management burden involving additional costs. Together with the signals associated with decoupling, the potential cross-compliance penalties associated with sheep tagging might be the bureaucratic "straw the breaks the camels back" leading farmers in the systems of most environmental value to stop production.

Overall, the new identification system should allow a more effective control of animal numbers and movements, with potential management benefits for the larger, modernised producer, especially once electronic identification is introduced.

Policy conclusions

Clear strategic objectives need to be established for S&G farming in Europe, not purely as an agronomic-economic sector, nor as a land use simply to be controlled by rules and regulations. Rather, an integrated territorial approach is required, in which a viable future for S&G farming is designed to help to address issues such as wild fires, maintenance of biodiversity and landscapes, soil conservation, and the social fabric and cultural heritage across very large areas of Europe.

A set of EU-level strategic objectives should include the following:

- To maintain a regional distribution of S&G systems across Europe, avoiding excessive concentration, as this implies a decline and disappearance of systems from many areas where they are beneficial.
- To maintain S&G grazing systems on the most marginal land within regions (this requires the identification of the most sensitive areas and farms, and the identification of animals).
- To specifically support sheep farming with environmental benefits, such as appropriate stocking levels and grazing regimes (minimum and maximum densities, seasonal movements of stock where environmentally beneficial)
- To favour shepherding (an integral element of the most environmentally valuable farming systems, and one which is becoming economically unviable).
- To discourage the tendency to increasingly intensive feeding systems (housing and reliance on concentrates), especially in milk-orientated production but also in meat systems.

Policy mechanisms need to be designed and implemented across the S&G regions in order to pursue these aims. The main policy options to be considered in the present study are those available, or potentially available, under the CAP S&G regime. The reality is that these options are rather limited. Fully decoupled premium (as in UK, Ireland, Italy) has few opportunities options to influence the type and pattern of sheep and goat farming.

Cross-compliance should have a role in addressing problems of extreme overstocking, although such problems may well be reduced with decoupling of the headage premium. Minimum stocking levels may also be established, in order to fulfill the requirements on land maintenance (preventing scrub invasion).

This mechanism may provide an incentive for some farmers to keep livestock and for land to continue under grazing, whereas in the absence of cross-compliance the economically rational response to decoupling would be land abandonment.

However, this is not a secure approach, and is almost impossible to implement on the vast areas of public and common grazing that are under S&G use at present, and where the individual farmer cannot be held responsible for the condition of vegetation owned, for example, by the Local Authority or the State. Neither is the obligatory approach a secure option for maintaining farming systems that are inherently unviable and unattractive in socio-economic terms, especially for young people.

Partially coupled premium (France, Spain, and to some extent Greece) may continue to provide an incentive for S&G farming (meat orientated), but without addressing the problem of competition between the more intensive systems on better land, and the marginal systems that are increasingly not viable. Hence the process of concentration and abandonment is not addressed.

A key conclusion of the study is that such general mechanisms alone are insufficient. Cross compliance can set the extremes of acceptable grazing pressure, but there is a clear need to provide *targeted* measures in order to promote the most appropriate grazing patterns within these limits:

- Incentives targeted on specific areas (much more tightly defined than existing LFAs, and with incentives for the most marginal areas or the most marginal farms that are set sufficiently high to maintain the economic viability of low-intensity farming in these areas or on these farms).

- Targeted on specific farming systems, especially those that exploit natural resources at a lower intensity (e.g. lower stocking densities than the average within the specific area).

- Targeted on specific farming practices, such as shepherding, local cultivation of fodder crops, transhumance.

- In addition to incentive payments, there is a need for investment aid in farming infrastructure. Again, this needs to be targeted on specific objectives (such as improving the viability of farms in the most marginal areas), otherwise investment aid tends to be exploited only by the more dynamic farms.

Currently the only mechanism potentially available for a targeted approach under the S&G regime is Article 69 envelopes. These could be used to provide a higher level of aid to certain farming systems and/or areas, for example, with stocking densities below certain thresholds, using shepherding, or grazing more remote and inaccessible pastures. However, it is not clear that Article 69 envelopes are intended for such specific environmental targeting.

Pillar 2 measures are more appropriate for a targeted approach. Although not a focus of the present study, it is apparent from the research undertaken that there is considerable work to be done in developing a more effective package of Pillar 2 measures on the ground in S&G areas.

In particular, there is a striking contrast between the relatively more developed policy situation in the Atlantic region (UK and Ireland), where LFA and agri-environment schemes are being used to influence the pattern of livestock farming in sensitive areas; and the situation in the Mediterranean region, where the LFA scheme is far less influential (in spite of the larger proportion of territory included in the designation) and where agri-environment schemes generally have paid less attention to extensive livestock systems.

S&G policy questions are not limited to support payments and control mechanisms. One policy concern that emerged from interviews were the difficulties faced by more marginal S&G farms in receiving grant aid for the improvement of basic farm infrastructure (e.g. sheds, livestock handling facilities). Such aid often depends on the preparation of a full modernisation plan, compliance with economic thresholds and the availability of capital, factors that act as serious barriers to many farms. Concern was also raised about the EU labelling system for "traditional" products and for "geographical origin" that do not distinguish between different farming systems (e.g. intensive and extensive).

Recommendations

Especially given that the negative impacts of intensive S&G systems are relatively less than for most other farming sectors, the environmental priority for S&G should be to ensure active and sufficient

support for the farming systems that play a *positive* environmental and territorial role. Two primary aims can be condensed from the objectives proposed above:

- To maintain the *basic socio-economic viability* of the more environmentally-valuable sheep/goat farming systems in the areas where their presence is most environmentally positive.
- To encouraging the farming practices that are environmentally most beneficial (e.g. appropriate grazing regimes, shepherding, hay-making), and discouraging certain practices that are damaging.

Simple support schemes are needed to keep S&G farming in the remote regions where there are few if any agricultural alternatives. To have such a function, the support provided by the S&G premium system would need to be coupled in some way to the farming activity and targeted in order to provide a higher level of support to the least intensive systems. In the absence of sufficient mechanisms under Pillar 1, the LFA scheme may be the most appropriate for providing basic support, although with the same criteria as referred to above.

Long-established S&G management techniques should be valued and supported through policy mechanisms. Certain aspects are fairly universal and environmentally beneficial and could be supported across the EU territory, especially shepherding, the use of sheep dogs and annual grazing regimes within locally appropriate density bands. Bonuses could be paid through the LFA scheme for supporting such practices.

There is a limit to what blanket measures, whether Pillar 1 or Pillar 2 (e.g. LFA), can achieve. There is a need is for a much clearer identification of aims at regional-local level, putting S&G farming in the context of territorial objectives (fire control, biodiversity, landscape, social fabric and cultural heritage) with targeted measures to achieve them. Agri-environment schemes are suitable for more detailed targeting (e.g. supporting particular seasonal grazing regimes).

The scope available through Pillar 2 has not been fully utilised. There needs to be a much more balanced policy approach between the Atlantic and Mediterranean regions, much more targeted LFA mechanisms recognising the value of S&G grazing in areas of High Nature Value, and wider development of agri-environment schemes that recognise the value of grazing animals at appropriate stock density over large areas of territory.

Basic mechanisms for income support and incentives for certain practices need to be complemented with simple mechanisms for targeted investment aid, in order to improve the farm infrastructure of holdings that tend be by-passed by policies focused on competitiveness.

The EU system of product labelling needs to be reformed so that the consumer can distinguish between products of intensive S&G farming systems and those using practices adapted to the local environment (appropriate grazing of local forage, use of locally grown fodder, etc.). This is more important than geographical location, from the point of view both of food quality and the territorial role of the farming system.

Data sources are inadequate at present. Databases such as FADN and FSS should be better adapted to environmental considerations. In particular, data are needed on the real stocking densities of individual livestock species, not only on the farm area, but also on public and common land. FADN could be extended to include economically smaller holdings.

1 Introduction: objectives and methodology

1.1 Objectives of the study

1.1.1 General objectives

The objective of the study is to determine the impact of the sheep and goat farming and of the sheep and goat policies on the environment. The study also looks at the implications of the improvement of registration of sheep and goats from an environmental point of view.

This objective has to be put in the perspective of the legal obligation of the Commission to report on the environmental consequences of both sheep and goat regime as indicated in Article 28 of Council Regulation (EC) No 2529/2001 to the Council.

The study addresses the specific environmental impacts of sheep and goat [1] farming and of the sheep and goat premium system. The environmental impact of the sheep and goat farming, the levels and trends of the main indicators related to sheep and goat farming activity having environmental consequences are hence analysed (number of animals per category, stocking densities, input, output, etc.).

With regard to the analysis of the environmental impact of the sheep and goat premium regime, the study concentrates on the environmental consequences of the main instruments of the premium system during the period under analysis.

The study also analyses the way in which the premium system is managed as well as the responding behaviour of farmers and the main related impact on the environment.

1.1.2 Thematic objectives

This general objective can be subdivided into specific thematic objectives respectively environmental analysis, policy analysis and identification analysis.

The environmental analysis

The sheep and goat production environmental appraisal is rather contrasted. On the one hand, it is identified as a key factor for maintaining sustainable agro-ecosystems that were mainly created by pastoral farming systems. In this case, the maintenance of extensive — or semi-extensive — sheep and goat activity is generally seen as having a positive impact. But, mainly in the Mediterranean environment, the use of fire to keep or to extend grazing areas is still a problem even if quite less frequent than in the past. On the other hand, this sector of animal production does not escape from intensive patterns associated with livestock overstocking of certain areas, leading to vegetation extinction, loss of biodiversity, soil degradation and water pollution, to quote the most recognised environmental impacts.

Thus, the overarching question of the environmental analysis is: what is the balance between positive and negative impacts potentially associated to S&G farming across Europe?

The context of the analysis of the environmental impact of S&G has also to be remembered with regards to available knowledge resources. Compared to the "main" productions such as bovine, pigs and poultry, the sheep — and even more the goat — sectors are poorly addressed by studies and works. Thus one objective of this study is to identify the main gaps and provide a specific analytical framework for organising existing data and deducing most likely environmental impacts. This explains why such importance is given, in the report, to the structure of the environmental reasoning. This includes the attempt to address environmental impacts in a systematic way, with thematic analysis of the impact on water, air, biodiversity, landscape and soils.

[1] — S&G in the following pages.

The policy analysis

The policy analysis focuses on the premium regime and its consequences of the sheep and goat farming systems. The assessment of policies considers the "basic" premium system [2], the supplementary premium paid in Less Favoured Areas, additional payments, also called "national envelopes".

This analysis is carried out in order to orient the policy towards a better environmental integration. Such a goal should be obtained through common and horizontal rules (e.g. cross-compliance under (EC) reg. 1782/2003 for instance) and through the policy measures (e.g. incentives) that orientate S&G production.

The understanding of this policy objective needs some clarifications about its context.

The central regulation analysed in this report is (EC) 2529/2001, which came in force on the 1st of January 2002 and is still in force. Nevertheless, the Mid Term Review of the CAP of 2003 introduced a major change with the option of decoupling (reg. 1782/2003), which came in force in 2005. Thus, the temporal scope in which reg. 2529/2001 acted "alone" is rather limited — 2002-2004, with likely anticipation of the announced MTR — and does not allow proper *ex post* analysis of its effects. All the more, the policy options aimed at must be relevant in the present situation, considering the changes introduced by the decoupling. From an extreme point of view, if the scope of the study is "sheep and goat support policy", it can be assumed that such a policy no longer exists when full decoupling is implemented. This leads the analysis to be fundamentally oriented as an *ex ante* one, trying to anticipate what will be the likely consequences of the new rules affecting the S&G sector — i.e. the encounter of the reg. 2529/2001 and the MTR — and how to integrate environment in a future policy agenda.

Identification and registration analysis

The analysis in this field has a different status compared to the two previous themes. Identification of sheep and goats is a relatively new scheme which started in 1992 and took a further step in 2004, with the regulation (EC) 21/2004 with stricter requirements, and specific to S&G. The implementation of this regulation started in 2005 with full implementation due in 2008. It must be also noted that, through the cross-compliance rules of regulation 1782/2003 (CE), identification will also have a potential economic impact which needs to be analysed.

Thus, the analysis deals with two main issues:

- the factual description of the existing schemes, mainly for information purpose of a rather new policy;
- the analysis of the potential environmental impact of the identification and registration issues.

Geography

With regards to the geographical scope, the study is addressing a EU level. The conclusions and recommendations are thought to be relevant at this level. Nevertheless, 6 MS — UK, Ireland, France, Spain, Italy and Greece — covering more than 90% of S&G production and farms are those centrally analysed in this report. The extrapolation of the results will be made considering that these MS are representative of the three main geographical zones described in the other report, with EU relevance for most S&G production:

- UK and Ireland: Atlantic
- Northern France: Continental
- Southern France, Spain, Italy and Greece: Mediterranean

With regards to the policy issues mentioned above, the geographical analysis tends to both characterise trends (concentration of animals and farms) occurring at different levels — national, regional and on farm — and the main factors in relationship with these trends.

[2] — As defined by Article 4 of Regulation (EC) 2529/2001.

1.2 Methodology and data sources

1.2.1 Analytical frame

As stated above, the study aims to facilitate an understanding of the effects of the existing sheep and goat schemes on the environment.

The figure below gives an overview of the components of the logical impact model proposed and their articulation. The boxes — A: S&G farming systems; B: environmental impacts; C: economy; D: policy — are identified and the related ovals list the theme and issues to be covered in the study (those of box D are not developed here, as it has been made above).

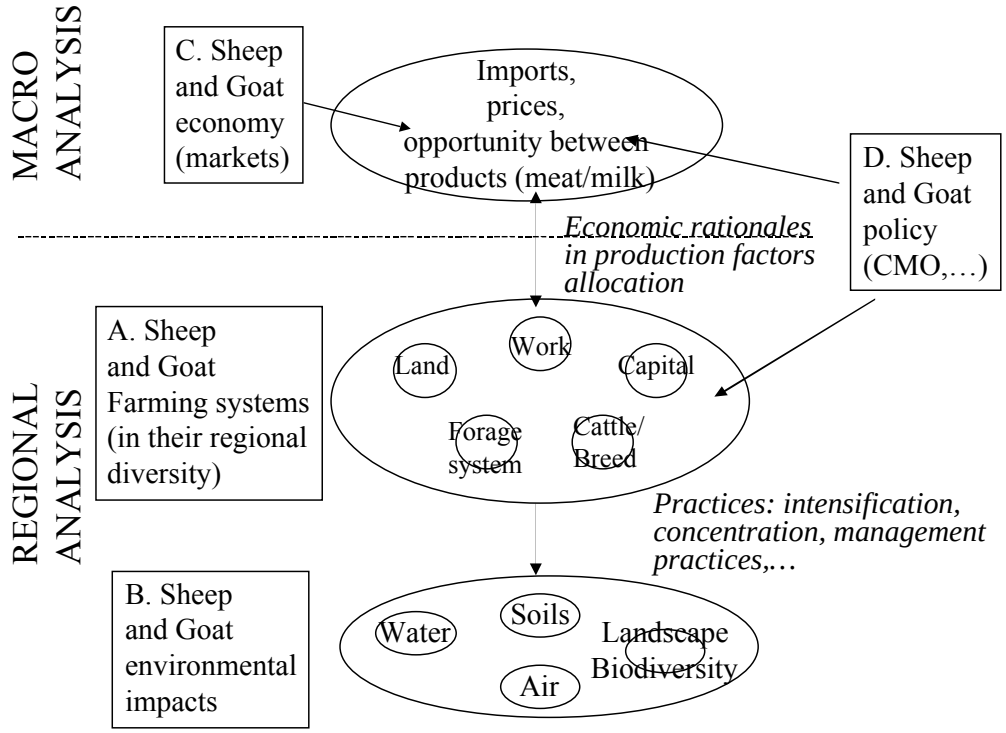


Figure 1: The general analytical frame of the study

The technical core of the study deals with the description and analysis of components A and B and, all the more, their relationship. As stated in the figure, the analysis makes explicit the link between (1) several forms of S&G farming systems in Europe, (2) associated practices — e.g. intensification/extensification processes — and (3) environmental themes (water, soils, landscape,…).

The policy core of study stands more on the relationship between components A, B and C. The question being: to what extent does the present policy scheme influence the S&G economy and the rationale of S&G farming systems? In order to allow a "counterfactual analysis", the relationship between the different farming systems — component A — and the functioning of the S&G markets (meats, milk, cheese) — component B — must be carried on according a "rationale analysis": why such a system is adapted to such a market? This analysis being established apart from policy analysis — which is the case in reality as farming systems rationale settled before the existence of a CMO —, it will ease the analysis of the proper effects of the scheme.

Note that the 'common ground' between the technical and the economy-policy issues classically stands on the analysis of the combination of the different production factors amongst farming systems. That is the reason why the analysis of farming systems using a typology approach — box A — is central in the all study and can be proposed as a 'red rope' all along the steps.

1.2.2 Methodology

The methodology implemented in this study followed three main phases:

The first one had been devoted to structure the whole analysis, with identification of issues and fields of investigation. The whole design of analysis has been sketched in this phase; it allowed to identify the main data gaps to concentrate on.

The second phase consisted in carrying out interviews with main sources of information at national level in order to fill some gaps and/or provide experts' views.

The last phase was devoted to the finalisation of the analysis, taking form of the present report.

The nature of information mobilised can be classified in the following categories:

1. Collecting the basic data for describing the S&G sector at EU level

The description of sheep and goat farming firstly stands on the collection of basic descriptors: location of sheep and goat farming, structure of the farms, policy and economy facts. Relevant maps are also part of this task.

Different data bases have been mobilised for this task, with their own advantages and limits:

- The Farm Structure Survey (FSS) gives the more detailed information for all types of farms (professional and non professional) and has been used to describe the structure of farms. Nevertheless, FSS does not allow to distinguish between meat and milk oriented systems. Another issue is the fact that the most recent year available is 2003.

- The Farm Accountancy Data Network (FADN) gives a more comprehensive description but of professional farms only, which leaves apart the smallest ones. Nevertheless the number of ewes represented in FADN sample is rather close from the total number measured by FSS. Some variables are more difficult to assess than others (for example, the number of days grazed off-farm). FADN has mostly been used for 2003. (see Appendix 1).

- The livestock survey gives the best approach of number of animals in the long term, and at regional level, with distinction between milk and meat orientated animals. Nevertheless, some gaps are noticeable as not every region and every year is documented between 1990 and 2004.

2. Literature analysis

A review of existing literature about sheep and goat has been performed (see literature references at the end of document). The available references can be classified into the following categories: description of farming systems, environmental analysis and policy and economy analysis.

3. Collection of the information about policy and implementation of S&G regime

This task classically stands on collection of regulations and examination of their national transcription.

4. Building the analytical framework

One important methodological task has been to set an explicit analytical framework. Most effort has been made to build a typology by crossing different sources of knowledge: national descriptions of farming systems, expertise of the team and statistics. This typology has been used for environmental and policy analysis as well.

Another significant task has been to organise the environmental analysis according to the explicit framework detailed in the environmental section of the report.

5. National interviews

The analytical framework has also been important to build appropriate interviews guidelines, by identifying the main issues and data gaps to be investigated.

Thus a series of thematic expert interviews (environment / policy / identification) has been carried out for the purpose of the study, consisting in its second phase. A more detailed description of the interviews guidelines and list of interviewees is given in appendix 2.

1.3 Structure of the document

The document starts with the description of S&G farming in Europe. It proposes an approach of the geographical framework required to analyse the S&G sector, thus proposing an appropriate zoning for this purpose. It is followed by a statistical description showing the main features of production and of farming systems, organised using the above zoning. This section leads to the typology used all along the report. It can be considered as the overall background of the analysis.

The following environmental impact analysis is divided into two main parts: the first one is analytical and describes the unitary impact of S&G on the different environmental themes (water, biodiversity, landscapes, air, soil) and identify the main practices at play. The second part proposes a synthesis organised by zones (Atlantic, Continental and Mediterranean), consisting in an overall view of environmental impacts per farming systems.

The following policy analysis section is mainly organised into four parts: the first one is a brief background showing the specific issues addressed by the common market organisation in the S&G sector; the second one consists in an ex post analysis of the previous CMO, putting into evidence the broad mechanisms at play; the third part is the analysis of the 2529/2001 (EC) regulation which took place between 2002 and 2005; the fourth and last part is an ex ante evaluation of the possible impact of the new regime applied to S&G in the context of the MTR reform of 2003.

The identification and registration analysis forms the body of the next section. It is divided into a descriptive and an analytical parts.

The conclusion summarises the main findings of the analysis and proposes recommendations to better integrate environment in S&G EU policy.

2 Sheep and goat farming in Europe

2.1 A zoning of sheep and goat in Europe

2.1.1 Historical outlook

From an historical perspective, sheep farming used to be spread all across Europe, like goat farming though the latter never reached the same level of concentration. The “wool heritage” defined large production basins for sheep, with large and specialised farms. Beside these large flocks, flocks of few sheep/goat were spread in numerous small farms, combined with other animals. In traditional systems, sheep and goat flocks used to be kept by a common shepherd, that led the flocks to graze poor lands (semi natural moorland and/or fallow lands on dry (limestone) plateaus for example). Nevertheless, in the South-Eastern parts of Europe sheep and goats played a more vital role in sustaining the local societies by providing the essential animal proteins for their nutrition. Since bovines were needing more rich food resources, these small ruminants were the most economic source of meat and milk that was transformed to cheese to address the seasonality issues (Boyazoglou and Morand-Fehr, 2001). The dung of the nomadic sheep was integrated in the fertility cycle of such poor lands, when cultivated. The ability of sheep (and goats) to move on long distance and to take benefit of seasonal forage resources led to historical transhumant systems in Mediterranean and mountainous countries (in central Europe for instance) (Revue de Purpan, 1999).

Three steps can be considered that led to the present map of sheep farming in Europe, from sheep and goat spread all across the territory to more specialised production basins.

At the end of the XIXth century, the competition of the specialised British wool producers and those from the “new” countries — Australia, Argentina — led to a drop of ovine production in continental Europe.

Thus, the sheep production tended to be a "peripheral" production — geographically and agronomically speaking.

The second step came with the modernisation of agriculture in the second half of the XXth century, where the value of sheep as a fertiliser source on fallow land declined[3], as the use of chemical fertilisers increased. This trend also affected the UK. Changes in land-use tenure and lifestyles also deeply affected the transhumant systems that tend to be more and more difficult. The "peripheral" characteristic of sheep farming got accentuated.

The third step is characterised by the recent EU policy — that will be further analysed below — that led to a comeback of sheep production in some places, as for others the decline continued.

2.1.2 Purpose and approach of the zoning

With the exception of the most intensive indoor types, S&G farming systems are adapted to the natural conditions in which they operate. Factors such as rainfall, temperature and altitude are key determinants of the type of forage that is naturally available or that can be cultivated. Such factors also have an important influence on the environmental considerations of S&G farming, for example, questions such as fires or water pollution.

The following classification aims to capture the variability of S&G farming systems across Europe and to explain why the different farming systems can be found in different situations. In order to provide a meaningful background to the farming systems typology (below), the zoning approach must use simple and relevant variables that help structure the analysis without losing too much detail. Thus, the main entries are:

- Geographical
- Type of fodder and forage resources

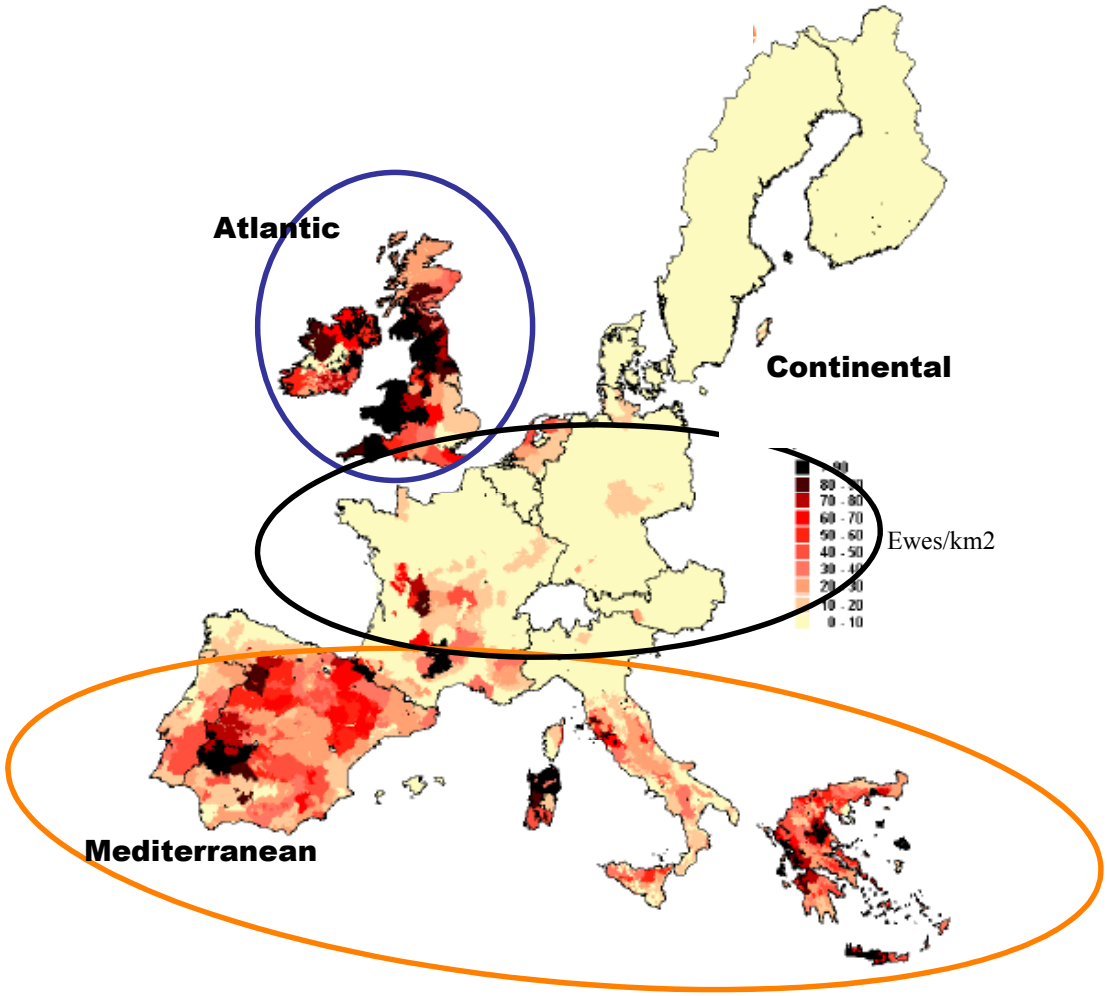
The system of feeding is fundamental to differentiating the farming systems. The links between appropriate forage and fodder systems and positive or negative environmental impacts are also relatively well known: forage systems determine land-use and therefore environmental impacts.

The main production regions are:

Sheep

The map below shows the present (2000) distribution of sheep — ewes — in Europe.

[3] — The example of the French "cereal Champagne" (not to be confounded with the neighbour vineyard) illustrates this story: in the XIX, this limestone plateau was classified as a poor region devoted to sheep production. The introduction of fertilisers and tractors in the50's led to one of the richest agricultural region in Europe.

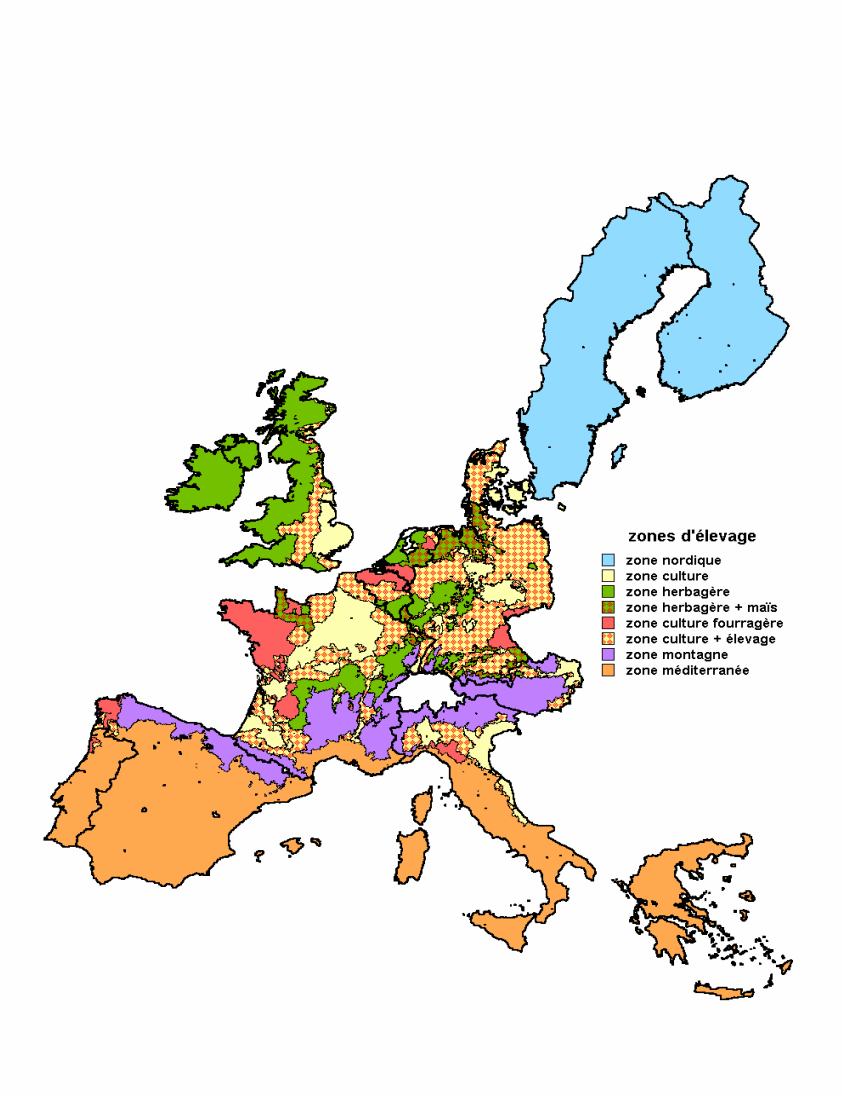


Map 1: Distribution of sheep (ewes) in Europe (data; FSS 2000; map: Institut de l'élevage)

This map shows a high concentration of sheep in two European areas: the western part of the Atlantic region (Wales, South-West of England, Scotland and Ireland) and the Mediterranean countries (mostly Spain, Sardinia and Greece).

Sheep are also present in smaller numbers in the Continental Region: in France and, to a lesser extent, in the Netherlands and Germany.

The geographical zoning of S&G is based on the regionally predominant forms of forage production. The following map produced by the French *Institut de l'élevage*, characterising the different livestock zones in Europe, is a useful starting point



Map 2: EU livestock zoning, based on the main forage systems (source: Institut de l'élevage)

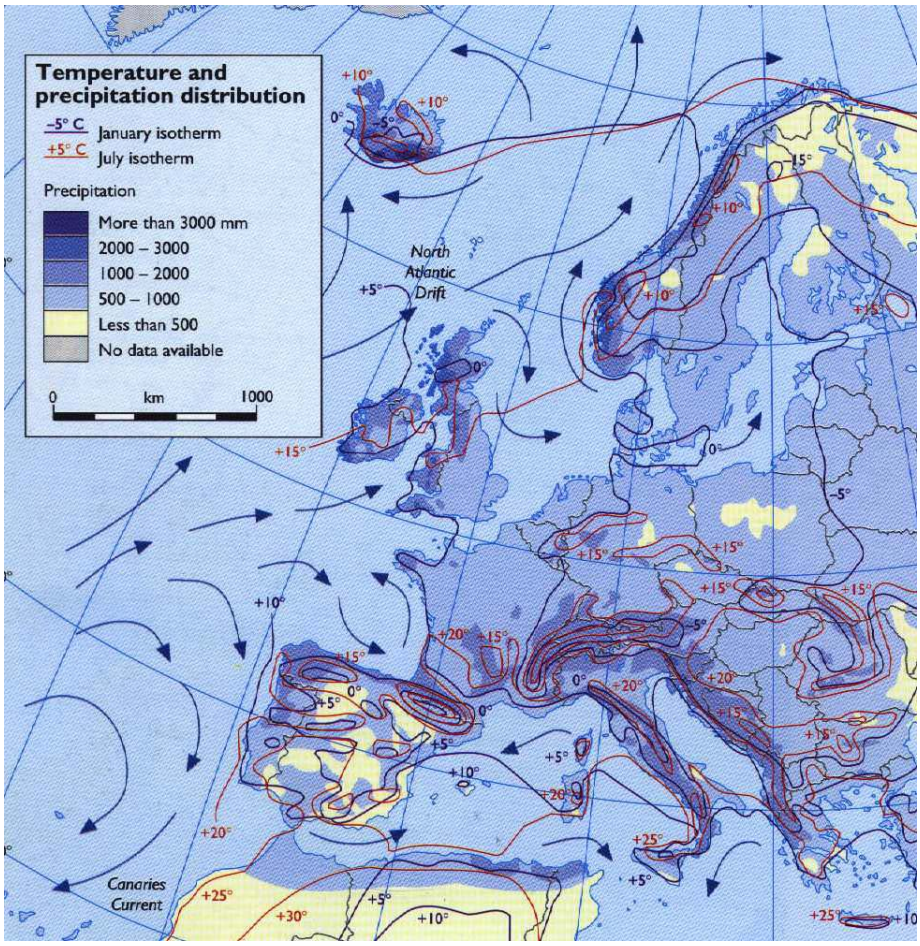
Overlaying the above two maps shows a significant overlap in three zones:

- Grassland zones in the Atlantic area (in green in British Islands)
- Continental mountains (in purple) and grasslands (in green in France, Belgium and Germany)
- Mediterranean zones (in orange)

To a lesser extent, goats and sheep systems will be encountered in mixed crops + livestock areas (mixed yellow/red grid).

The need for a further analysis in Mediterranean area

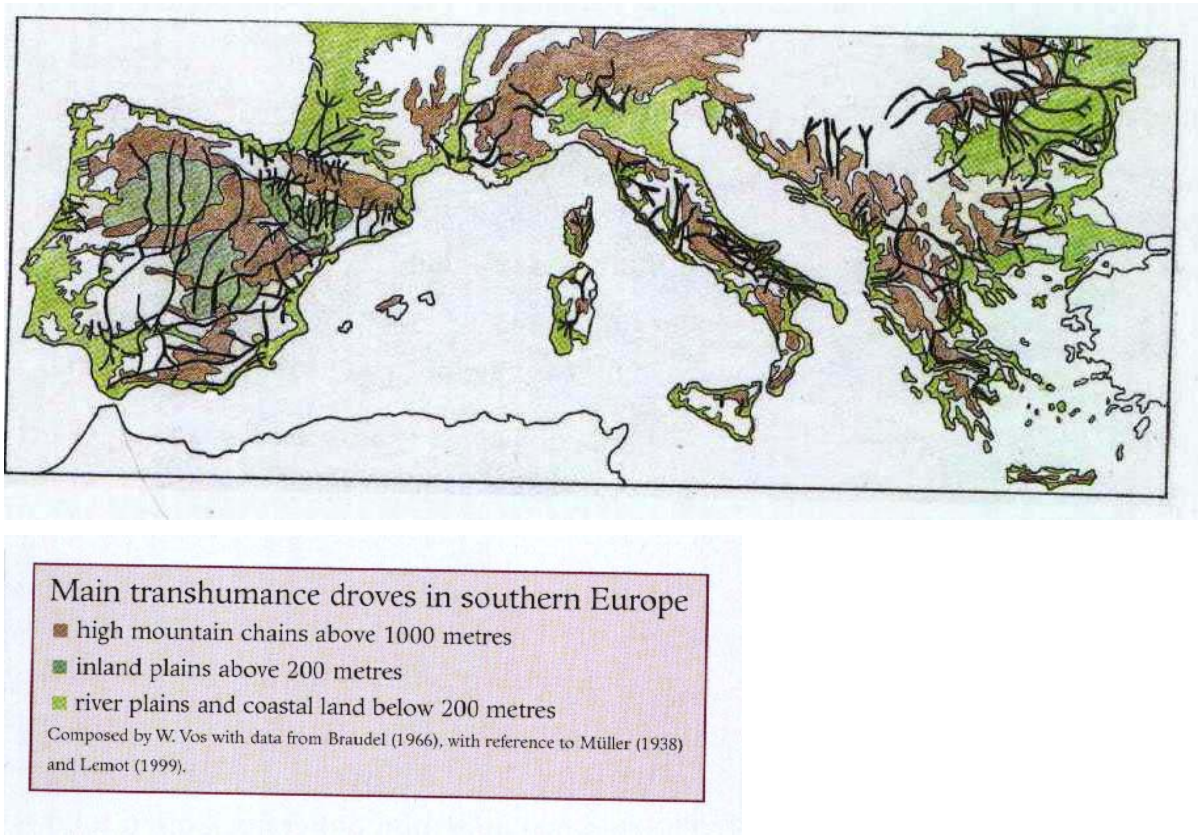
This map, produced for the analysis of the whole livestock sector in Europe, dominated by bovine, is not fully adapted for the analysis of the situation in the Mediterranean area , which variability is much higher than what shows the homogeneous orange zoning. The range of precipitation will be crucial for our analysis, as it primarily influence the forage production (see Map 3).



Map 3 : Precipitations in Europe (source: EEA, 1995)

This map shows the arid places in central Spain, as the mountainous areas in Spain, France, Italy and Greece know quite high precipitation. Nevertheless, it must be reminded that this average rainfall hides a seasonal contrast, with long dry periods in summer and precipitations concentrated in autumn, winter and spring. Except in mountainous areas, where altitude allows a better repartition of resources through the year (coinciding with a level of precipitations 1000-2000 mm in Map 3, dark blue – see also mountain chains above 1000 m in Map 4), an average rainfall of 500-1000 mm might lead to critical period for forage production (except if irrigated).

This situation explains the historical importance of transhumance in the Mediterranean context, consisting in complementary use of forage resources in time and space. Viewed from a Mediterranean perspective, mountains are not that far that they don't frequently take place in the forage systems.



Map 4: Main transhumance droves in southern Europe (source: CLM, 2004)

For sheep and goats in the Mediterranean context, this transhumance is still observed – though in decline in some places – and is a key element for understanding the development of farming systems.

2.1.3 Description of the zones

The following zoning covers the majority of S&G farming systems:

- Atlantic grassland [4], characterised by a high average rainfall (above 1000 mm/year) relatively evenly distributed through the year, in the UK and Ireland. There can be huge differences in the type and productivity of vegetation, from highly productive grassland through poor quality acidic grassland and heath to heather dominated moorland.

- Continental grassland, characterised by a medium average rainfall (500-1000 mm/year), with more moisture-stressed conditions during the summer. The productivity of grassland on average is lower than in the Atlantic zone. This zone is encountered in France (Limousin, Lorraine, North Massif Central) and in parts of Germany, Belgium and the Netherlands, and Italy (north Appenines).

- The "Mediterranean" mountains [5], plains and plateaux, that can be displayed into two sub-zones:

    - humid "Mediterranean" mountains [6], characterised by a high average rainfall (above 1000 mm/year) correlated with an altitude above 1000m. These mountains are encountered in Spain,

[4] — Note that our definition of "Atlantic" is not strictly corresponding to the common EU-biogeographical regions which comprises the half Western part of France, the main part of Belgium and the Netherlands + the British Islands. The comparison of maps 1 and 3 suggest that the level of rainfall is a relevant factor explaining the distribution of sheep.

[5] — We integrate in this zoning the south of French Massif Central, French Southern Central Alps and Western Pyrénées which are not "pure" Mediterranean mountains but share the common characteristic aimed at.

the South of France, Italy (Alps and the Appenines) and Greece. The summer moisture-stress decreases from East to West but, in general terms it is limited. Vegetation ranges from high altitude semi-natural grassland and meadows to dry shrubs in pure Mediterranean climate. Common and public grazing lands are widespread in this zone.

- The arid Mediterranean plains and plateaux, in Spain, Sardinia and Greece, characterised by a medium altitude and a low average rainfall (<500 mm/year) and a huge summer moisture-stress. The forage resources are diverse — crops, shrub, semi-natural arid grassland (steppe) — but have low average productivity in common.

The definition of such zones does not imply that S&G farming systems are homogeneous within each zone, but that the physical conditions are broadly similar across the zone. In practice, other factors (historical, land ownership, etc.) equally importantly come into play. Combined with local variations in the physical conditions, these can lead to considerable variations in the farming systems within a zone.

A complementary approach is to describe the main characteristics of systems found within each zone. As an example, appendix 4 shows the main sheep farming systems found in Spain, and their distribution.

2.2 The main characteristics of sheep and goats: general zootechnic issues

The characteristics of the animals explain some key features of the farming systems and their interaction with the natural environment [7]. This is followed by a brief overview of S&G farming in Europe.

2.2.1 Sheep

Sheep originate from dry and arid areas of Near Asia where they were domesticated around 12.000 years ago. They have been exported and adapted to a great variety of areas and environments, reflected by the large number of breeds across Europe and, more widely, in the world.

Ovine are able to use low productivity pastures (natural grasslands, moorland, shrubland, maquis, scrub). Notably, the period of highest nutritional demand from forage resources is limited to three months (during the milking / suckling period), which makes sheep capable of adapting, in a range of contexts, to periods of forage shortage or of very low nutritional value. Most bovine breeds are less well adapted.

This means that in much of the poorest agricultural land in Europe, sheep farming is the only livestock farming option. Many of the same places are also of High Nature Value. Ovine will also respond to rich feeding regimes in both meat and milk systems (e.g. based on cereals or managed grasslands) to produce milk or suckled lambs. In more productive farming systems meat is produced where the forage is evenly available during the year, e.g Continental areas, whilst milk production is more typical of a higher forage seasonality, warmer and dryer seasons, as in Italy (Southern Italy, Sardinia, Sicily), Spain and Greece.

The productivity of ovine varies greatly under different geographical conditions, management systems and breeds. For meat production purposes, the weight of a carcass of lamb varies between 10 and 22 kg. This equates to between 120 and 250 kg of ovine carcass meat produced annually per reproductive LU. This compares with an estimate of 300-450 kg of bovine carcass meat per reproductive LU, and reflects the lower physical productivity of ovine. According to Eurostat – Statistics on focus – Theme 5 – 25/2002 - sheep and goats LU are considered 0,1 and dairy cow 1 and other cows 0,8.

Lamb produced in milk-orientated systems (mostly in the Mediterranean countries, especially Spain and Greece) is slaughtered younger with carcass weights less than 10kg. (Zygoyiannis, 2006; Zervas et.al., 1999).

Milk yield also greatly varies, depending on the geographical conditions. In the most productive areas (such as Roquefort in France), it can reach around 300 kg/year i.e. 1,800 kg/LU, but even this is low

[6] — We integrate in this zoning the south of French Massif Central, French Southern Central Alps and Western Pyrénées which are not "pure" Mediterranean mountains but share the common characteristic aimed at.

[7] — The information of this paragraph comes partly from the French agricultural dictionary *Larousse agricole*, 2002

compared to most bovine production. However, the quality and the composition of the ewes' milk, very important for the production of distinctive types of speciality cheese, is much variable. Milk yields in traditional systems, still widespread in Italy, Spain and Greece, are far lower (e.g. < 50 kg/ewe/year). In some areas, breeds such as Merino, primarily a wool and meat breed, are also milked for producing small quantities of speciality cheeses (e.g. La Serena in Extremadura, Spain and Gentile di Puglia in Basilicata, Calabria and Puglia, Italy).

2.2.2 Goats

Goats have been domesticated much earlier than sheep (Boyazoglou et.al., 2005), adapted to even more difficult environments and are capable of utilizing ligneous forage in scrub and forest situations, although they also consume herbaceous vegetation. The range of habitats exploited by goats is very wide, mostly in dry conditions, while their relative independence on drinking resources is notorious. The grazing behaviour of goats is more selective and individual than that of sheep. Like sheep, the highest nutritional demand is concentrated in a limited period of time. Goats are browsers rather than grazers and are best adapted to a nomadic existence. When sheep and goats forage together they are a most efficient means of controlling scrub invasion and in the Mediterranean context are highly efficient for fire prevention.

The carcass weight of a kid is light, around 8-15 kg. The physical productivity of meat can be estimated around 120 kg per she-goat LU.

Goat milk is produced in France, Italy, Greece and Spain. Production systems vary greatly.

In France, production is almost entirely in intensive, indoor systems, with yields reaching an average 800 kg/she-goat, or 4,800 kg/LU.

Similar structures and milk yields are also present in Italy in different regions, from Alps to south, independently from bio-geographical and climatic conditions, even if the more productive breeds are of Alpine origin (Camosciata delle Alpi,, Alpina, Saanen,) or Mediterranean (Rossa Mediterranea, Girgentana). After a moderate increase of these specialized farms during the eighties, during last years the number of productive units is less than 1.000 and is relatively stable. The larger part of caprine population of different local breeds are bred in pastoral systems, often in mixed flocks with sheep, mainly on upland areas along the Apennine and Alps ridges, to produce meat and milk. In some situation the milk is used to obtain local goat cheese (Caprini); more often mixed with that of sheep for traditional cheese production.

Most of the goats in Greece are bred in pastoral systems subsisting efficiently on the natural ligneous vegetation. Goats can be reared with sheep or without sheep but their milk is mainly mixed with that of sheep for cheese production. There are very few intensive goat farms using intensive forage systems or harvested feeds only (Vallerand et al, 2001). Average milk productivity is <100 Kg/goat/year, but there are some local breeds exceeding 250 Kg/goat/year.

In Spain there has been a strong growth in intensive milk-oriented systems in recent years, especially in the south but also in parts of northern Spain. However, there are still traditional goat farms especially in upland areas, usually managed for a mix of meat and milk production, with low milk yields, due to the use of natural forage and breeds that are less highly bred for milk production.

2.3 Two different markets : meat and milk

One must take into consideration the fundamental difference between milk an meat production, whose broad characteristics are summarised in the following table.

	Milk/Cheese	Meat
Types of animals	Sheep and Goat	Mainly sheep (lamb)
Macro-economic background	Cheese for S&G markets are mainly domestic (at EU scale), mainly for consumers' taste reasons. Hardly no import/export with third countries. Limited import/export across EU	Open market with two levels of competition: - Europe with NZ - Between EU countries

Table 1: The macro-economic context for S&G milk / meat

2.3.1 Milk market

The main characteristics of the European S&G milk market are the following (FAO-CIHEAM 1995):

• Rather high prices (compared to bovine milk), milk mainly use for cheese processing.

• Concentrated in four countries: Italy, Greece, Spain, France. Mostly for domestic consumption (which supports the high prices), and limited intra or extra-EU trade.

• Quite different market organisation across countries: many Appellation d'Origine Contrôlée in France (high added value), more "industrial" sector in Greece and Spain (mixed milks sheep/goats/cows).

• A large variety of breeds across Europe

• Differences between cheese processing on farms (direct selling) or off farm (cooperative, industrial units)

On the period considered, the milk-cheese market is in a favourable context, due to the high demand on quality products, as shown in next figure.

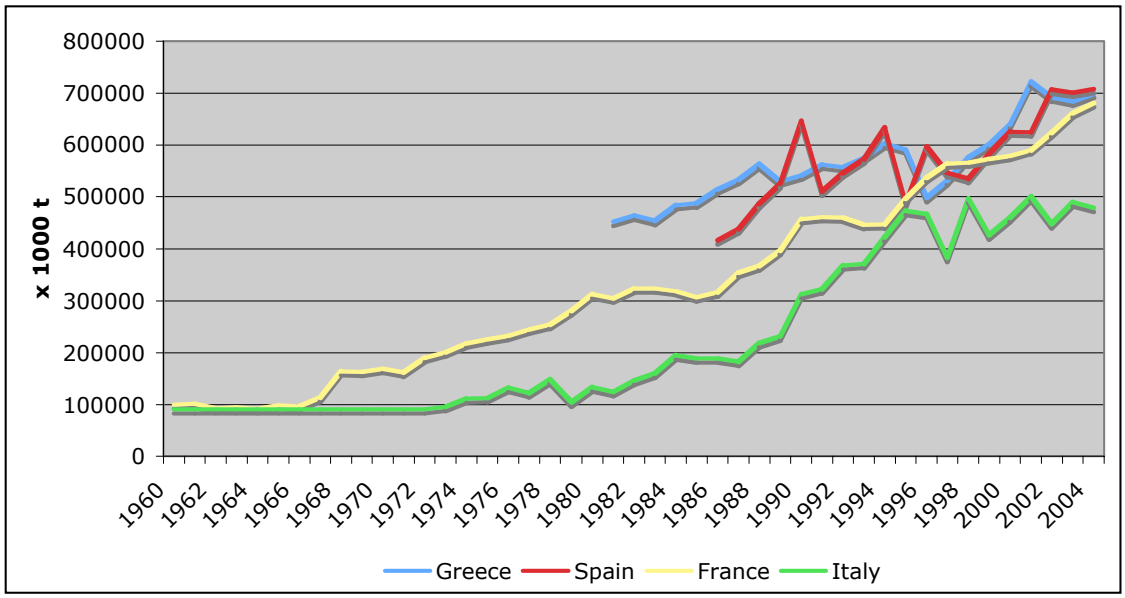
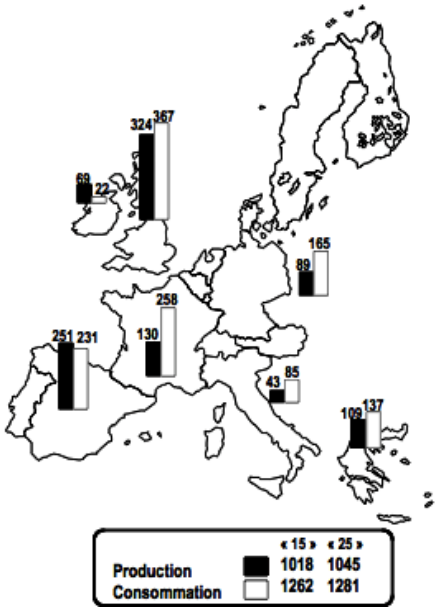


Figure 2: Development of milk production (sheep+goat) in the 4 main EU producing countries (source: Eurostat)

Compared to the meat sector, the policy issue is not to support farm income but to regulate different cheese chains (industry vs. more small-scale) with regards to quality issues.

2.3.2 Meat market

The meat market can be considered as "traditional" both for lambs and goat kids. However, the big volume is concentrated on lamb meat although there are significant differences in consumption levels between countries, as shown below.



Map 5: Consumption/production in Europe in 2005
(data: Eurostat / map: Institut de l'élevage)

On the long term, the consumption of sheep meat shows a continuous decline due to its competition with cheaper meats on the one hand, and its high proportion of fat (going against recommendations for human diet). As EU does not export sheep/goat meat, the trend of consumption goes along the one of production, approached here through the slaughtered animals.

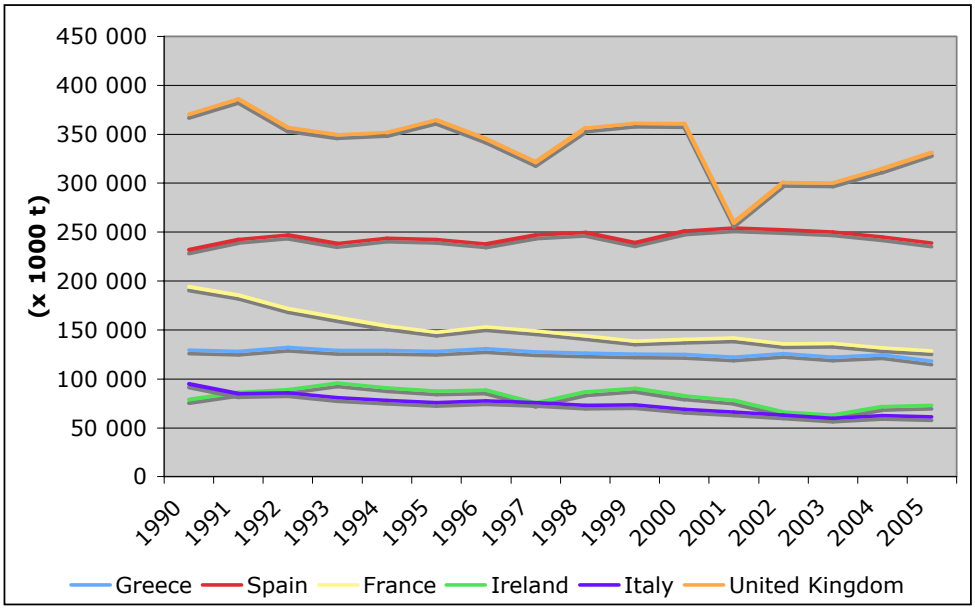


Figure 3: Development of slaughters for sheep+goats in the 6 MS (source: Eurostat)
No data for EU15, but in 2005 for lamb these 6 countries represented 96% of total EU15

Except for Spain, the volume of meat slightly decrease. The episode of foot and mouth disease in the UK at the turn of 2001-2002 is quite visible on the figure and is one of the main event of the sector in the recent year.

EU market is structurally deficient in supply due to the competition with new countries and allowance of tax-free imports. Ireland and Spain are the main EU exporters, as the rest comes from third countries (New-Zealand and Australia). Frozen carcasses represent 75% of imports. In general terms, these two countries dominate the world market in which prices are much lower than intra EU prices (CE 2005).

Meat prices show variation through year, due to seasonal production (in Spring in Atlantic areas, in Autumn and Winter in Mediterranean) and consumption patterns (Easter is a peak, as well as the Moslem's "Mutton day") (Institut de l'élevage, 2005, 2006).

Goat market is in rather different situation, as consumption is mainly local and stands on rather "traditional" markets in Mediterranean countries.

2.3.3 The EU farming systems feeding the markets

When the meat/milk-cheese markets stand on rather different rationale, at farm level the limit might be much less clear. The geographical units helps us to broadly identify the systems and their contribution to the markets.

Atlantic: meat for heavy lamb – mainly an opportunistic production combined to others

In Atlantic context (i.e. UK and Ireland), milk production is hardly developed. Thus, nearly 100% of animals are sheep and meat directed. In general terms, sheep production can be conducted alone (on specialised systems) but is frequently associated to other animals, mainly cattle. FSS 2003 shows that 61% of farms with sheep in UK and Ireland are classified under type 44 ("other grazing livestock"), representing 70-75% of ewes. Nevertheless, this specialisation does not exclude other animals (cattle, dairy cows) in such farms.

The rationale is to take profit of the on-farm land by combining different types of animals, sheep being kept outside for wintertime and giving birth to lamb on early spring (February-March), with low-costs for housing. The size of the flock is more or less correlated to the available UAA (limited off-farm land, except in the uplands). Generally speaking, UK situation shows larger farms and flocks than the Irish one.

At a more detailed level, there are shift of animals between uplands (producing light lambs) towards lowlands (more fattening oriented).

Continental: meat for heavy lamb and the case for goat cheese

Continental systems share common characteristics with Atlantic ones. Sheep are bred on the same broad rationale than in Atlantic — with more common use of "poorland" in crops systems. In France, 51% of farms are classified in type 44, concentrating 76% of ewes (FSS 2003).

Goat-cheese is concentrated in two regions — Poitou-Charentes and, to a lesser extent Centre — and is conducted under rather intensive patterns, mainly for industry or high-added value cheeses processed at farm level. Types 44 and 13 "crops+herbivores" concentrate nearly 90% of animals on 57% of farms having she-goats (FSS 2003).

Mediterranean: mixed productions

Milk production (mainly for cheese purpose), is the main production by value in Mediterranean areas, although meat production is dominant in some of the main sheep regions. Other S&G milk products are also important (like yogurt in Greece). Compared to Atlantic or continental countries, the degree of specialisation of farms is lower as only 30-40% of farms with sheep are classified in type 44, representing 60-77% of sheep at end. This shows a juxtaposition of specialised farms with rather mixed farms which all feed the market.

There is a great variability in milk yields, as shown in the next table.

2004	Spain	France	Greece	Italy
Ewe milk production (millions of liter)	342	304	678	741,9
Goat milk production (millions of liter)	320	520	459	94,7
Average ewe productivity (L/lactation)	Latcha Š Churra < 100 ; Assaf >200	80 (Corse); 100 (Manech and Basco b˘a rnaise); 300 (Lacaune)	98,5	100 to 250
Average goat productivity (L/lactation)	Serrana<250 ; Malague–a 250 Š 500 ; Murcian>500	>500	116,6	250 to 500
Sheep cheese production (t)	289 000	53 300	189 000	90 000
Goat cheese production (t)		85 000		8600
Ewe milk price (Ū/l)	0,79	0,81 (Roquefort) to 1,10 (Corse)	0,82	0,64
Goat milk price (Ū/l)	0,42	0,49 to 0,53	0,52	0,44

SourceŹ CIRVAL

Table 2: Main characteristics of S&G milk/cheese production in the main producing countries

2.3.4 Conclusion: issues addressed by the policies in the sheep meat sector

The EU sheep meat sector can be considered at different levels of regulations, that can be articulated in a top-down analysis considering three levels:

- The overall framework is given by the GATT and more recently WTO, with tax-free imports quotas. In practice, this agreement determines the overall amount of meat that can be produced in the EU around 80% of EU consumption (OFIVAL 2003). The consumption patterns at EU level will be the main driver, with key role given to the relative price of sheep meat compared to other meats it is competing with from the consumers' point of view. The general pattern on price is long-term decreasing, following the world market's trends. This statement clearly distinguish the meat issue from the milk issue.

- Within this EU envelope, policy must regulate the allocation of production across farming systems and regions and MS. Generally speaking, a classical policy question is find a balance between income support for producers and give room to market drivers. As the latter leads to concentration of production in the most productive holdings [8], the main issue will be double: regulation of regional distribution — for example between LFA and non LFA area — regulation of structural distribution — e.g. small, medium and large farms. The policy mechanisms influence the structural patterns of production in terms of stocking density and labour force intensity. A key question will then be to assess how policy schemes influences this distribution.

- Within this "structural" regulation, more specific issues are to be addressed by policies (with some possible feedbacks on structure). Environmental issues are the major one for our subject, dealing with practices that must be analysed at lower level: "fine" stocking density (rather than the average one which is a rough indicator), manure management practices, adapted grazing practices.

2.4 Overview of S&G farming in Europe

2.4.1 Number of animals

Sheep

[8] — Without presuming of how the highest productivity can be reached: through high output/input or low output/input strategies. Both are relevant in the case of S&G.

The following table indicates the distribution of sheep in the main producing countries and in EU 15 as a whole.

Country	*France*	*Greece*	*Ireland*	*Italy*	*Spain*	*UK*	*EU 15*
Most recent year	*2004*	*2003*	*2004*	*2003*	*2004*	*2004*	*2003*
Total ewes	6749	7026	3469	7156	17179	16177	64369
Total milk-ewes	1618	6328	na	5725	3075	na	na
Total meat-ewes	5131	698	na	1431	14104	na	na
Total other sheep	2149	2300	987	795	5550	8377	na

Table 3: Number of sheep and ewes in EU 15 and in the 6 countries covered by the study (Source: Eurostat, Livestock survey x 1000 heads)

In 2003, the six studied countries represent 94% of European ewes. Spain and United Kingdom are the main producers, respectively with 28% and 26%.

Goats

Country	*France*	*Greece*	*Italy*	*Spain*	*EU 15*
Most recent year	*2004*	*2003*	*2003*	*2004*	*2003*
Total she-goat	1040	3646	798	2185	na
Total other goat	178	1471	163	648	na
Total goats	1218	5117	961	2833	11633

Table 4: Production of goat in EU 15 and in the 4 producing countries covered by the study (Source: Eurostat, Livestock survey x 1000 heads)

About 80% of the goats in European occur in three countries: Greece (representing 45% of the European production), Spain and France. In 2003, these three countries and Italy covered 90% of EU15 animals.

The geographical distribution of goats in these countries show significant concentration: in France mainly in Poitou-Charente; and in Spain mainly in Andalucía and the Canary Islands. In Greece goat farming is more evenly distributed across the country, with the exception of Central Macedonia where there is a higher concentration. Goat production in Italy is relatively small and more often in mixed flock with sheep located in marginal and LFA areas. Intensive milk production holdings are mostly in the north of the country, mainly in Lombardy. Extensive and less specialized goats production is distributed on the Apennine ridge in Sicily and Sardinia. The interrelation between sheep and goat is the more marked in Greece than in the other Mediterranean countries. In northern countries (UK, Ireland), commercial goat farming is negligible. There is a small amount of goat production in Ireland (there are small flocks of goats kept exclusively for milk production) and there are 470 registered herds, some with very few animals. The total number of registered goats is about 5000. There is no commercial trade in goat meat.

Trends for sheep

Sheep numbers have declined overall at EU level in recent years, though with variations between countries.

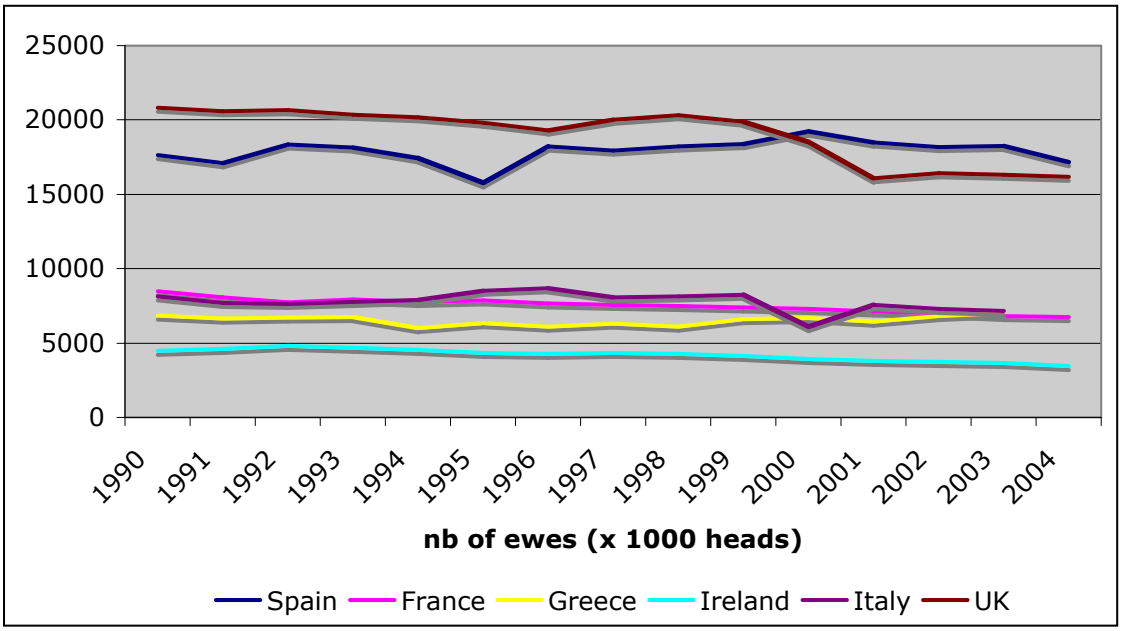


Figure 4: Development of the number of ewes in the 6 countries covered by the study (Source: Eurostat, Livestock survey)

The figure shows two opposite trends between 1990 and 2003:

- Ewes number increased in Greece and Spain.
- Ewes number decreased in the four other countries, in a larger extend in Ireland and UK.

These figure reflect both the decline in sheep meat consumption, the competition with NZ and, in recent years, the foot and mouth disease that affected the UK and Ireland from 2001 and blue tongue in Italy.

Trends for goats:

The following figure shows such trends.

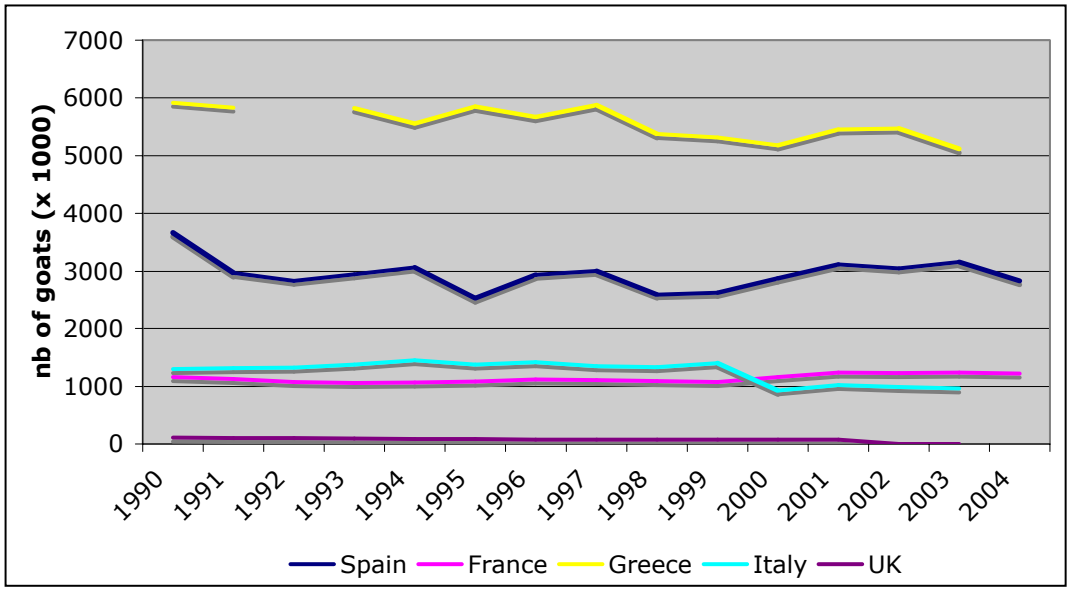


Figure 5: Development of goats in EU 15 and in the 6 countries covered by the study (Source: Eurostat, Livestock survey)

Generally speaking, the number of goats slightly decreases as well, except in France. When compared to Figure 2 showing a net increase in milk production of both ewes and she-goats, this trend suggests a huge increase in milk productivity (the role of decline of goatmeat can be considered as marginal).

Trends in the Atlantic region

The size of the UK national sheep flock in December 2005 was 24,688,000 making the UK the largest sheep producer in Europe. Sheep farming is virtually exclusively for meat production and generally carried out in conjunction with (and often subsidiary to) other farming enterprises. In this respect it is distinct from sheep farming in the other major producing countries of Europe where there are more specialist sheep farms as well as sheep milk production.

The recent history of sheep farming in UK and Ireland have followed similar trends especially in the way the number of breeding sheep increased in direct response to the strong policy incentives in the 1980's and 1990's. In the UK, the Foot and Mouth outbreak led to a reduction in the national breeding flock from 20 million to 16 million by 2001. Between 2002 and 2004 there was a further small decline in sheep numbers, for instance in Wales there was a 5% drop (from 4.6 to 4.3 million) and there is some evidence of a continued fall in numbers which is thought to relate to the introduction of full decoupling in 2006.

Although the sheep-meat sector in Ireland is small in European terms it has been highly dynamic, expanding considerably during the 1980's, when the total number of sheep increased from 3.6 million in 1980 to 8.7 million in 1990. Numbers peaked in 1992 at 8.9 million but declined by 11% to 7.99 million in 1999. Although the downward trend was arrested in 1997 and 1998 it resumed again in 1999 and this downward trend has continued and has accelerated with the introduction of the SFP resulting in a national sheep flock in December 2005 of 4,257,000 (total sheep). This compared with 4,557,000 at the same time in 2004. The fall in numbers represents an overall decline by 6.6% and a fall in the number of breeding sheep by 7.4%. Like the UK, there is evidence of a continuing fall in numbers in response to full decoupling.

Trends in continental regions

The decline of sheep production in continental regions is, on the long term, associated to the competition with other, more profitable productions that have replaced sheep in most cases. The production of sheep is labour-demanding, which is limiting the opportunity of such production compared to others. In France, the number of sheep went from nearly 13 millions in 1979 to 9,4 millions in 2000. Between 1988 and 2000, the number of farms with sheep faced a drop of -43% for sheep meat and -18% for sheep milk. The rate is -58% for goat producer on the same period of time (with, nevertheless, a maintained number of goats). The overall trend is the concentration of production in a limited number of regions, mostly when S&G is the "last option", generally in dry context (Institut de l'élevage, 2002).

Trends in the Mediterranean region

Two systems have developed rapidly in some parts of the Mediterranean region in recent years: sedentary, fenced systems of managed fodder area or of semi-natural grazing lands and these can be found in Greece, Sardinia, Tuscany, Lazio and Sicily, but especially in western Spain (the highest concentration of sheep in Spain are now under such management); and intensive indoor systems using mostly bought-in feeds for milk production, especially for goats in France and sheep in Spain, Sardinia and Greece. Since milk production has a good financial output in Greece the trend is to develop towards this direction. This is combined with mechanization of the milking and the obligation to produce milk of high hygienic standards (total microbial flora, somatic cells etc.) which can not be obtained in extensive conditions. Moreover, some administrative choices of Government (like the allocation of management responsibility to the Forestry Services) brought unfavourable conditions for the utilization of communal lands (there is a tradition of friction between agronomists and forestry people over the grazing of state lands). Further to that characterization of 262 areas covering 22% of total land area, as NATURA 2000 sites has imposed further restrictions in their use thus leading farmers to intensification. A further critical issue in the evolution of S&G sector in Greece is the dynamic of this sector in the neighbouring Balcan and CEEC countries after their accession to the EU. These countries have a tradition similar to the Greek in farming S&G therefore they may opt in developing this sector in their territory, thus supplying the market with low cost S&G products.

The Livestock survey data shows that the most significant decrease in goat numbers between the 6 countries studied took place in Italy, from 1 247 000 heads in 1990 to 898 000 heads in 2003.

2.4.2 Farm structures

Sheep

The following figure shows the average ewes number and main fodder area (MFA) for the 6 countries studied in 2003.

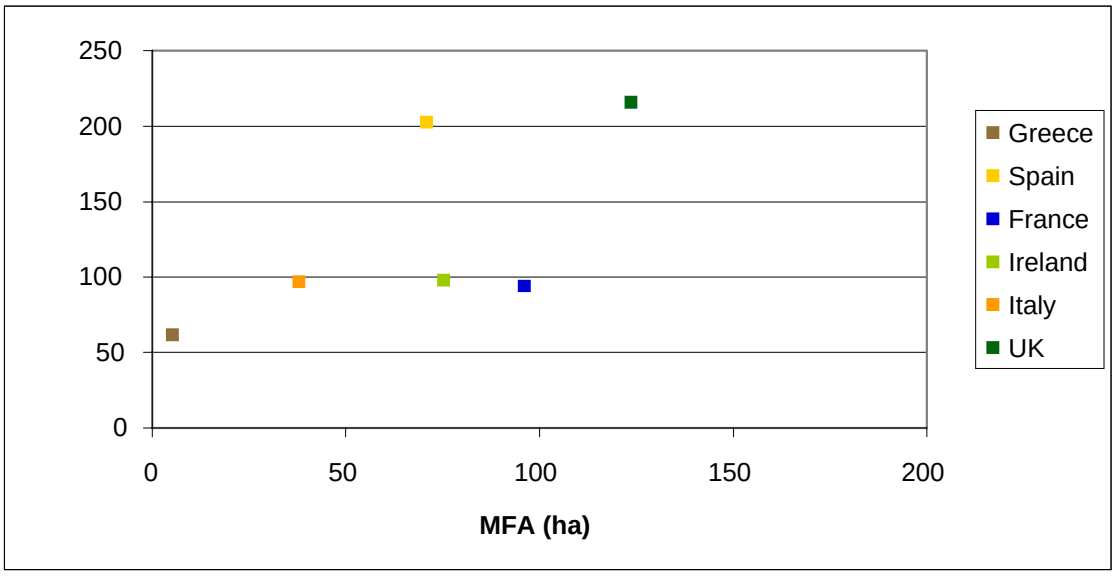


Figure 6: Relationship between the average number of ewes headage and MFA in the 6 countries studies (2003, FSS)

This figure shows two main characteristics:

The great variability of average sheep number between countries, varying from an average 61 in Greece to 215 in the UK. Spain and the UK have the larger flocks (see below).

The great variability of average private main fodder area of the whole farm (it might be used by other animals as well in case of mixed farm). In Greece there is a very limited average private MFA (8 ha) as the UK shows an average 143 ha. Thus the apparent stocking density appears very high in Greece (average 7,7 ewes/ha of MFA). This figure reflects the high use of common land in Greece. To give an idea, the private MFA of farms with sheep is around 1 M ha in Greece as the common lands (mainly

semi-natural pastures) represent 4 M ha as a whole (Hadjigeorgiou et al 2002; Hadjigeorgiou and Karalazos 2005a). In lesser but significant extent, this fact is found in Spain, Italy and France.

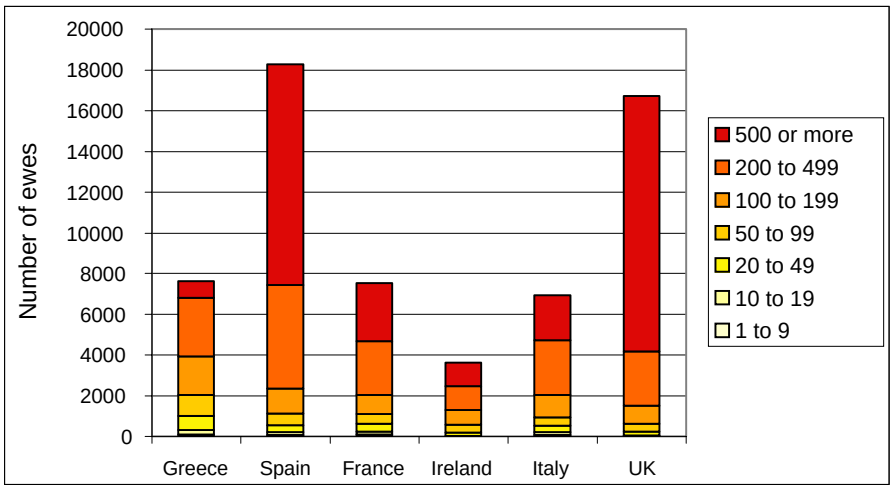


Figure 7: Distribution of ewes according to their flock size (Source: FSS, 2003)

As the previous figure shows, in the 6 countries studied, most of the breeding ewes belong to large size flocks.

In the United Kingdom, and Spain, about 90% of ewes are kept in large flocks of more than 200. In France, Ireland and Italy, the size of flocks is more homogeneous with about 35% of ewes in flocks of 500 or more, 35% in flocks of 200 to 499, and about 30% in flocks of less than 200. However, in Greece, large size flocks are less common and 50% of breeding ewes are in flocks of less than 200 sheep and 12% in flocks of less than 50 animals.

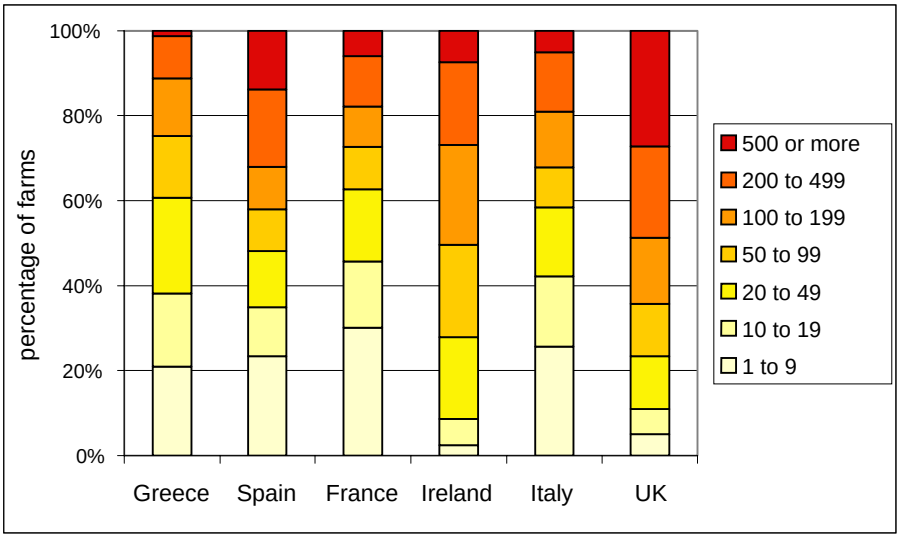


Figure 8: Distribution of farms according to the size of sheep flock (source: FSS)

This figure shows the relationship between the number of farms and flock size.

In UK and Ireland, the proportion of farms with small flocks (less than 20) is few, representing only about 10% of farms. The proportion of farms with very big flocks is higher in the UK than in Ireland, with more than 25% of farms having flocks of over 500 sheep.

In the four other countries, these small flocks of less than 20 sheep are present in about 40% of the farms. In Spain, there are both small and big flocks: with 35% of farms having less than 20 breeding sheep. and35% more than 200. In France and Italy, more than 40% of farms have less than 20 breeding sheep. In these two countries, the proportion of large flocks (more than 500) is common.. Conversely, in Greece, very few farms have more than 500 breeding sheep.

Goats

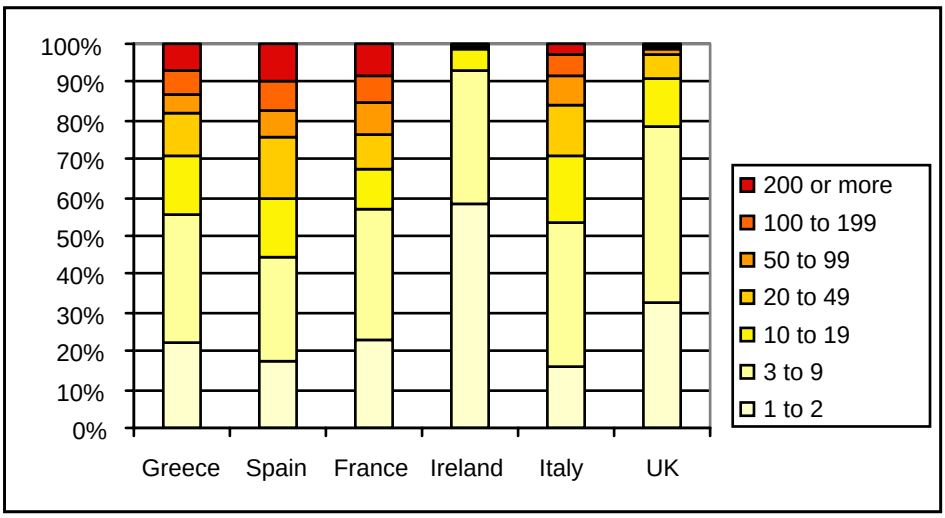


Figure 9: Distribution of farms according to size flock in 2003 (%) (Source: FSS)

Compared to sheep, goats are mainly bred in much smaller holdings. This figure reveals the coexistence of two contrasted systems: industrial and specialised milk-systems in France, Spain, Greece and Italy with large flocks. Mixed systems (goats and sheep) directed towards cheese-production are present in every of these countries.

Relationship between livestock density and flock size

At EU 15 level, the farm types are distributed rather evenly, as shown in the following figure indicating the number of farms per flock-size and average stocking density on farm (source: FADN 2003).

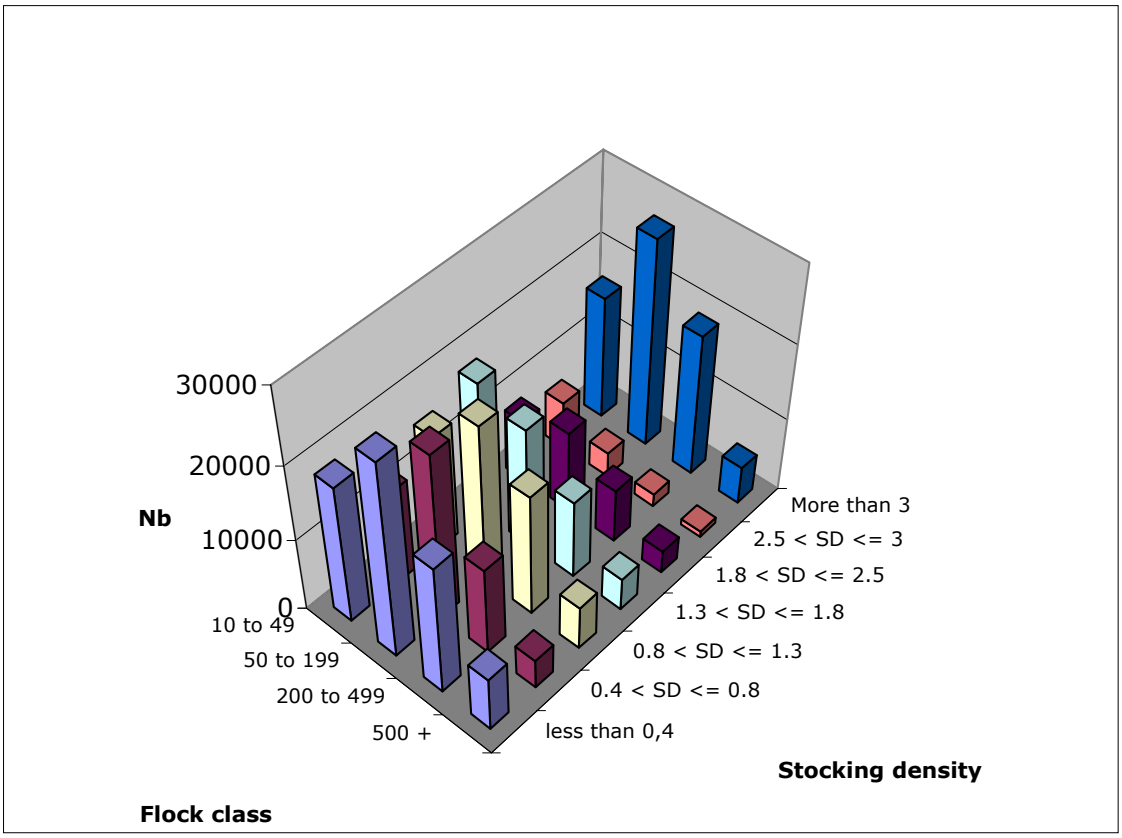


Figure 10: Distribution of S&G farms per flock size and on-farm stocking density (SD) (Source FADN 2003)

This figure shows the variety of situations and structures across Europe. The main comments are the following:

The distribution of farms across EU 15 shows that 53% of farms have a stocking density below 1,3 LU/ha. Reversely the 20% of very high density (above 3 LU/ha) reflect in fact the Greek situation, where most of S&G farmers lead very small holdings, depending on common lands for grazing. They can be assumed as mostly pastoral systems, having a contrasted but in average extensive use of land.

There is no clear correlation between the stocking density and the size of the flock, though the most intensive systems (1.8 - 3 LU/ha) are mostly represented by small-medium flocks.

2.4.3 Land-use and livestock density

As with many farming sectors in Europe, S&G farming ranges from the highly intensive to the highly extensive. This is reflected in the land-use of S&G farms of the next figure (farms with more than 10 ewes + goats in FADN sample 2003). A high percentage of rough grazing and permanent grassland (including meadows) is an indicator of rather extensive systems as, on the other hand, more intensive systems have a higher ratio of temporary and arable land temporary grassland. It is nevertheless interesting to note that arable land might be present in rather extensive situations, being used for specific periods in the management of the flock (complement after birth). The land use in very high stocking density (>2.5 to 3 LU/ha) "hides" the fact that common lands off-farm are used by such holdings, thus on farm land-use mainly reflects the intensive side of the system.

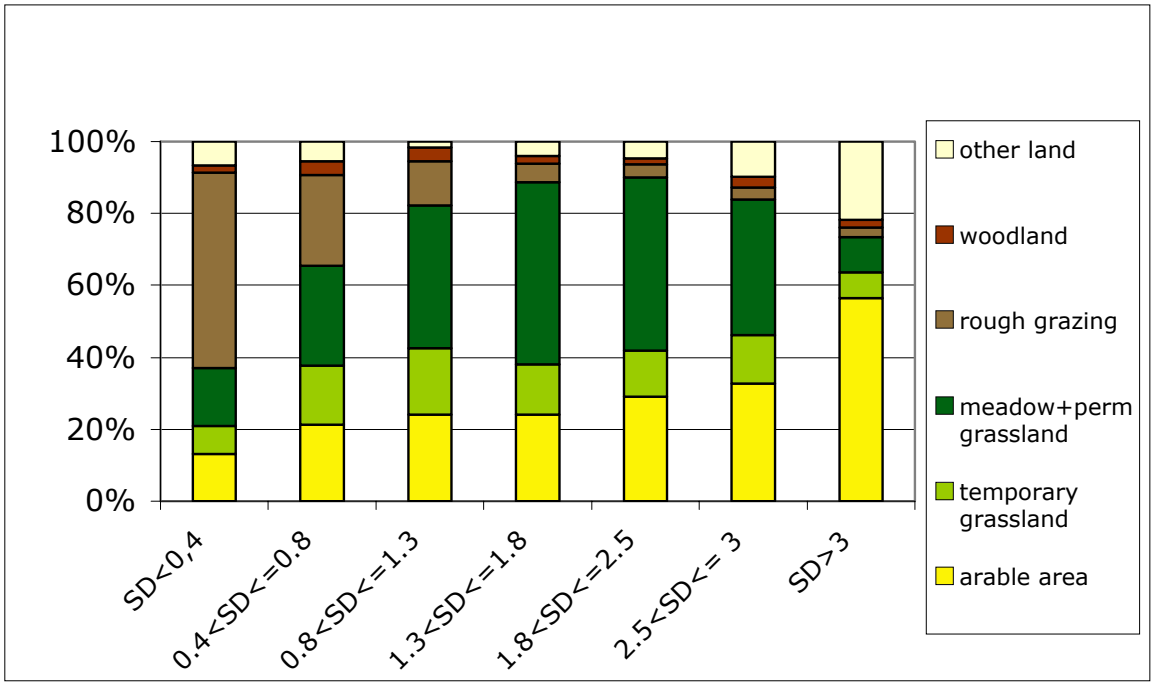


Figure 11: On-farm land-use of S&G farming systems (source: FADN sample, 2003, all EU 15 farms > 10 heads)

This overall figure reflects the ability of S&G to use "poorland", represented here with rough grazing and woodland. This is logically correlated with the geographical distribution of animals in LFA areas, as shown in next figure and map.

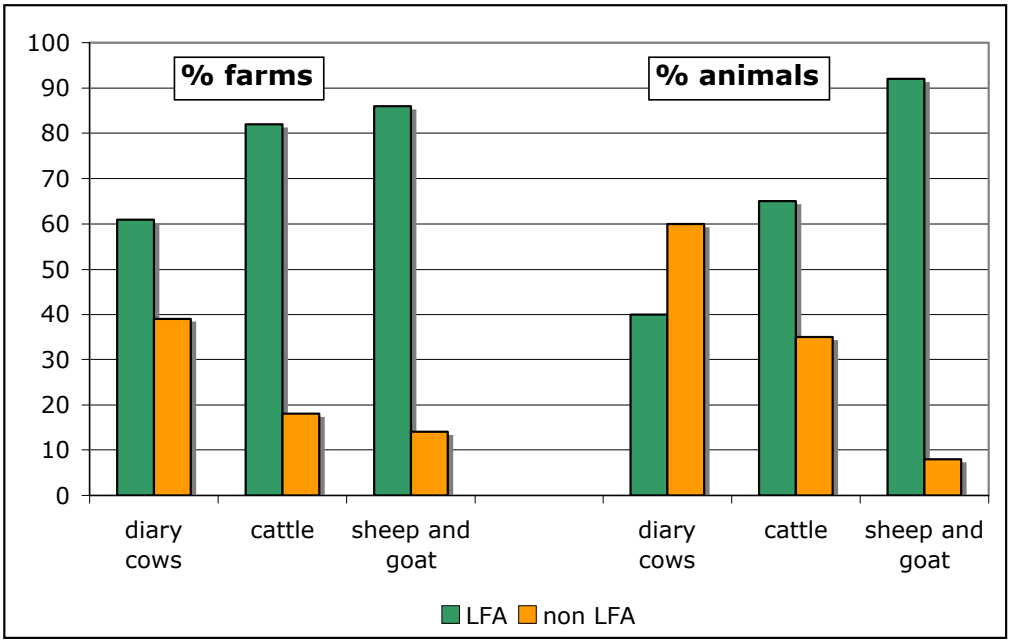
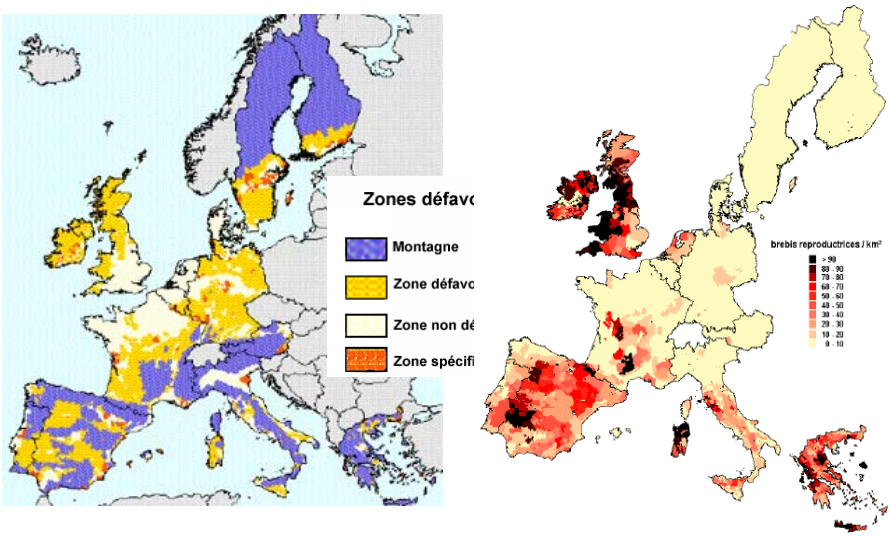


Figure 12: Percentage of S&G in LFA and non LFA (animals and farms) (Source: FSS, 2000 data)



Map 6: Comparison of LFA and sheep distribution

In the case of S&G, extensive systems are by far the more widespread. In terms of the contribution to EU agricultural policy, the importance of sheep is that they can thrive on some of the poorest quality land in some of the most marginal and remote areas. In terms of EU environmental policy much of the nature value of these areas depends on the continuation of pastoralism. On better agricultural land bovine production is always likely to be more profitable This has lead to the concept of sheep farming being the "last option" in many parts of Europe. The next figure clearly illustrates this point.

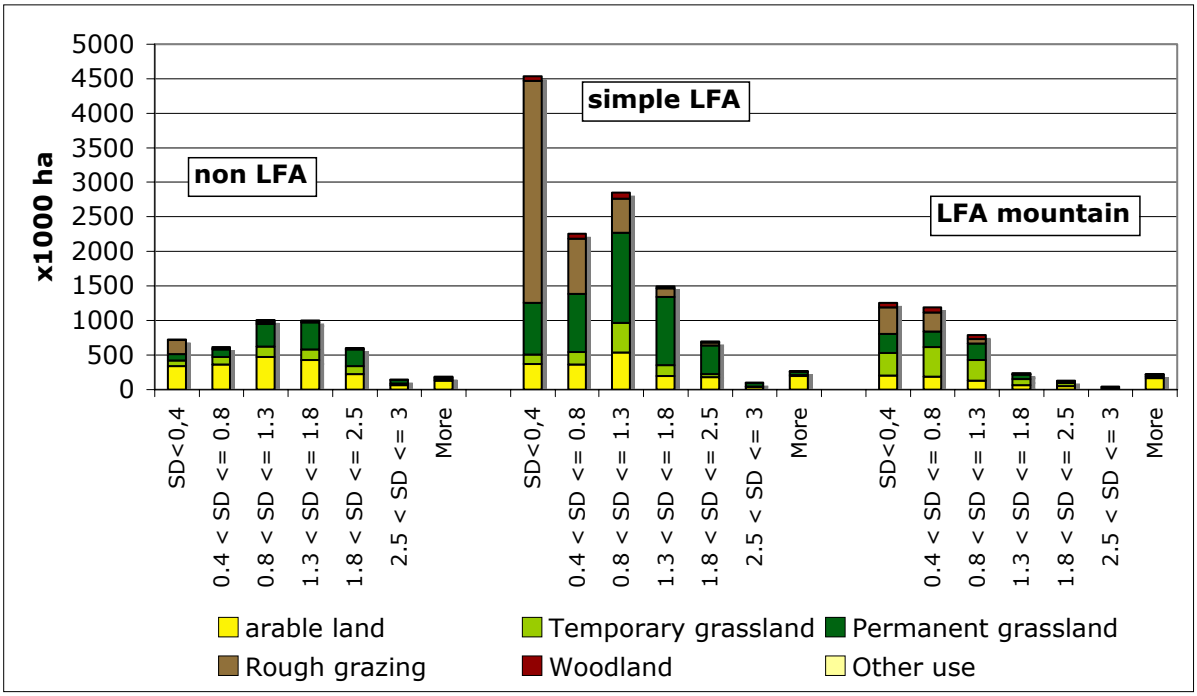


Figure 13: Breakdown of on-farm land-use patterns between non LFA, simple LFA and LFA mountain S&G farms (source: FADN 2003)

The largest area of land used by S&G farming in Europe is under semi-natural vegetation (grassland, scrub = "rough grazing" + woodland), exploited by extensive grazing and browsing. As a whole, permanent grassland and rough grazing represents 56% of S&G on-farm land use (respectively 30 and 26%). Common land off-farm would significantly increase the share of semi-natural vegetation used as a whole. More than any other type of farming in Europe, sheep and goats are associated in many regions with semi-natural vegetation, especially in uplands and mountains. In Mediterranean regions, especially

in Spain, there are also extensive systems using large areas of low-intensity arable land (stubbles and fallows) and dry grassland in the plains.

These systems that exploit extensive semi-natural grazing and low-intensity arable land are often dependent on shepherding, as such land often is not fenced, especially in the Mediterranean countries. In many upland and mountain areas of the Mediterranean countries (including France), considerable numbers of sheep and goats are still moved to different altitudes according to the season, to make use of available vegetation (transhumance, or trasterminance in its more local form). This activity also requires shepherds.

In Atlantic and Continental regions, sheep farming systems are mostly sedentary. Although these systems generally include some fenced land, in the extensive areas of semi-natural vegetation (e.g. UK uplands and mountains, west of Ireland) labour-intensive shepherding with dogs is still essential for management. Although there are specialist sheep systems in both the Uplands and Lowlands a high proportion of sheep production is carried out in mixed livestock systems (mostly with beef or dairy cattle). In both contexts this has historically been to make best use of the available forage.

2.4.4 Distribution of farm types

The ability of sheep and goat to use poorland leads to three contrasted rationale in conducting systems (Chatelier et alii 2003):

- When holdings are located in regions with a high percentage of poorland, the specialisation can be the rule as a way to take profit of such land. Flocks can be rather big and represent a high percentage of animals as a whole.

- When the percentage of poorland is low, S&G production will be a complement to another main production (frequently cattle or crops). Thus the size of the flock will be limited to the amount of poorland and labour force.

- Specialised systems might be found in favourable conditions, but mainly for profitable production, i.e. milk sheep/goat.

Such rationale are reflected in the following table, showing that farming systems specialised in S&G production (type 44 in EC classification) represent nearly half of farms and 70% of animals. For the rest, animals are spread in various farm types, with crops and cattle (types 81, 42 and 60).

	% ewes		% farms with ewes		% she-goats		% farms with she-goats	
total Total	60663670	100%	480540	100%	8421360	100%	220840	100%
(44) Sheep, goats and other grazing livestock	42132280	69%	221480	46%	5975000	71%	74710	34%
(81) Field crops-grazing livestock combined	5837820	10%	35710	7%	697980	8%	12250	6%
(42) Specialist cattle rearing and fattening	2159400	4%	31260	7%	49200	1%	5470	2%
(71) Mixed livestock, mainly grazing livestock	1915080	3%	26880	6%	356760	4%	12930	6%
(13) Specialist cereals, oilseed and protein crops	1643170	3%	18310	4%	82710	1%	4650	2%
(82) Various crops and livestock combined	1525600	3%	28940	6%	527370	6%	18660	8%
(41) Specialist dairying	1368840	2%	18210	4%	67350	1%	6510	3%
Others	4081480	7%	99750	21%	664990	8%	85660	39%

Table 5: Distribution of goats and ewes within the EC farm types (Source: FSS, 2003)

In FSS, the EC farm type 44 (specialised in sheep and goat) includes 71% of goats, 69% of ewes, and only 46-34% of farms having sheep and/or goat. The last value shows that traditional mixed holding are very frequent in Mediterranean regions though considered of minor economic importance. Moreover this reflect the ability of S&G to be combined with other productions and should be taken into account in building the typology.

2.5 A typology of sheep and goat farming systems in Europe

2.5.1 Purpose of the typology and methodology

A logical framework is needed to comment on the environmental consequences of different sheep

management systems in different areas. No existing classifications or typologies are based on the two aspects we regard as most relevant to the environment – the forage resources and the intensity of management. "*Characterising livestock production systems on the basis of economic and technical indicators is a complex process, as this paper will attempt to demonstrate. This is particularly the case in the sheep sector where production systems are far from uniform across the European Union. […].Sheep systems continue to be enormously rich in diversity. […] . This diversity of production system is in marked contrast to many other sectors, for example the dairy industry where the breed of cow, the management systems and the feeding systems are becoming remarkably uniform across the world.*» (Ashworth 1998; Chatelier et alii 2003). The statement is even more true for goats.

We used expert knowledge (from the start-up meeting and through interviews) to construct a typology; in two parts, one for the Mediterranean Region and one for the Atlantic and Continental Regions, reflecting the ecological differences described in the section on Zoning, above. It provides a simple way to allocate any sheep farm to a "system" that is recognisable on the ground and has some environmental meaning. In some there is considerable variation within the group and if looked at nationally or regionally, many more sub-types could be described. However, the variation within the types is always less than the variation between the types and for the purposes of this study the limited number of types is more than adequate.

Because the variables used to distinguish the systems are not all available as EU statistical data, it is not always possible to quantify the distribution of the systems or their attributes, but detailed qualitative descriptions are possible. Quantitative summary statistics could be produced using national and regional census data but this was beyond the aims or scope of this study.

At the EU level the only material available to us is the FADN data which is based on farm accounts and whole farm data. Despite its limitations regarding the criteria for selecting farms and the size of the sample (see more detailed comments below) an attempt has been made to produce a quantitative typology which comes close to the "expert knowledge" version that we know reflects reality on the ground.

The criteria used to characterise the types are the following:

- The overall fodder availability, that will depend on the combination between:

  The quantity of forage resources = size of the forage area frequently encountered

  The quality of forage resources = agronomic potential from forage area at farm level (± high/low output)

- The needs for complementary off-farm resources
- The indicative stocking density on on-farm MFA
- The other possible production (s) on on-farm forage area. If "none", sheep and goat production is assumed to be the "last option"
- The rationale in the direction of production: Meat or Milk Sheep or Goat
- The location of farmland in LFA or not

2.5.2 Description of sheep farming systems

Atlantic

Farming systems in Atlantic region are directed towards meat production. They show a great variability in feeding strategy based on grassland, depending on the availability of forage resource. Farming systems are complementary at national level, as upland holdings are specialised, in broad terms, in giving birth to lambs and lowland systems in fattening.

Atlantic	quantity = size of the forage area frequently encountered	quality = agronomic potential from forage area at farm level (± high/low output)	needs for complementary off-farm resources	indicative stocking density on on-farm MFA	other possible production on on-farm forage area = "none"=last option	Rationale in use of animal: Meat or Milk Sheep or Goat	LFA/non LFA
sedentary intensively stocked, managed grassland	medium-high	high, productive grassland (high rainfall, smooth temperature)	limited	1,5-2,5	cattle, cows	- Meat sheep as a complement of other livestock - Specialisation for fattening	typically in non LFA, but also in best areas in LFA
sedentary sheep and arable	medium-high	poor grassland (best land for crops), meadows	limited	<0,4-0,8	sheep (crops)	- Meat sheep to value "poorland" and crops (cereals)	typically in non LFA
sedentary semi-natural forage	high-very high (evenly including commonage)	poor productivity (climate, soils)	limited (except for farms standing on commonage)	<0,8	none	- Meat sheep to value meadows (does not prevent from an on-farm intensification on best land)	typically in LFA (upland)

(the stocking density is given in LU/ha)

Sedentary intensively stocked systems stand on a maximum use of grassland, whose productivity varies but is generally high given the favourable natural condition (even in some LFA cases). Sheep are frequently a complement to other animals — generally cattle — in order to take profit of land during winter, when soils are too wet to stand heavy animals. The degree of intensification depends on the whole number of animals (not only sheep). The most intensive use of land is encountered for fattening systems producing mid-season fat lambs for slaughter.

Sedentary sheep and arable systems are based on a different rationale, as grassland is not the main forage resource. This is a specialized system characterized by arable production on good agricultural land in the UK lowlands with sheep (mostly lambs for fattening) being grazed on the poorer uncultivated land, on stubbles and in some cases on crops grown specifically for them. In Ireland these have in the past included oats, grass, turnips and sugar beet. The removal of the sugar beet subsidy has ended sugar beet production in Ireland and is likely to have the same effect in the UK. This may further reduce the number of sheep associated with this system.

Sedentary semi-natural forage systems. Hill breeds of sheep are used, either bred pure or crossed with a low-ground breed sheep to produce a better meat lamb and a female sheep that can be sold for breeding in the lowlands. Pastures are predominantly natural vegetation. Stocking densities typically vary from as low as 0.15 LU / ha (lower in some parts of Scotland) to 0.6LU / ha and higher in areas that would be regarded as overgrazed.

One can attempt to quantify the relative importance of each system with FADN criteria (2003 data). In the UK, holdings with characteristics of sedentary semi-natural forage systems (i.e. low SD and high percentage of rough grazing in land use) represent only 19% of farms and 27% of animals but 55% of main fodder area used by S&G farms as a whole. In Ireland, same systems seem to represent a bit less than 20 % of farms and all MFA with 13% of ewes. UK systems standing on managed grassland represent around 75% of farms and animals and 44% of the MFA and more than 80% of farms, animals and MFA in Ireland, which seems a bit over represented. Arable systems are found in FADN database only in the UK and represent less than 4% of farms, animals and MFA.

Continental

Sheep farming has considerably declined in the last decades in the continental context. As in the Atlantic situation, grassland is also the most logical way to feed the animals, but its productivity is on average lower due to lower rainfall during summer and more sever winters.

Continental	quantity = size of the forage area frequently encountered	quality = agronomic potential from forage area at farm level (± high/low output)	needs for complementary off-farm resources	indicative stocking density on on-farm MFA	other possible production on on-farm forage area = "none"=last option	Rationale in use of animal: Meat or Milk Sheep or Goat	LFA/non LFA
sedentary managed grassland	medium-high	relatively high, productive grassland (medium rainfall)		0,8-1,3	cattle, cows	- Meat sheep as a complement of other livestock - Specialisation for fattening or high quality product	typically in LFA (simple LFA)
sedentary crops+grassland	medium-high	poor grassland (best land for crops), meadows		1,8+	(crops)	- Meat sheep to value "poorland" and crops (cereals)	typically in non LFA or in "plain" LFA
Sedentary forage crops and fodder	medium	high, based on fodder crops (temporary grassland and maize)	limited	1,3-2	cows	- Goat milk profitable on limited MFA (but labour demanding)	typically in non LFA

(the stocking density is given in LU/ha)

Sedentary managed grassland systems are based on the same broad rationale as the Atlantic ones. They are found in the humid hills of Bourgogne, Limousin and Auvergne as a way to take profit from grassland that cattle or cows would not entirely use. The productive patterns generally are rather extensive in order to minimise costs (low output/low input). The balance of such systems is fragile due to relatively high labour demand, as sheep will compete with cattle/cows on this criteria.

Sedentary crops + grassland systems are legacy of former large wool systems in crops plateaus (Champagne, Bourgogne, Lorraine). Animals are housed most of time and fed with cereals and fodder crops (hay, alfalfa,…) produced on-farm, only dry ewes are grazing in fenced fields of low-output grassland and meadows. Shepherding was a way to get use of stubbles by grazing, but disappeared due to labour costs. Such systems stand on a high output/input strategy.

Sedentary forage and fodder crops systems are the closest to intensive bovine systems. Animals are fed with high output grassland and fodder crops, such as alfalfa, clover and, in a limited extent, maize. Such costs are engaged in order to support a high output production which, in the continental context, consists of goat-milk for industrial or on-farm cheese processing or high quality meat ("*Agneau label rouge*" for instance).

The quantification of such systems in continental France can be approached with a study from *Institut de l'élevage* (2002) for specialised sheep meat systems, based on 2000 general census. It shows that sedentary managed grassland systems breed half of the ewes on the 2/3 of MFA[9] and represent half of the farms. Sedentary forage and fodder crops systems breed 37% of animals on 25% of the total MFA. Cereals systems represent 15% of farms, and 10% of animals and MFA.

Mediterranean

There is a wide range of sheep and goat farming systems in the Mediterranean countries. A complete and detailed categorisation of these systems is complex and with the information that is available, it would not be possible to report on the environmental effects of each specific system.

In order to review environmental effects, a simplified categorisation of feeding systems is used:

[9] — Of the 8,000 continental farms represented in the study.

Mediterranean	quantity = size of the forage area frequently encountered	quality = agronomic potential from forage area at farm level (± high/low output)	needs for complementary off-farm resources	indicative stocking density on on-farm MFA	other possible production on on-farm forage area = "none"=last option	Rationale in use of animal: Meat or Milk Sheep or Goat	LFA/non LFA
sedentary managed forage area	low (Greece <10 ha), medium (Italy and France ±30 ha), high (Spain 50ha+)	high, productive grassland or crops (irrigated if necessary)		0,8-1,8	cattle, cows	- Meat/milk sheep/goat as a complement of mixed production - Specialised milk high value added	in non LFA and LFA (non mountain or high altitude plateaus with some rainfall)
pastoral	low	generally look for maximum production on permanent or temporary grassland	various types of public and common land + private rented land	2,5+	cattle, cows (but little land as a whole)	- Milk/meat sheep/goat exploiting semi-natural grazing (grass, scrub, woodland)	in LFA (mountains)
sedentary semi-natural grassland	high-very high	poor productivity (drought and soils)	traditionally the summer deficit was addressed through transhumance; now a strong reliance on purchased feeds	<0,8	sheep, cereals	- Meat sheep (some local milk production) as the only productive use of very dry grasslands.	in LFA (non mountains, rather dry steppes and *dehesas*)
pastoral on stubble and fallows (shepherded)	none or low	generally look for maximum production on permanent or temporary grassland	private land (grazing may be rented and/or historic rights of use)	2+ In Spain these are mostly landless, so stocking same as type 18. Grazing density is very low (<0.3LU/ha)	sheep	- Milk/meat sheep/goat to value private fallow, on-farm intensification for winter fodder stock	in non LFA and LFA (non mountains, dry plateaus)
indoor	none	not relevant	purchased concentrates and fodder	3+	not relevant	- Industrial milk	LFA and non LFA (e.g. Med. Islands)

(the stocking density is given in LU/ha)

indoor - often a gradual conversion from other systems, as purchased feeds replace cultivated fodder and shepherding, and sheds are expanded

sedentary managed forage area – not common in most Mediterranean regions, except as part of pastoral and indoor systems in which holding provides part of the fodder needs

sedentary semi-natural grassland - stock are normally on fenced, semi-natural grassland on the farm holding, although some local shepherding to other pastures may occur (trasterminance)

pastoral on stubble and fallows - using traditional rights to graze on private arable land, daily shepherding as the land is mostly unfenced

pastoral on semi-natural vegetation – the most typical S&G system in the Mediterranean, based primarily on poor, semi-natural forage resources (grassland, scrub and woodland, often mixed), especially commons in uplands and mountains. In more traditional systems, shepherds accompany the stock all day and most days of the year (no fencing, predators); in modernised systems stock are taken to different types of pasture and then visited daily or weekly, but not accompanied (fencing, no predators). Seasonal/altitude movements are still common.

In practice, many sheep and goat farms make use of a variety of feed sources. The categorisation is for the purposes of synthesis.

The precise quantification of systems is rather difficult, but broad figures can be approached on the basis of FADN 2003. For the three "pure" Mediterranean countries — Spain, Italy, Greece — 27% of farms with 30% of ewes + goats manage 49% of the whole on-farm main fodder area (MFA) with livestock density below 0.4 LU/ha. For LD between 0.4 and 0.8 (thus, rather extensive), the respective figures are

11%, 12% and 26%. On the other extreme, pastoral systems (assumed with LD>3 LU/ha) represent 1/3 of farms and animals on only 4% of on-farm MFA. If we assume that these three categories are associated to extensive land-use patterns, the overall proportion of production under these patterns is 71% of farms and nearly 80% of animals and on-farm land.

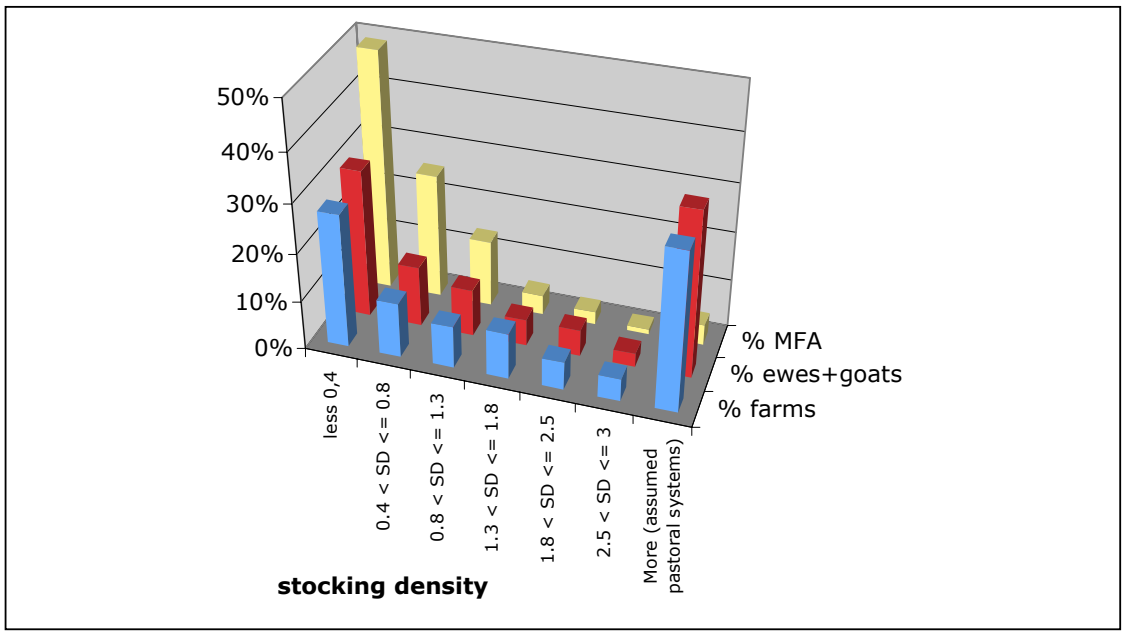


Figure 14: Percentage of farms, ewes + goats, MFA in the three Mediterranean countries — Italy, Spain, Greece (FADN 2003)

2.5.3 The main systems involved in S&G markets

The first issue to consider when analysing the S&G farming systems in Europe is their orientation towards milk or meat. These two productions are based on highly contrasted micro economic rationale that are summarised in the following table.

	Milk/Cheese economy	Meat economy
Micro :	The production is labour-intensive and allows a rather high added-value due to the cheese process. It can compete other productions in the same region. Seasonality is an important issue. Nevertheless it can be produced (1) in low-cost farming systems, minimising the financial inputs and maximising labour productivity (2) in high-cost FS, more or less on the same pattern of dairy production (maximising the amount of milk produced/labour unit).	Production with low added-value/ha per se compared to other common agricultural products => "Last option" for low productive land, mostly in LFA. The issue is to maximise the quantity of meat produced/labour unit. This can be obtained through two separate strategies: (1) High number of lamb fed on intensive pattern (high cost/ha) (2) High number of lamb fed on extensive pattern (low cost/ha)

Using the same typology, the main systems feeding the EU market can be described as follow:

Atlantic	Purpose in use of animal: Meat or Milk Sheep or Goat	LFA/non LFA
sedentary intensively stocked, managed grassland	- Meat sheep as a complement of other livestock - Specialisation for fattening	typically in non LFA, but also in best areas in LFA
sedentary sheep and arable	- Meat sheep to utilize "poorland" and complement crops (cereals)	typically in non LFA
sedentary semi-natural forage	- Meat sheep to maximase vegetation potential of forage (also on-farm intensification on best land for fodder production)	typically in LFA (upland)

Continental	Purpose in use of animal: Meat or Milk Sheep or Goat	LFA/non LFA
sedentary managed grassland	- Meat sheep as a complement of other livestock - Specialisation for fattening or high quality product	typically in LFA (simple LFA)
sedentary crops+grassland	- Meat sheep to value "poorland" and crops (cereals)	typically in non LFA or in "plaine" LFA
sedentary fodder crops	- Goat milk profitable on limited MFA (but labour demanding)	typically in non LFA

Mediterranean	Purpose in use of animal: Meat or Milk Sheep or Goat	LFA/non LFA
sedentary managed fodder area	- Meat/milk sheep/goat as a complement of mixed production - Specialised milk high value added	in non LFA and LFA (non mountain or high altitude plateaus with some rainfall)
pastoral	- Milk/meat sheep/goat exploiting semi-natural grazing (grass, scrub, woodland)	in LFA (mountains)
sedentary semi-natural grassland	- Meat sheep (some local milk production) as the only productive use of very dry grasslands.	in LFA (non mountains, rather dry steppes and *dehesas*)
pastoral on stubble and fallows (shepherded)	- Milk/meat sheep/goat to value private fallow, on-farm intensification for winter fodder stock	in non LFA and LFA (non mountains, dry plateaus)
indoor	- Industrial milk	LFA and non LFA (e.g. Med. Islands)

As the productivity is much higher for cheese than for meat, lamb (goat) meat can be a side-product (a complement) of cheese production (or even cattle and in a lesser extent, crops – see below). The reverse has no real economic meaning.

For S&G milk production, specialisation of farms in S&G will be more frequently the case, as the high added value makes little interest for another production (cattle, dairy). This “rule” does not prevent the existence of mixed systems relying on sheep milk but with associated cattle.

Meat production can be seen in both specialised or mixed farms.

3 Environmental impact of sheep and goat farming

3.1 The environmental effects of sheep and goat

Most of the environmental impact analyses are related to one issue in one particular situation: overgrazing in Ireland, landscape management in Southern Europe, biodiversity conservation in the Alps, fire prevention in the Mediterranean countries… Other issues, such as water pollution or air pollution, for example, are much less covered.

3.1.1 Analytical analysis

Landscape

The role of S&G in the maintenance of open landscapes is recognised (Ashworth 1988, Mollard et al. 2002). The S&G may play a major role in the maintenance of semi-natural steppes. S&G can be associated to rather uniform land-use (i.e. landscape dominated by grassland) or introduce diversity in land-use (when associated with crops).

When S&G is a "last option" — which is frequently the case — the alternative for land use frequently is land abandonment, leading to shrub and scrubs and, then, to woodland. As discussed below, the nature of the impact depends on the geographical context (dry/wet) and of the proportion of open land/forest in the landscape.

In the Mediterranean context, forest fires are prevented with an appropriate use of grazing (Véron and Parfait 2005). Reversely, land abandonment by farming will contribute to higher probability of forest fires" below).

Goats are also recognised as preventing forest regeneration if grazing pressure is heavy, mostly in Mediterranean forest. The impact on soil erosion (discussed below), might also have a landscape dimension. The appropriate spatial management of the animals (shepherded or not) is crucial for these issues.

Also in Mediterranean context, the use of fire as a way to "open" pastures might also have an impact on landscape. The discussion about fires will be held in the § devoted to air pollution and soil.

S&G frequently is associated with traditional architecture as well: shepherds' shelters, stone walls, watering places built with stone.

Biodiversity

The ability of S&G to manage low productive land make them associated with the existence of semi-natural farmland, characterised as HNV. The general extensive pattern of S&G farming at EU level is largely recognised (EC, 2005, Institut de l'élevage 2005). The role of S&G in the management of HNV in Europe is irreplaceable in many situations (IEEP, 1995) — the "last option" characteristic plays a major role in this statement. In nomadic conditions, the temporal use of some distinct places through the year will lead to positive impacts for biodiversity (for vegetation, invertebrates, mammals and birds), as the disturbance of an habitat will be limited.

Transhumance might also play a role in the transportation of seeds in the wool of the sheep, thus favouring the diversity of wild plants (Tatoni T. et al., 1998).

Nevertheless; it can not be assumed that S&G farming is good for biodiversity and HNV in itself, though the characteristics of the animals clearly are assets for the maintenance of HNV. The key condition in order to preserve the HNV characteristic is the low-input use of land (Andersen et al. 2003), which can be estimated both by a low level of inputs (synthetic or organic) and a low stocking rate — though there are discussions about the appropriate stocking rate through year (a low average stocking rate might hide a high pressure in a limited time). In experiences made in Spain (dehesa), France (garrigue) it was shown that the number of days on pasture and a well defined ratio between the total feed and maintenance

requirement of the flock are efficient criteria to define the stocking rate for maintaining the natural environment having a suitable production[10] . The key criteria for farming systems associated to HNV are (1) the existence of semi-natural forage resources (grazed or cut) (2) appropriate management of flocks (shepherded animals in order to avoid over concentration) (Ostermann, 1997).

With regards to the biodiversity issue, if 100% extensive systems can easily be identified as potentially HNV, it must be noted that some farming system might stand on contrasted use of land: part of the forage area might be intensified, while another might be used on a rather extensive pattern (mostly when grazed). Many mountainous systems described below rely on an intensive hay or crop production (for fodder) in the valleys as animals graze semi-natural land at higher altitude. This extensive use of land might also be encountered in plains, when flocks graze on fallow land or a limited part of extensive grassland.

On another level, carcasses of dead animals might contribute to the maintenance or development of vultures population (mainly in Mediterranean context) (Sarrazin F., 1995).

The relationship between S&G farming and large predators (bears, wolves, lynxes) can be noted as a particularly "hot" and controversial issue in Mountainous areas where the species coexist. The way of keeping animals (shepherded or not, use of watch dogs) is the central issue. Nevertheless, such predators do not need sheep (or goat) to survive.

Water

Quality

The nature of the impact of S&G farming on water quality can be associated to two components of the farming systems:

The management and the density of the flock, and more generally the management of manure, leading to potential leaching of nitrate, phosphorus and risk of bacteriological pollution. The way animals are fed also play a role in the risks of pollution (i.e. moisture content of dung).

The management of the forage area and the fodder system, with classical issues associated to crop production: fertilisation, use of pesticides (for other fodder crops than grass).

The good use of S&G manure on farmland is a link between these two components.

The farm criteria to considered are (1) the livestock density (stocking rate) (2) the nature of the forage system (% of permanent grassland / temporary grassland / crops).

Thus, in general terms, S&G face the same kind of issues than other livestock production, such as bovine. Nevertheless, some characteristics of the S&G might change the nature of the problems faced:

The general extensive pattern for S&G breeding (though locally, it might be intensive).

In milk system, imported food during milking period might increase the livestock density and, thus, the risks of pollution.

S&G excrements have a high C/N index making them rather stable (all the more when dry).

The average N production per LU is lower than for bovine (66 kg N/LU against 85 kg N/bovine LU [11]).

Sedentary and nomadic animals face contrasted issues in the good management of manure. The former will mainly have to deal with classical issues of storage and spreading of manure on fields as the latter will have to deal with the spatial management of the flock (and notably the protection of water courses).

[10] Susmel P. et al. (1987)

[11] — Estimation based on the French standards for Nitrate directive.

Quantity

The irrigation of fodder systems for S&G is presumably marginal [12].

Nevertheless it can be assumed that S&G farming might have an indirect but significant impact of quantitative management of water through — again — the prevention of fires in Mediterranean context. Indeed, as fires evaporate the water contained in the soil and mineralise them (with a lower water retention capacity), prevention of forests fires might have a positive impact on the overall hydrogeological water balance at water basin level. This issue needs to be further investigated.

Soil

The impact of S&G farming on soil can be analysed with different issues:

- The risks of erosion, linked to overgrazing and destruction of forests (anywhere for the former, in Mediterranean context for the latter). Positive impact of S&G farming on erosion can be associated to prevention of land abandonment (terraces on Mediterranean slopes for example) and/or forest fires. The balance between over and undergrazing is the key issue relative to this theme. A critical question is whether flocks are shepherded or not.

- The impact on soil structure and biology. Overgrazing might lead to deterioration of soil structure, but mostly in limited places (as overgrazing occurs when the whole land is not evenly grazed). At larger scale, the use of fire for opening pastures might lower the quality of the soil structure (but in a limited way as the fire is superficial). More significant are the forests fires that deeply impact the soil quality and structure.

The case of fires

The fire issue appears to be central and needs further discussion.

Firstly, two kinds of fires must be distinguished:

Opening and regenerating fires on pastures (mostly semi-natural), whose localised impacts on soils, GHG effect and biodiversity are limited when they are superficial and allow a fast growing of grass. Such practices are encountered in Mediterranean countries, and in Scotland and Ireland as well.

Wild fires, whose impacts are major in the Mediterranean context. Nevertheless, the factors and impacts leading to such fires are more numerous than the simple existence or absence of S&G in one area. In addition, the environmental impacts of Mediterranean forest fires at large scale need further discussion (as it can also be considered as part of the natural life cycle of forests)[13].

S&G farming might have contrasted and contradictory relationship with these issues. As stated above many times, the grazing of shrubs, scrubs and woodland is recognised as a major positive impact on forest fire prevention. On the other hand, badly managed pasture fires might increase the occurrence of forest fires. The abolition of pasture fires must be balanced with the risk of changes in overall land use and abandonment of semi-natural pasture management (Hadjigeorgiou et al., 2005b; Lorgnier, 2001; Chabert et al., 1998).

3.1.2 Synthesis

Two issues might be addressed when considering an overall environmental impact analysis of the S&G farming systems:

[12] — Though it might exist in some Mediterranean areas.

[13] Various Aa.– La biodiversità nella regione Mediterranea – Agenzia Nazionale per la Protezione dell'Ambiente – Stato dell'Ambiente 4-2001:22-26

- For one issue (landscape, water,…), what is the validity of the environmental appraisal stated for one situation? In other words, what are the key characteristics of the S&G farming that allow to lead to a conclusion in terms of environmental impact?

- For one system, what is the overall environmental "profile" that can be proposed, considering the whole range of environmental issues?

The following table summarises the main links between characteristics of sheep farming systems and the environmental issues identified in the study, for S&G farming across the study countries. Box 1 states why air emission is peripheral in the analysis, both due to the lack of data and the little presumption of risks in the S&G sector as a whole.

Characteristics of the farming system	Potential Environmental themes
Management of the flock	
- Indoor	Water pollution Lack of management of open landscape (no grazing)
- Sedentary outdoor not shepherded	Water pollution Management of open landscape, potentially HNV Risk of over- or under-grazing natural vegetation
- sedentary outdoor shepherded	Management of open landscape, potentially HNV. Limited risks of water pollution and overgrazing (if complying with good practices).
- nomadic (shephered)	Management of open landscape, potentially HNV. Very limited risks of water pollution and overgrazing.
Stocking density	
- optimum stocking density (varies between system and location)	Stocking density provides an overall indicator of the risks of overgrazing, soil damage and water pollution.
- Undergrazing	Risk of land abandonment, vegetation change, scrub and woodland encroachment and potential loss of biodiversity, increased fire risk.
- Overgrazing	Risks of soil erosion and loss of biodiversity.
- balanced grazing	Positive impact on landscape and biodiversity. Minimum risk of soil damage and water pollution. Reduced fire risk.
Forage system	
- semi-natural vegetation, including grasslands	Generally very positive for landscape, water, HNV, fire prevention and GHG. For HNV, effects depend on management practices (e.g. grazing regime).
- permanent grassland (in Atlantic region this may be managed intensively; often linked with temporary grassland).	Generally positive for landscape, fire prevention and GHG. Impacts depend on the management for HNV and water (see stocking density)
- temporary grassland	Neutral or positive impact for landscape, fire prevention and GHG
- crops	Impacts depend on intensity and management practices. Low-intensity cropping with fallow is very positive for HNV in med araes. Sheep dunging is positive for soil organic matter and reduces fertiliser use (GHG+). Intensive systems generally negative in themselves, although sheep play a positive function.
Management of fire	
- managed fires on pastures	Negative but limited impacts* on GHG, soils and landscapes Contrasted for biodiversity
- unmanaged fires on pastures (leading to involuntary forest fires)	Negative impacts* on GHG, soils, biodiversity and landscapes
- prevention of forest fires	Positive impacts* on GHG, soils, biodiversity and landscapes
Miscellaneous	
- carcasses of dead animals, although EU regulations require the burial of carcasses	Positive impacts for invertebrates, scavaging mammals and many birds e.g vultures Negative - Sanitary risks, water pollution, public health.
- maintenance of built heritage (including terraces)	Positive impact on landscape and erosion if terraces are maintained and stocking levels are not excessive (sheep and goats damage terraces)

Figure 15: Summary of relationship between environmental themes and farming systems attributes

There are relationship between the above attributes — see the approach in terms of farming *systems* — that need to be comprehensively captured. This advocate for the farming system typology approach.

Box 1: the impact of S&G sector on air

Impact must be analysed with regards to greenhouse gas effect and air pollution (ammonia emission).

• Three sources of greenhouse gas effect (GHG) are recognised in relationship to agricultural sector:

The fermentation associated to ruminants (enteric fermentation), representing 32% of emissions (Eurostat, 2005, based on EEA data);

The fermentation of manure (methane – CH4 – and NOx), being originated by ruminants or not (such as pigs or poultry), representing 20% of emissions,

The carbon and methane cycle in soil, linked to crop pattern, representing 48% of emissions.

As ruminant, sheep and goat contribute to the first type of emission. They are estimated to contribute to 11% of enteric fermentation, which is their share in the EU meat production. Their contribution is relatively lower than bovine.

The Eurostat publication does not display the figure of the contribution of the S&G sector to the fermentation of manure (b). Nevertheless, as methane and NOx emissions are higher in anaerobic conditions (which can be assumed of being the exception for S&G sector), the relative contribution of the S&G as a whole is probably low, essentially under CO2 (which GHG index is lower than CH4 and NOx).

With regards to the main item — soil balance — the first element to take into consideration is the share of permanent grassland used for the fodder resources as a whole. Indeed, this use of land is recognised to be, from far, the one with the highest C storage capacity amongst agricultural uses of land. The advantage of permanent grassland compared to other kinds of land use is also its limited use of tractor and fossil oil compared to crops. The share of permanent grassland used by different types of S&G will be a good indicator of their contribution to this item.

Another effect of S&G farming will also be linked to fires, as their prevention retain the storage of C in the soil and in the trees. Figures allowing to estimate the balance occurring from this item needs to be looked after.

• Ammonia emission are poorly studied in the case of the sheep and goat sector, as this production is rather marginal at EU level. Compared to bovine, pig or poultry sectors, the S&G one is hardly analysed (Portejoie et al., 2002). Interviews allow to conclude that, nevertheless, the dry nature of S&G manure and the high C/N ratio limit the ammonia emission.

A further issue is the potential loss of autochthonous breeds of S&G which is associated to the loss of a gene pool for desirable characteristics like resistance to diseases, endurance in harsh conditions, or ability to utilize marginal landscapes.

The analysis of environmental effects is presented separately for the Atlantic, Continental and Mediterranean areas.

3.2 Environmental effects in Atlantic areas

3.2.1 General outlook

Most of the recognized (and a lot of the perceived) environmental problems associated with sheep farming in north-west Europe relate to overgrazing – or more specifically inappropriate management associated with excessive stocking numbers (such as concentrations of sheep, burning of vegetation, supplementary feeding practices) – on natural pastures (rough grazing) (Ashworth, 2000). In the typology this equates with systems exploiting semi-natural forage and occurs in the Less Favoured Areas.

In this context the net increases in sheep numbers in western Ireland and the uplands of Wales and England were of particular concern. In Scotland and Northern Ireland, even in the mid 1990's when sheep numbers were at their highest, sheep stocking densities were never as high as in the main sheep farming areas of England and Wales, and never regarded as a major issue.

The reason for the environmental concern about excessive stock numbers was partly because of localized severe, and in some places irreversible, changes to the vegetation and the soil. The sensitive blanket peat vegetation of western Ireland is the classic example (NPWS undated reports and A.Bleasdale pers. com.). Furthermore, the concern was raised because of the High Nature Value of the main sheep farming areas,

much of which had no formal designation as such, but where sheep numbers where clearly beyond the biological optimum. It increased awareness of the positive interactions between natural areas and farming activity – positive interactions that in recent years have been breaking down as a result of intensification of management and which in the future are predicted to do so because of abandonment (Jones,D.G.L., et al. 2006).

Where there are negative environmental impacts associated with these systems (e.g. point source pollution) these are more likely to be associated with the other enterprises on the farm (usually dairy or beef cattle). The converse of this is that the sheep farming systems (mostly in the LFA and mostly system standing on semi-natural forage) that have had negative impacts have done so because they did shepherd correctly the flocks.

An important point is that a high proportion of sheep production is either under systems of management that do not have any significant negative environmental impacts, or is under systems that occur in areas of high nature value. Even though the nature value of these areas is intimately linked to the long history of livestock farming, the types of vegetation are easily damaged by more intensive use.

In the UK (less so in Ireland) there is increasing concern about the lack of grazing (both by sheep and cattle) in lowland areas. Since so much farmland is intensively managed (either under crops or zero-grazing livestock systems) the remaining areas of semi-natural vegetation (of high nature value) that developed under former pastoral systems are reverting to scrub and woodland. Finding farmers who have appropriate livestock to graze these areas is becoming an increasing issue. The areas are often small, poorly fenced or not fenced and often remote from the nearest livestock farm. So the environmental issue of "lack of sheep grazing" may in time become more important (both in the lowlands and the uplands) than the current emphasis on excessive sheep numbers in some areas.

3.2.2 Synthesis of environmental impacts according to the types of farming systems

The following table gives an outlook of the environmental impacts associated to the farm types.

Atlantic	Positive environmental impact	Negative environmental impact	What happens to land used by sheep/goat if they disappear	Best environmental practice
sedentary intensively stocked, managed grassland	Landscape	Classical intensification on main fodder area, little specific to sheep Problems in housing (manure management)	Replacement by cattle, localised land abandonment	extensification
sedentary sheep and arable	Mixity in landscape, manure on crops (organic)	Housing (manure management) Overgrazing => when large flocks	Loss of biodiversity on meadows	shepherding of medium flocks with ad hoc stocking density
sedentary semi-natural forage	Maintenance of HNV (on farm)	Overgrazing => when large flocks non shepherded No access to landscape (fences)	Loss of biodiversity on meadows (encroachement); depends on the magnitude of the abandonment	shepherding of medium flocks with ad hoc stocking density

A more detailed analysis is given below.

Water pollution

There is considerable concern about water pollution in Ireland because so much of the country is composed of limestone geology. The Nitrates Directive is a major issue at the moment Clearly water pollution (through erosion and increased sedimentation rather than eutrophication) is an issue linked with overgrazing. Many mixed farms in lowland areas will be affected by the Nitrates Directive but generally

sheep are secondary to the main enterprise which will either be suckler-cow farming, dairy farming or some other specialist cattle production system. The same applies to some of the lowland mixed systems in the UK where sheep may be indirectly implicated because of water quality problems (e.g. dairy and specialist lowland cattle /sheep in intensive managed grassland type) e.g. through slurry spreading or the use of herbicides Water pollution is not an issue normally associated with sheep production in the UK because of the strict legislation connecting with it (e.g. regarding the use and disposal of sheep dip). It has been a localised issue in the context of overgrazing by sheep in the English uplands (erosion causing sedimentation).

Soil erosion / overgrazing

The sedentary semi-natural forage systems have been implicated with severe overgrazing in the west of Ireland and in English uplands. In the early 1990's in a number of specific areas in the six counties of western Ireland there was severe overgrazing particularly on blanket peat or bog areas. This was a reflection of poor management, primarily on commonage areas (pastures shared by several farmers), but also on some private land (NPWS undated).

In the UK,, the extensive hill and mountain sheep systems have been implicated with overgrazing in parts of the English uplands especially on blanket bog vegetation, but measures have been taken to address this (see policy section below). For example, in 2003 of 416,000 hectares of upland Sites of Special Scientific Interest (SSSI) in England, 193,000 ha was adversely affected by overgrazing but by December 2005 the figure had dropped to 90,000 ha. Over the same time period the areas adversely affected by fire and drainage had stayed approximately the same (102,000 ha and 28,000 ha respectively) (English Nature 2001).

In the worst affected areas of the Welsh mountains and in the Lake District sheep density could be as high as 4 ewes to the hectare (0.6 LU/ha). This compares with an ecological optimum for blanket mires of the north Pennines of 0.6 ewes to the hectare (0.09LU/ha) to as low as 0.1 ewes to the hectare. Part of the damage to plant communities is a legacy of past management and the environmental agencies are wary of overstating the problem because sheep grazing at the right levels is beneficial. The Agri-envionment measures introduced to encourage lower stock densities have had good uptake in the most sensitive areas. For example in England 91% of farmers in the Lake District entered the scheme (Hunt, 2005). On Dartmoor the figure is 96%. In England the National Envelope was also used to encourage reduction in sheep numbers in areas of high grazing pressure (see Part II).

In Northern Ireland there has not been the overgrazing problem seen in parts of southern Ireland but there were places where hill ewes were kept for the premium but did not produce lambs (because of poor reproductive success and low market prices for hill lambs). In Scotland there are areas where overgrazing by sheep is perceived to be a problem but in many cases Red Deer and Rabbits are also implicated. Where there is damage to sensitive vegetation it is often a result of management practices (e.g. erection of fences on former open pastures) rather than the absolute number of sheep; for instance in the southern uplands where shepherds were still employed there was less impact.

Natural risks prevention - fires

Fires have always been a feature of upland sheep farming areas of Ireland and there is seasonal controlled burning of Calluna vulgaris and Molinia caerulea vegetation. Whilst improving the herbage as sheep grazing these fires have little biological benefit and for many species (e.g. invertebrates) they are very damaging. They are however mostly small, infrequent and localized. Burning of vegetation in the UK uplands (again mostly targeting Calluna vulgaris and Molinia caerulaea) is an accepted agricultural and hunting management activity. Unlike Mediterranean areas, where grazing prevents scrub encroachment and thus prevents wildfires, in the Atlantic zone burning is encouraged to produce short vegetation more suitable to sheep. Where cattle grazing occurs in association with sheep there is less need for frequent burning. There is an increasing feeling that with a decline in hill sheep farming (and thus a decline in controlled vegetation burning in some places) rank vegetation will provide more opportunities for wildfires

Biodiversity / Landscape

There is a general recognition that pastoral farming plays an important role in maintaining the characteristic landscape of the marginal farming areas of the UK and Ireland.but that in most places stocking densities are above the ecological optimum. Despite this, livestock farming largely created and still maintains wet heaths and moors, a range of grasslands from mountain grazings to saltmarshes and

machair, as well as a variety of river-side vegetation used as pasture, all of which are of very high nature conservation value. Large areas of these habitats, in both the UK and Ireland, are designated as SAC, and many threatened European species are dependent upon them.

In the context of the High Nature Value of these areas, lack of grazing is beginning to become an issue in the context of the recent policy changes that are expected to lead to abandonment of sheep farming in the uplands. In parts of Wales and England (e.g. coastal areas of south and west Wales and south-west England) there is concern about the lack of livestock grazing, primarily by cattle but also by sheep, on areas of high nature conservation importance such as commons and coastal heaths. In England there are estimated to be 22,000 hectares of special conservation sites that are under-grazed because there are no longer any livestock farmers able or prepared to graze them with their stock.

3.3 Environmental effects in Continental areas

3.3.1 General outlook

In continental part of France and Italy sheep farming is not considered to be a major problem in relation to the environment. The major issue of overgrazing that dominates in the UK and Ireland is not generally regarded as an issue in France and Italy. Much more significant is the question of maintaining appropriate flock management in the hills and mountains, to maintain the high nature value and the landscape character of sedentary grassland systems. In the Italian Alps a large part of the seasonal high mountain farms (Malghe) where milking cows but also dry cows and sheep were kept for about 100 days were abandoned notwithstanding the public intervention for building and roads improvement. The negative effects on pasture evolution is evident, with consequence on endangered fauna as varying hare, rock ptarmigan and tetraonids (Susmel P. et al., 2006).

Intensive goat farming is identified as dealing with same kind of environmental issues as intensive livestock systems as dairy cows, for example.

3.3.2 Synthesis of environmental impacts according to the types of farming systems

Continental	Positive environmental impact	Negative environmental impact	What happens to land used by sheep/goat if they disappear	Best environmental practice
sedentary managed grassland	Landscape	Classical intensification on main fodder area, little specific to sheep Problems in housing (manure management)	Replacement by cattle, localised land abandonment	extensification towards more extensive grassland
sedentary crops+grassland	Mixity in landscape, manure on crops (organic)	Housing (manure management) Overgrazing of dry animals => when large flocks	Loss of biodiversity	shepherding of medium flocks with ad hoc stocking density
sedentary fodder crops	?	Classical intensification on main fodder area, little specific to sheep Problems in housing (manure management)	Replacement by cattle, cows or crops	extensification towards more extensive grassland

Water pollution

Sheep and goat are not recognized as a problem for water pollution (nitrogen, pesticides) in any of the farming systems although recent changes in farming practices in some places – specifically where flocks that used to spend each night in different places high in the mountains but now stop close to shepherds shelters near to water courses - might potentially cause water pollution (bacteriology) .

Soil erosion / overgrazing

Only in the context of dry years is it mentioned as a potential problem for the semi-extensive hill and mountain systems. A problem is under-grazing leading to encroachment by woodland and scrub.

Natural risks prevention: fires, avalanches.

Not relevant in this context.

Biodiversity/landscape

Even in intensive farming regions, where there are areas of open semi-natural vegetation (e.g. the grasslands and heaths on the Brittany coast) that require grazing to prevent scrub encroachment, sheep have played an important role. This positive role (in terms of both visual appearance and associated biodiversity) is becoming more appreciated. In many Italian mountainous holiday places (Alps), where grazing animals are not bred, regions and municipalities pay regularly grass cutting on large areas to maintain the traditional landscape appearance.

In crops oriented regions, the maintenance of flocks valuing extensive meadows (for dry animals in Spring and Summer) is associated to the maintenance of interesting flora and diversity in landscape feature.

3.4 Environmental effects in Mediterranean areas

3.4.1 General outlook

Studies of the environmental impacts of sheep and goat production were not encountered for the Mediterranean countries, other than some rather specific research into local effects. Most interviewees provided mainly general views on environmental effects.

A clear differentiation can be made between predominantly indoor, intensive systems, and the far more widespread outdoor systems. Intensive indoor systems have become quite common for the production of sheep milk and goat milk in some regions (e.g. goats in certain areas of France, southern Spain and locally in Italy, sheep in Castilla y León).

In this case the environmental concerns mostly revolve around the potential for water pollution arising from animal wastes and milk-processing wastes. However, these concerns are far less than for other livestock sectors, such as dairy cattle, pigs and poultry, because the animal wastes are drier, the production units generally are smaller and less spatially concentrated, and the milk production period is short within the year.

Other aspects to consider are the environmental effects (GHG) of feed production and transport for systems that often rely almost exclusively on industrially manufactured feeds. Also crucially, these indoor systems do not have the positive territorial functions associated with most grazing systems.

The environmental effects of outdoor sheep and goat farming are linked mainly to the effects of their grazing on vegetation, wildlife and soils. In terms of land area, the most widespread systems in the Mediterranean countries are based predominantly on low-intensity grazing of semi-natural vegetation (grassland, scrub and woodland, often existing in a mosaic). For example, in Greece, only 12% of the total land is not connected with presence of S&G, while on 5% of the land S&G numbers are in excess of conventional SD.

In certain circumstances, there can be negative effects, for example, overgrazing of vegetation with consequent impacts on habitats, species and soils, or water pollution resulting from the concentration of animals near to water bodies.

However, the environmental effects of extensive sheep and goat systems generally are positive, so long as stocking densities and grazing regimes are appropriate to the physical conditions. In the latter case, biodiversity values are generally significant and often high. In their most environmentally beneficial form, these farming systems make a minimum use of external inputs, including forage, which is cultivated locally in the form of crops such as grass, lucerne and cereals, and they thus constitute one of the most environmentally sustainable and positive of European farming systems.

In some areas, the environmental values associated with extensive systems have been reduced somewhat in recent years as a result of intensification, taking the form of an increasing use of bought-in feeds, of

fencing instead of shepherding, and higher animal numbers. Leaving aside the macro issue of intensive feed production and transport, such partially-intensified systems may be adapted to the needs of biodiversity conservation at the micro level, e.g. through appropriate management of stocking levels and grazing regimes.

However, positive functions are reduced as a result of intensification. For example, in the Villafáfila area of Spain (Castilla y León), Great Bustards are dependent on fields of lucerne which traditionally were cultivated for sheep forage. As sheep production has shifted to more intensive, indoor systems, local lucerne cultivation has declined. The crop now has to be subsidised by LIFE and agri-environment schemes in order to prevent its disappearance. In this case intensification thus has an economic cost as well as an environmental cost.

Also, modernised management of flocks for greater productivity and quality tends to imply more time in sheds and fenced areas within the holding, and thus less time grazing more remote parcels of land, with the consequence that such land is gradually abandoned. A degree of abandonment is not necessarily negative in environmental terms (some natural succession to scrub and forest may add diversity to a predominantly grazed landscape). However, if abandonment becomes widespread, landscape and habitat diversity are reduced. Restoring grazing systems is extremely difficult once the farming community has declined below a certain point.

Particular features of environmental relevance in the Mediterranean countries include:

- The territorial importance of goat grazing, especially in Greece, but also in parts of Spain and Italy.
- The association of shepherded sheep flocks with extensive, dryland arable farming, that is often of high nature value.
- Shepherding is a key environmental issue in Mediterranean countries, making possible the use of resources from low-input arable systems, and of unfenced semi-natural vegetation. Without shepherding, there are many situations in which no grazing is possible, with consequent environmental loss.
- Seasonal movements, whether long distance (transhumance, often by lorry) or shorter distances (trasterminance, still practised on foot between lowlands and nearby uplands and high-altitude pastures in many areas).
- The crucial role of shepherded sheep and goats in controlling vegetation and reducing the risk of wild fires over very large areas of grassland, scrub and forest land.

3.4.2 Synthesis of environmental impacts according to the types of farming systems

Mediterranean	Positive environmental impact	Negative environmental impact	What happens to land used by sheep/goat if they disappear	Best environmental practice
sedentary managed forage area	Mixity in landscape, manure on crops (organic) Feeding of vultures	Housing (manure management) Overgrazing of dry animals => when large flocks	Encroachement (or replacement by cattle)	extensification towards more extensive grassland+shepherding of medium flocks with ad hoc stocking density
pastoral	Maintenance of HNV (off farm) when shepherded Feeding of vultures	Overgrazing of semi-natural habitats in certain situations (e.g. some forests by goats). Farmer-predator conflicts when flocks not shepherded.	Loss of highly valued habitats. Possible substitution by cattle if not too dry, but cattle cause more damage to habitat	shepherding of medium flocks with ad hoc stocking density
sedentary semi-natural grassland	Maintenance of HNV (on farm), including Natura 2000	Overgrazing of grassland habitat when stocking densities too high. Fencing affects certain wildlife (e.g. Bustards). Abandonment of moutain areas as transhumance replaced by feeds	Loss of highly valued grassland habitat (too dry for cattle)	avoid over-stocking, especially at certain times of year for wildlife. Transhumance
pastoral on stubble and fallows (shepherded)	Integral part of a diverse landuse. Environmentally beneficial role in extensive arable system (manuring and removing stubbles). Maintain patches of semi-natural grass, field margins. Cultural value.	Flocks are tending to stay nearer to the holding (decline of shepherding), where localised impacts can occur (concentration of manure, compacting of soil).	Arable systems would use machinery or fire to remove stubbles, possibly more manufactured fertiliser. However, these low-yielding arable systems are also threatened with abandonment or conversion.	Daily shepherding of medium-sized flocks at very low density, including more remote parcels. Cultivation of leguminous forage crops instead of cereals.
indoor	none	Housing (manure management)	nothing	?

The following tables provide an overview of effects on air, water, soil, biodiversity/landscape and fire. These are followed by a discussion of key issues with examples from the Mediterranean countries included in the study.

POSITIVE EFFECTS

Production systems	**Air**	**Water**	**Soil**	**Biodiversity and landscape**	**Fire**
Indoor systems using cultivated fodder and/or concentrated feeds.	None	None	None	Usually none, but a shift to indoor goat raising is reported to have reduced overgrazing in certain situations.	None
Sedentary grazing on permanent grassland, normally not shepherded.	None	None	Natural mineralization and fertilization Biodiversity	Landscape value is significant in some areas. Biodiversity ranges from neutral to very high values. Intensification is reducing values in some areas.	Not significant, unless the alternative to grazing is abandonment.
Shepherded grazing on arable land (stubbles and fallows).	Positive alternative to stubble burning.	None	Dunging should lead to improvement of organic matter content, and potentially less need for synthetic fertilisers.	In Spain, this system is often associated with high natural values resulting from a mosaic of arable, fallow and grassland farmed at low intensities.	Positive alternative to stubble burning and reduces risk of wildfires.
Shepherded grazing on semi-natural vegetation.	Positive alternative to natural vegetation burning.	None.	Stability	Under appropriate grazing regimes, biodiversity and landscape values are often significant, and sometimes very high.	Grazing and browsing are very important fire-prevention tools. Most effective when goats and sheep together.

NEGATIVE EFFECTS

Production systems	Air	Water	Soil	Biodiversity and landscape	Fire
Indoor systems using cultivated fodder and/or concentrated feeds.	Intensive production and transport of feeds has negative effects, e.g. CO2 emissions.	Potential for localised water pollution from animal and processing wastes. Microbiological contamination	Potential for local pollution from animal and processing wastes.	Shift to indoor systems is associated with the decline of grazing systems and consequent loss of natural values.	Shift to indoor systems is associated with the decline of grazing systems and consequent loss of fire-control function.
Sedentary grazing on permanent grassland, normally not shepherded.	Some methane production.	Potential for localised pollution if animals are concentrated near water courses at high densities.	Potential for soil erosion if animals are concentrated at high densities.	Potential for negative effectives on biodiversity in the event of overstocking.	Some fire prevention effect, though risk is generally not high on permanent grassland.
Shepherded grazing on arable land (stubbles and fallows).	Not significant.	Potential for localised effects where animals are concentrated in high numbers.	Potential for localised effects where animals are concentrated in high numbers.	Intensification of arable cropping normally reduces biodiversity, but not S&G related.	Not significant.
Shepherded grazing on semi-natural vegetation.	Not significant.	Potential for temporary localised effects where animals are concentrated in high numbers. Microbiological contamination	Potential for localised effects where animals are concentrated in high numbers. Parasites contamination	Negative effects can occur in certain cases, e.g. overstocking, certain habitat types where grazing is in conflict with local conservation priorities.	Fire is often used as a management tool by shepherds; sometimes fires are poorly managed and cause extensive damage.

Water

No concrete data were encountered on impacts resulting from intensive indoor systems. Some commentators mentioned that intensive pig and dairy (cow) units in the same areas were far more problematic, due to the quantity and nature (more liquid) of wastes. However, there was some concern that the disposal of animal wastes from intensive sheep units could become a problem in future, if they continue to expand in size and number.

In Greece, most experts agree that sheep and goat farming do not represent a problem *per se* for water pollution (nitrogen, pesticides, pathogen microbes etc). However, the production of feedstuffs for this sector is sometimes associated with water pollution. Also, small-scale cheese making industries are often responsible for pollution of water courses.

A further problem (related to water) is appearing as a result of overgrazing, where the compaction of soil results in increased surface run-off (with the risk of erosion) and less water reaching underground reservoirs.

Soil erosion

In Greece and other Mediterranean regions, overgrazing and the subsequent soil erosion is an important environmental issue concerning systems using grassland (the majority of systems). It is not identified as a problem over the whole Greek territory since there are large areas which are undergrazed or totally abandoned (Zervas, 1998) and those at a moderate distance from villages and towns which are over-utilized (Giourga et al., 1998; Margaris, 1987; Yassoglou, 1987).

The land which is overgrazed is subject to erosion (both water and wind erosion), since the surface plant cover is removed and the soil surface is exposed: to sun heating (leading to dryness), to wind transportation of particles and to increased speed of surface water flow. These factors contribute to soil erosion in situations of overgrazing (Oostwoud, 2001; Marathianou et al., 2000; Kosmas et al, 1999; Kosmas et al, 1996).

Cases of overgrazing causing some soil degradation are also reported from Spain and Italy (Sardinia, Puglia, Sicily). However, the impression from interviews is that these cases are quite localised. Soil erosion affects far larger areas of cultivated land (arable and permanent crops), and the rate of soil loss is far higher than on grazed land, even in the event of extreme overgrazing, which is unusual.

Natural risks prevention: fires, avalanches.

The role of grazing sheep and goats in reducing fire risks in Mediterranean areas is well recognised by scientists and by environmental managers (e.g. national parks). Mixed sheep and goats flocks are the most effective way to clear scrub. However, in Greece the general public still tends to believe that these animals are a threat for natural vegetation, and Italy a threat for woodland. Experts maintain that the presence of S&G flocks in an area is closely associated with continuous human presence and with beneficial management of the land, such as tree thinning, anti-erosion constructions, early fire extinction etc. (Etienne M. et al. 1989; Lorgnier 2001).

Biodiversity/landscape

Sheep and goat farming is recognised as beneficial in preventing landscapes from closing (shrub encroachment) (Chabert et al. 1998; Quetier et al. 2005). Scrub encroachment is is associated with a reduced biodiversity and increased risk of wild fires in the Mediterranean areas (Hadjigeorgiou et al, 2005b; Fabro et al, 1999, 2000) .

In Spain and Greece, it is reported that communal rangelands are sometimes poorly managed by the local councils by allowing a non-differentiating stocking density, with the result that some areas are overgrazed and some undergrazed. In the past there were more effective oral agreements on the management of these lands (Michailidou and Rokos, 2005). In very few cases there are contracts between farmers and environmental managers for grazing in protected areas.

Sheep and goat farming allow the maintenance of some areas, even in intensive regions, where there are lands that are not possible to intensify. Except for intensive sheep and goat production, there is always a degree of grazing during at least a period of the year. This moderate grazing is the most beneficial for flora diversity (Hadjigeorgiou and Karalazos, 2005a; Trakolis et al, 2000) and such pastoral systems are

positively linked with biodiversity because they exercise rather low stocking densities and no fertilisation of grazed land.

Nevertheless, the interaction of herbivores with the grazed ecosystem has variable outcomes, since the competition of mammalian herbivores with their small rivals (like insects) can result in the extinction of the latter (Kapaksidi, 2005; Emmanouel et al., 1999) or their proliferation (Hadjigeorgiou et al, 2005b). The diminution of sheep grazing activity is considered as a reason of the considerable reduction of Scarabaeus sp. observed on many soils of central Italy. In fact dung correspond to trophic needs of Scarabaeinae[14].

The presence of wolves, bears, foxes and other predators in the areas where S&G are farmed is often controversial. In parts of Spain (e.g. Basque Country) it is reported that the expansion of large predators (wolves) is an important additional factor in driving farmers to abandon more remote pastures. In Italy (Piedmont, Friuli and Abruzzo) the presence of large predators (bear, wolf and lynx) is felt as increasing limit for unshepherded flocks (Filacorda S. et al., 1999) (Fabro C. and Filacorda S., 2003).

In some parts of Spain (e.g. Aragón, Extremadura), there is concern that increased and concentrated sheep numbers and the creation of very large flocks (1,000 to 2,000 head) over the past 10-20 years has had a negative environmental impact, particularly for steppe and scrub habitats and the species that rely on them.

However, the negative effects of possible cases of overstocking with sheep should be put in the context of other activities, for example:

- For the conservation of steppe habitats and species, other factors may be more problematic than sheep stocking levels e.g. increased fencing, new rural roads, urban developments, abandonment of cereal cultivation (Cardalliaguet, 2005).
- In non-steppe areas, overstocking with cattle is generally more problematic than sheep (see below) (Beaufoy et al, 2004).

At the same time as sheep numbers have increased in some areas with a clear "sheep vocation", the decline of traditional sheep and goat systems in other areas is viewed as negative for the environment. This is the case particularly in upland and mountain areas, where the decline of sheep and goat grazing has lead to a homogenisation of habitats and landscape and an increased fire risk (Tchakérian, 2003). This is the case of Carso (Venezia Giulia, Italia) where is on study the effects and strategies to reintroduce grazing animals[15].

In many different parts of the country, it is reported that cattle (suckler beef) have tended to replace sheep and goats on various types of rough grazing (dehesas, mountain pastures), generally with negative environmental consequences because the cattle are not shepherded, for example:

- Concentration of cattle in areas with easy access, causing overgrazing and damage to fragile upland soils.
- Damage to tree regeneration in dehesas (cattle will damage trees of 15-20 years whereas sheep and goats damage only the younger trees).
- Scrub encroachment on more marginal land that was previously grazed by shepherded sheep and goats, and where cattle are less effective at preventing encroachment.

The lower labour costs, greater profitability and the fact that headage payment for suckler cows are 100% coupled to production makes it difficult to resolve this problem of overstocking with cattle.

In Greece, Italy and Spain, the environmental effects of goat grazing are more controversial than those of sheep. This seems to result mainly from historic situations when goats were present in far greater numbers in many areas, and were responsible for overgrazing of forest land in particular.

Indeed, in certain areas, the decline of goat grazing from historically intense levels probably has had some positive consequences in allowing the regeneration of natural vegetation and soils in very dry areas, for example in parts of the south east of Spain.

[14] Various Aa. – La biodiversità nella regione Mediterranea – Agenzia Nazionale per la Protezione dell'Ambiente – Stato dell'Ambiente 4-2001:59

[15] Provincia di Trieste, 2004 – "Progetto di recupero ambientale della landa carsica".

However, there are also areas where further decline is certainly not desirable. Where there is undergrazing or abandonment, this leads to either encroachment by sclerophyllus shrub vegetation (poor in diversity), or in some cases with monotonous forest vegetation (e.g. pine forests) and in fewer cases with species rich forests (Hadjigeorgiou et al., 2005b).

As with sheep, the decline of goat grazing in certain upland areas is a major concern for biodiversity, landscapes and the greatly increased risk of fires, for example in the north of Extremadura (Beaufoy et al, 2004) and other places in Mediterranean context (Mc Donald et al. 2000; de Rancourt et al. 2006).

4 Analysis of the environmental impacts of sheep and goat policies

4.1 The policy drivers of S&G farming and its environmental consequences

This section addresses the environmental impacts of S&G policies on the environment. The analysis is carried out in two times: the first one describes the impact of the policies on the farms structure and main practices, the second interprets the changes in environmental terms, with regards to the previous section. The latter forms a kind of conclusive part in the present section.

Nevertheless, one must keep in mind that CAP is one driver amongst others on farming systems. Technological changes, demography and markets are other drivers of importance on farming systems. The counterfactual situation — "what if the CAP did not exist" — is rather difficult to design, but one must keep in mind that many processes — farm enlargement, decrease in labour force,… — would have likely occurred without CAP. This is not to say that CAP payments do not play any role – all the more in the context of the EU meat market – but that such role must not be considered alone.

If the whole S&G sector is comprised in the analysis, it must be mentioned that the meat sector will be of more importance in our thoughts. The first part of the present report will show the fundamental differences between meat / milk sectors across EU and the fact that the meat sector is much more policy driven than the milk one. Nevertheless, the limit between these two sectors is not always clear at farm level (mixed production is the rule in many small farms playing a key role in environmental management). In addition, one must note that the goat sector will be much less investigated in the analysis as its contribution to the meat market is rather marginal.

The EU sheep meat sector can be considered at different levels of regulations, that can be articulated in a top-down analysis considering three levels:

- The overall framework is given by the GATT and more recently WTO, with tax-free imports quotas. In practice, this agreement embedded the former agreements between the UK and other EU MS. UK had agreements with its traditional "sheep partners" in the Commonwealth (i.e. New-Zealand and Australia) with free imports quotas. When entering the common market, these imports were part of the EU package. This determines the overall amount of meat produced in the EU at around 80% of EU consumption (OFIVAL, 2003). The consumption patterns at EU level will be the main driver, with a key factor being the relative price of sheep meat compared to other meats with which it is competing from the consumers' point of view. The general pattern on price is long-term decreasing, following the world market's trends. This statement clearly distinguishes the meat issue from the milk issue.

- Within this EU envelope, policy must regulate the allocation of production across farming systems and regions and MS. Generally speaking, a classical policy question is find a balance between income support for producers and give room to market drivers. As the latter leads to concentration of production in the most productive holdings [16], the main issue will be double: regulation of regional distribution — for example between LFA and non LFA area — regulation of structural distribution — e.g. small, medium and large farms. The policy mechanisms influence the structural patterns of production in terms of stocking density and labour force intensity. A key question will then be to assess how policy schemes influences this distribution.

[16] — Without presuming of how the highest productivity can be reached: through high output/input or low output/input strategies. Both are relevant in the case of S&G.

Within this "structural" regulation, more specific issues are to be addressed by policies (with some possible feedbacks on structure). Environmental issues are the main concern of the present study, including practices that must be analysed at a lower level: "fine" stocking density (rather than the average one which is a rough indicator), manure management practices, adapted grazing practices.

4.2 An historical review of policy schemes and their impact

4.2.1 General outlook

The history of policy dealing with the sheep and goat sector effectively starts in 1981, when the first CMO was introduced for the sheep and goat meat sector (reg. CEE 1837/80 which came into force in 1981).

1992 is the next milestone, when the reform of the 1980 CMO introduced dramatic changes to the rationale of the policy (reg. CEE 3493/90) linking it with the rural world premium which came into force one year earlier (Reg. 1323/90).

As already mentioned, CE 2529/2001 established a new framework for the S&G CMO, but perhaps the most significant change to the sector came with the MTR reform of 2003.

The following figures summarise these temporal milestones and show the main features of each period.

	1981	1992	2001	2003	2006É
S&G policy scheme (meat)	Deficiency payments	Deficiency payments + regional ceilings (quotas) Introduction of Rural World Payment for LFA producers (1991)	Direct payments (independant from market prices) and subsidiary additional payments **(CE 2529/2001 reg.)**	Decoupling total or partial amongst the countries	
Market situation and answer of FS	the most productive systems are favorised	production stability at national and regional scale, but possible concentration at farm level. The income depends on the payment	production decrease (mostly in UK because of foot and mouth disease) so prices increase	prices increasing	?
European productions evolution	concentration in some intensive regions within intensive production systems (mostly in UK) which evolution in LFA?	regional stability		fall of sheep in "decoupled" countries	?

Figure 16: Chronological milestones of S&G policy

4.2.2 1981-1992: a deficiency payment system

The (CEE) 1837/80 regulation

Briefly described, the (CEE) 1837/80 Regulation introduced a deficiency payment system as the basis of the CMO for sheep/goat meat. Its rationale is based on the recognition of a need to support farmers' incomes in this sector, to prevent the number of sheep producers declining — although in fact the overall number of sheep (rather than sheep farmers) had not done so in the main sheep MS of EU 10 (+2M heads in UK between 1970 and 1983; +0.6M heads in Ireland and Italy; +1M heads in France).

The CMO distinguishes several "regions" (i.e. MS) in which individual producers would be eligible for a payment if the actual price of their product fell below the average market price in that region. Thus prices and payments differed across such regions (higher for UK for example). Greece and Spain entered the scheme when they joined the European Community, respectively in 1981 and 1986. The reference is an average lamb carcass, with differences between countries and conformation (fat/light and breed). The principle is to compensate the estimated loss of income at the end of the year in reference to the target price, based on the number of carcasses sold by each farmer calculated per average ewe at regional level.

Thus, at the end of the year, a farmer gets deficiency payment proportionate to the number of meat ewes he has.

This scheme is an incentive for farmers to have as many ewes producing lambs ready for slaughter, even if the actual weight of the individual carcass above a certain threshold does not lead to higher payment. Nevertheless, as the regionalised overall payment is calculated on the actual tons produces at the end of the year, there is an incentive to collectively produce more on year "n" with less ewe, even if it leads to lesser prices on year "n+1" (what occurred as shown on Figure 17). Farmers producing "store lambs" (i.e. not directly sold for slaughtering) take a partial benefit from this scheme, as they got 25% of the average ewe payment.

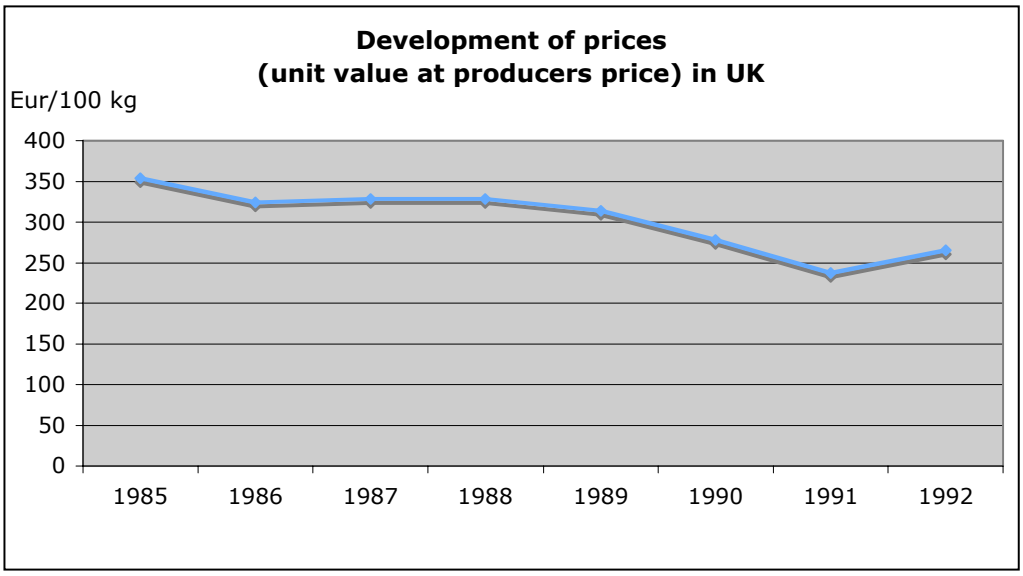


Figure 17: Development of average sheep meat price in UK 1985-1992 (source Agris)

Nevertheless, any policy analysis must recognise the fact that the market was actually a major driver during this period, as market price still represented 80% of the overall gross margin (1988 data, in Benoit and Laignel 2004). Most productive producers got higher gross margins at an individual level.

Responses of producers in the different European zones

In overall terms the policy led to an increase in both breeding ewes and total sheep number at EU 10 level, as shown on the following table.

	1983			1993			² 1983-1993		
	sheep	ewe	sheep/ewe	sheep	ewe	sheep/ewe	sheep	ewe	sheep/ewe
EU 10	64347	39987	1,61	85018	50199	1,69	32%	26%	5%

Source: FSS 1993 (p 315)

Figure 18: Changes in the number of sheep and breeding ewes in EU 10 1983-1993 [17]

The apparent productivity calculated as the average sheep/ewe slightly increased, mainly due to the UK.

Nevertheless, the impact of the same policy incentive led to different responses in the different countries considered, particularly with regard to changes in the size of the national sheep flocks.

[17] — 1993 was the closest year for characterising 1992 on FSS database.

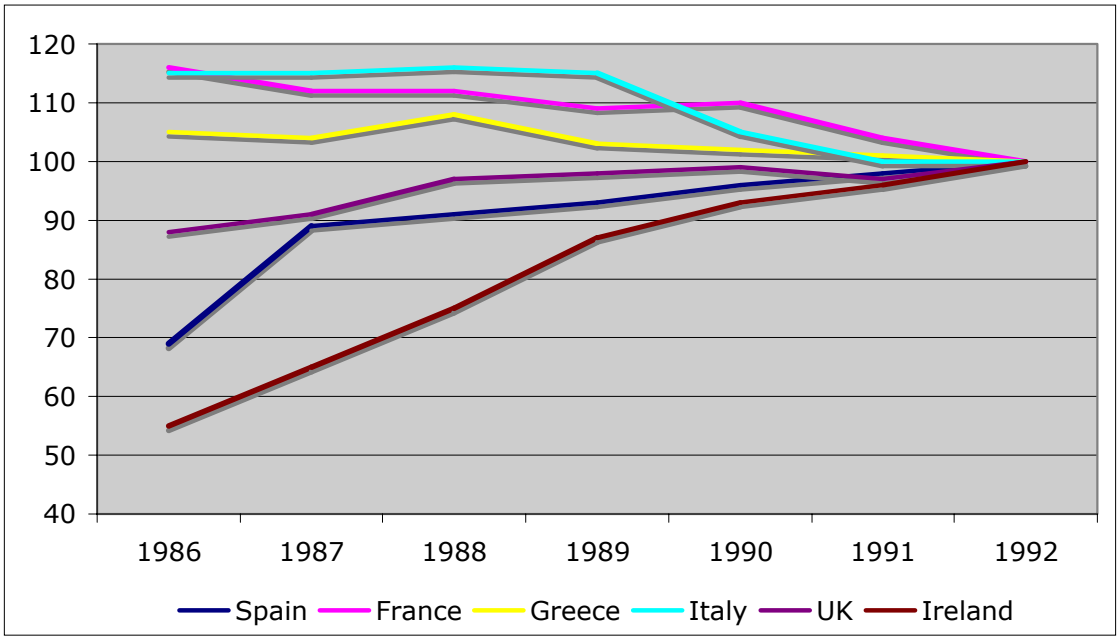


Figure 19: Development of number of ewes in the 6 MS – 1986-1992 (source livestock survey)

Ireland, Spain and UK experienced a net increase of production an animals whilst during the same period France, Italy and Greece saw a decrease in number of ewes.

The main objective of this scheme seems to have been to share the newly created EC common market, at a time when sheep meat consumption remained globally unchanged. In this situation, the best placed producers were those who could increase their productivity with minimal costs, assuming that food remains a major cost for S&G production on average (Benoît and Laignel, 2004).

The structure of farms in 1983 is the most relevant starting point to look for an explanation for the contrasted development of production between MS (see Figure 20). On average the countries that experienced the biggest increases were also those with the highest proportion of medium-large flocks (with the exception of France which will be discussed below). In overall terms, the countries where farms could increase by most their production and flocks were the biggest winners compared to countries where there were greater structural constraints. Details are discussed per regions (Atlantic, Continental and Mediterranean).

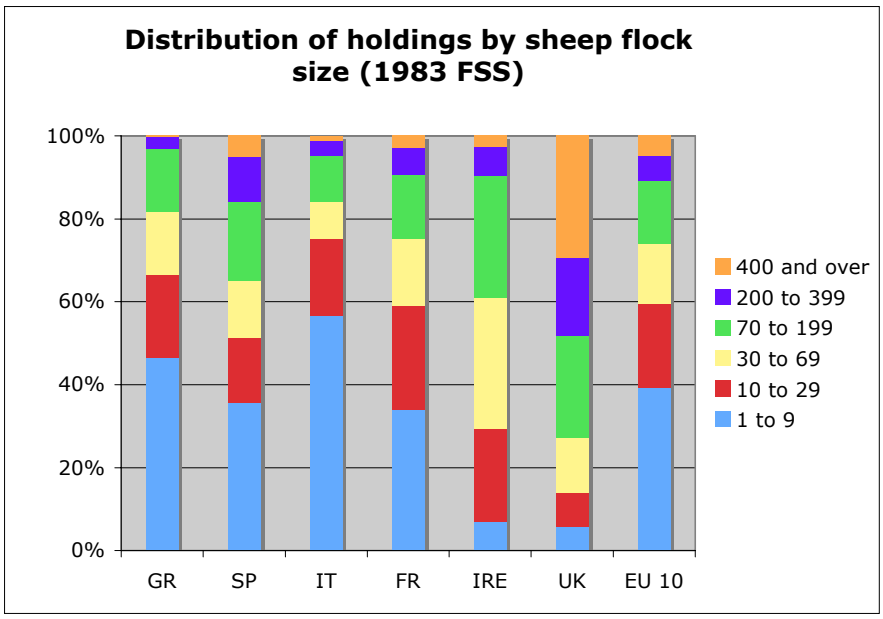


Figure 20: Distribution of sheep holdings per flock size (source: 1983 in 1993 FSS)

Development in Atlantic region on 1980-1992 period

In broad terms, but at different rates, UK and Ireland experienced the same development pattern during the period. The number of farms with sheep increased (from 85,500 to 95,500 in UK between 1983 and 1993 and from 20,000 to 33,500 in Ireland on the same period of time). Over the same period, small flocks (below 30 animals) decreased as the largest one increased [18].

This increase in production happened because farms had the capacity to do it because of the nature of their production systems. They could develop additional sheep in combination with existing stock, whether sheep or cattle. This is particularly the case in Ireland where the increase in sheep did not replace cattle (the numbers stayed at 6,9 M heads between 1983 and 1993). This intensification was largely through the management of grassland and fodder crops in the lowlands and through localised excessive stocking in the uplands. This trend was particularly important from an environmental perspective (DAFRD October 1999).

In the UK the number of ewes in extensive up-land systems increased, causing overgrazing in most sensitive areas. Nevertheless, as the forage potential was lesser than in the lowlands, the *relative* share of upland animals decreased. The UK Meat and Livestock Commission suggested that the proportion of animals decreased between 1980 and 1996 in the uplands from 45% to 37% (whilst it was increasing in intermediate and lowland areas (Anderson, 1999). Although this may in part have actually reflected the change in sheep breeds being used in the uplands – a trend also associated with more intensive management.

In summary the policy led to the following patterns in the Atlantic area:

- General increase in production, carried out on more farms, having larger flocks and with higher stocking densities;
- The above trend went faster in most productive areas (lowlands).

The relatively advantageous situation of farms in the Atlantic region to follow this pattern of development, compared to other regions (see below), explains the much bigger increase in sheep numbers.

Also note that from 1981 to 1986, the UK was the main beneficiary – in terms of budget – of the deficiency payment scheme.

[18]— Unfortunately, the thresholds of flock-size changed between 1983 and 1993 in FSS methodology, preventing from a long term comparison.

The following table summarises the changes occurring on the period per farm type (accordingly to the study's typology).

Atlantic	1980-1992
sedentary intensively stocked, managed grassland	Huge development of these systems, concentration of production of fat animal at EU level, in non LFA and LFA
sedentary sheep and arable	Decline due to more profitability in crop sector
sedentary semi-natural forage	increase in sheep number and more larger flocks

Continental region

The continental situation is mainly described through the French case, where in fact sheep production was not the rule during this period. Compared with the Atlantic situation, the intensification on grassland was not the best option for several reasons:

- For mixed systems combining crops and sheep the crop strategy clearly was the best option and most farms replaced their sheep — and associated meadows — with cereals. Compared to the Atlantic, the grass productivity is less and is not suitable for the "intensification" strategy described above.
- For meat grassland systems, the potential for intensification on grass is also less than in Atlantic context, and cost for housing animals also is higher in mountainous context. The overall trend also was the decrease of actual income on meat sheep sector. This led most small sheep farmers to replace sheep by bovine animals (beef and suckler cows) in most grassland regions, with limited intensification on grass. Meanwhile, specialised sheep farms increased their average flock, leading to more specialisation (but not necessarily to intensification).
- Meanwhile, the goat milk sector experienced an important development, based on on-farm intensification (similar to what occurred in the dairy sector) with less animals producing more milk, integrated with the industrial food-chain. There is no direct evidence showing that some sheep farmers went into more profitable goat farming, but the map of the respective development of sheep and goats in France between 1988 and 2000 (Institut de l'élevage, 2002) suggests that such choices might have been made at an individual level.

The following table summarises the changes occurring on the period per farm type.

Continental	1980-1992
sedentary managed grassland	Relative decline of meat sheep, towards more cattle
sedentary crops+grassland	Decline due to more profitability in crop sector
sedentary fodder crops	Development of milk-goat

Mediterranean regions

The analysis of Mediterranean regions must take into account the difference between Spain and other Mediterranean countries (including France) with regards to farms structure.

In Spain, the increase in the number of sheep largely relates to the capacity of large farms to develop large flocks. Thus the restructuring of the sector that occurred during these years has been considerable, the average number of sheep/sheep farm rising from 100 to 157 between 1983 and 1993 (source FSS), with the total number of sheep farms decreasing from 160,000 to 120,000 during the same period of time.

Given the climatic conditions, the intensification strategy (more fodder/ha) was not the most obvious and the enlargement of farms had been the best option. The best placed regions were those with available on-farm forage resource to feed large flocks on large plateaus land, coupled with few constraints on the management of pastoral units. This is typically the case in the *dehesa* fenced system of Extremadure

(Ofival, 2001), where sheep replaced cattle in many places. Meanwhile, the traditional systems with more difficult access to land — pastoral and "landless" systems — correlated with the medium-sized flocks were not in a good position to compensate for price-cuts with more land (MAPA, 2003; Institut de l'élevage, 2000).

Such structurally constrained systems with small-medium flocks were much more common in the other Mediterranean countries/regions: Italy, Greece and Southern France. What occurred in the regions of Spain with structural constraints for the meat-sheep sector, also happened on a larger scale in the other Mediterranean countries. There was no equivalent in these countries to the large Spanish plateaus to compensate for the decline of traditional meat-sheep production. More precisely, such plateaus, where they do exist (i.e. Sardinia and Sicily in Italy, les Causses in France), were focussed on more profitable production, particularly sheep cheese. In Mountainous pastoral systems, the remaining shepherds could cope with larger flocks at individual level, but the overall the figures show a decline of meat-sheep systems there, except if milk production could take over from meat (Greece and Italy at large scale, France and Spain at medium rate).

Mediterranean	1980-1992
sedentary managed fodder area	-Meat: relative decline due to more profitable other production - Milk: development
pastoral	Decline of meat due to labour costs and lesser profitability (abandonment); maintenance of milk
sedentary semi-natural grassland	Development of these meat systems
pastoral on stubble and fallows	Decline of meat due to labour costs and lesser profitability in meat Decline of milk due to the restructuring of the sector towards industrial systems
indoor	?

Conclusion on the period

This period reveals some important features of the S&G sector and its response to policy signals. First of all, it confirms the fact that important changes can be observed happening over a limited period of time. Such changes can be seen across MS, across regions and across farms. The general pattern has been an increase of production both in number of animals and in productivity.

The second finding is that the structure of the farm is important in determining how the production system can respond to policy.

Such mechanisms (that will be limited to some extent in the following period) are to be kept in mind when analysing the present-future situation [19]. To some extent, the 1983-1992 period was giving more direct incentive to production than the following one. It can be useful reference for the present period which actually re-opens market signals. Nevertheless, we will discuss to what extent the present situation is different.

4.2.3 1992- 2001: stabilisation at macro-level, concentration at farm-level

The policy changes from 1992

The CAP reform of 1992 and further regulations (CEE 3013/89, CEE 3493/90, CEE 1323/90) introduced some changes to the S&G CMO. Although the general framework (i.e. the principle of a deficiency payment) was maintained, some significant adaptations were introduced. The main ones are summarised here:

- Introduction of the rural world premium in 1991 (CEE 1323/90), which was directed towards LFA producers only. The amount of the RWP changed through time, but has been stable at € 6.641 from 1995 to 2001. Light lambs were less supported than heavy lambs (70% of the RWP from 1991 to 1997, 90% afterwards). Milk producers were eligible if at least 40% of their lamb were sold as fat carcasses. Small farmers (less than 10 ewes/she-goats) were not eligible.

[19] — This is what justified the development of the analysis on this period.

- Introduction of budgetary stabiliser in order to prevent uncontrolled expenses. From 1993, this scheme replaced the ex-post calculation of the number of eligible ewes/goats at the end of the year (see above) by a fixed cut in target price of 7%.

- Introduction of individual quotas rights, which effectively put a limit on expenses. National quota reserves could be used to help young farmers and other categories of producer. The introduction of individual ceilings (capping to 1000 heads in LFA and 500 heads in non LFA) had been given up in 1994.

- Introduction of regional ring-fences, in order to prevent major shifts from one region to another as experienced in the previous period.

These characterise a policy systems that tends (1) to compensate for the gap between LFA and non LFA regions (2) to prevent shifts across regions. (3) The policy signals at individual level (farm level) partly changed on the period of time as prices were still supported. The best strategy for farmers was still to maximise the number of ewes producing heavy lambs (and get rights for it), but with less incentive to maximise output.

On the 1992-2001 period, the average compensatory payment/ewe was € 19,71 (min 9, max 25.4 reflecting the market variations) (calculated on the French case) (Institut de l'élevage, 2006).

The macro effects of the scheme: stability

Compared to the previous period, the scheme led to a stabilisation of overall production at EU level, (as shown in Figure 21) in other words rather than encouraging more sheep it acted more as a barrier to reducing sheep..

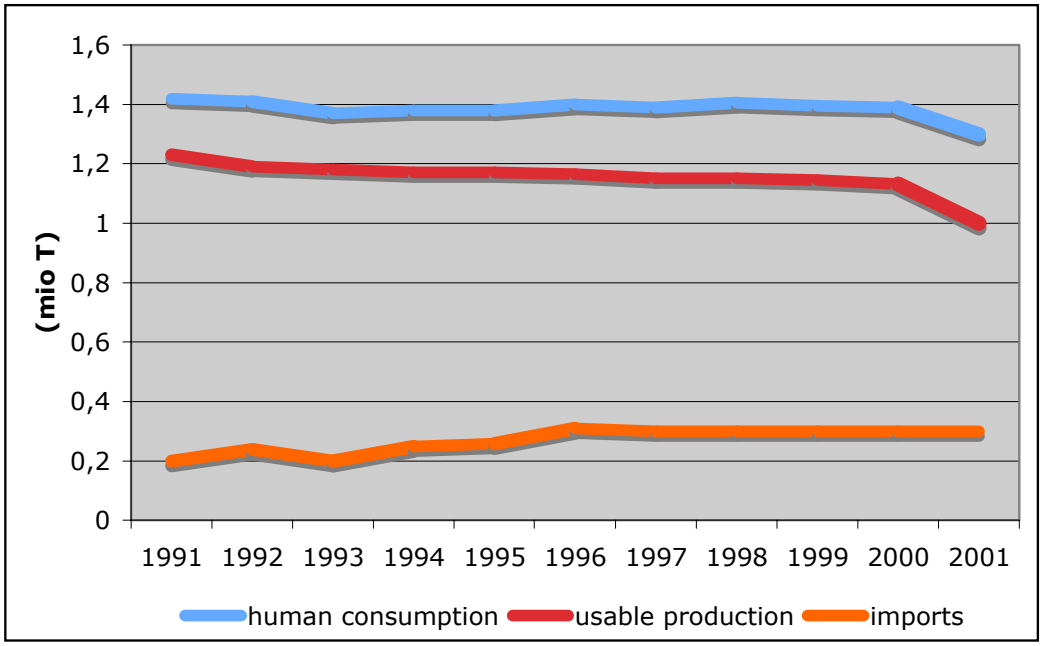


Figure 21: Development of production and consumption S&G (source Eurostat)

This overall stability in production is accompanied by a relative stability between MS (Figure 22).

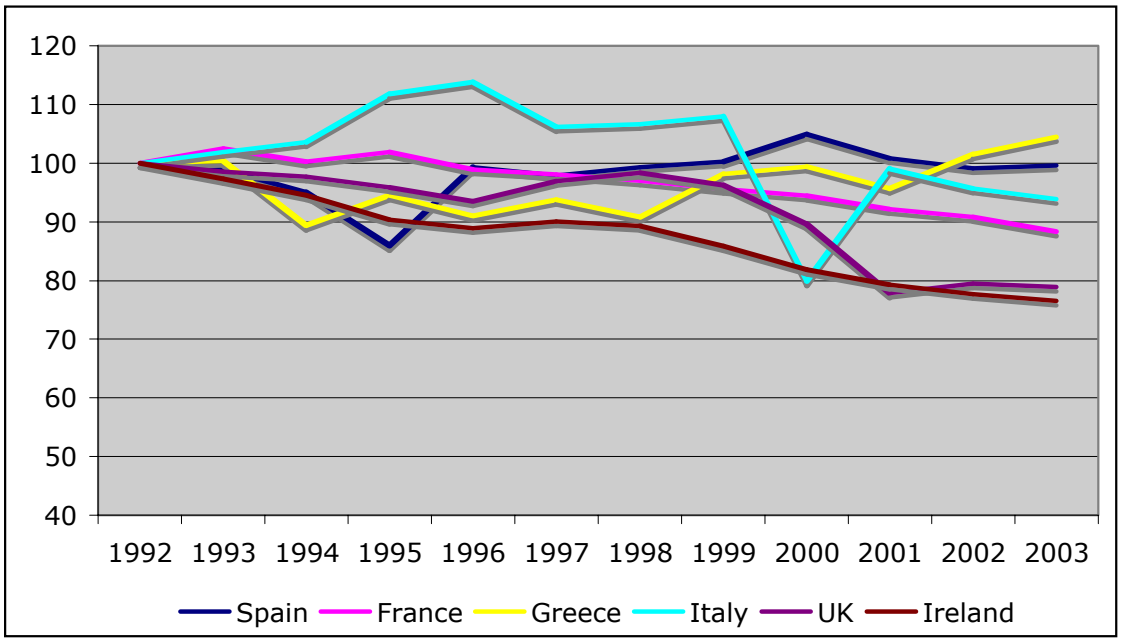


Figure 22: Development of number of ewes in the 6 MS –1992-2003 (source livestock survey) [Also see Figure 19]

As a result, prices showed a relative stability on the period, as shown for the two main EU producers, UK and Spain (reflecting the heavy/light lambs markets).

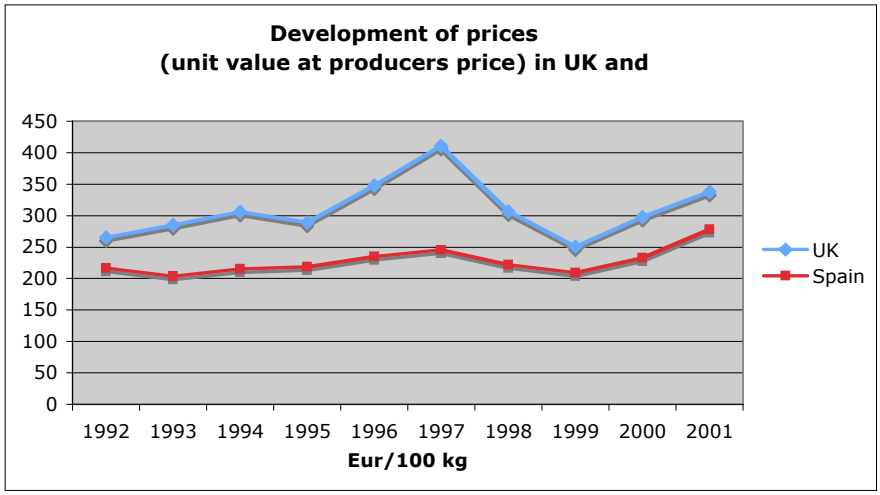


Figure 23: Development of meat prices in UK and Spain 1992-2001 (Source Eurostat Agris)

In constant currency, the period is also characterised by an increased stability compared to the previous one, as shown in the following figure (from Benoît and Laignel 2004), with variations around an average price.

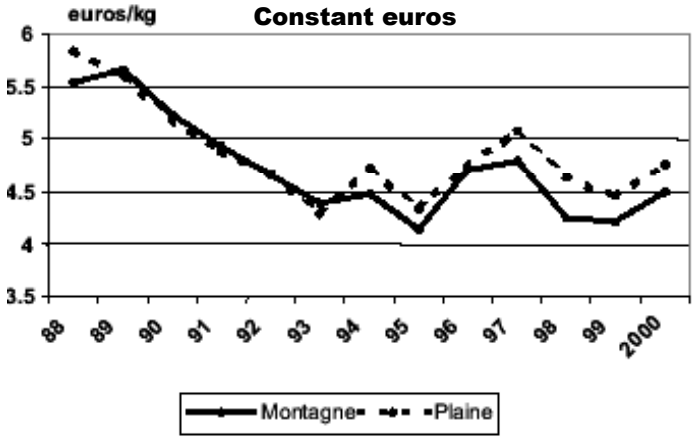


Figure 24: Development of producer price of lamb in France in constant currency (source Benoît and Laignel 2004)

As a whole, the policy can be understood as securing farm income from sheep. In addition, the share of public supports in the overall product gets a higher proportion and explains policy driven strategies (i.e. maximisation of the number of animals), all the more in LFA areas where the relative share of production is less than in non LFA areas.

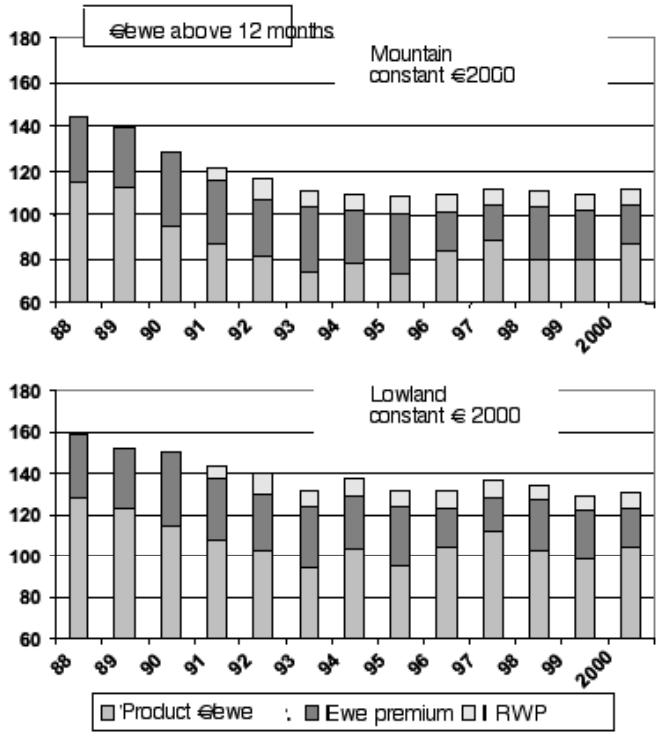


Figure 25: Development of share of payment/ewe in France in constant currency (source Benoît and Laignel 2004)

The regional effect: huge changes beside national stability

A first net impact of the CMO during the period has been to maintain the number of animals in LFA, notably in Mediterranean countries and Ireland (Ashworth, 2000, p 54).

Nevertheless, this average stabilisation hides some rather contrasting developments between regions, even between LFA. In Spain, for example, the livestock survey shows that the region "Centro"— grouping the three mains producing regions Castilla y León, Castilla la Mancha and Extremadura, largely in LFA —

remained rather stable between 1992 and 2001 (+1% of ewes). But more detailed figures shows that the constituting regions experienced contrasted fates: when the number of ewes declined by 9%, it increased by 13% in Extremadura on the same period.

Generally speaking, the increase in the number of ewes at nuts 2 level (regions) shows that the changes in animal number — decreasing or increasing — has been significant with few exceptions (where things have remained stable). Regional specialisation is suggested by the data.

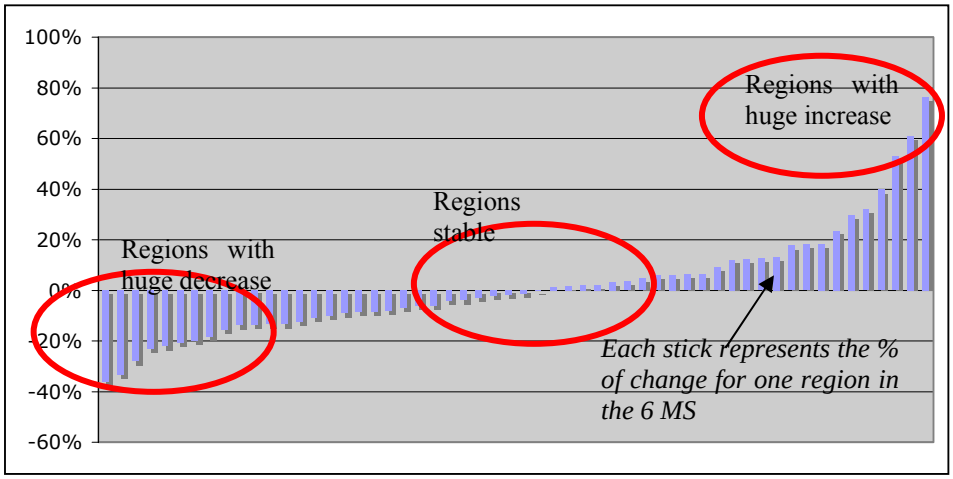


Figure 26: Rates of evolution of the number of ewes at regional level between 1992 and 2001 (livestock survey). This figure shows that most regions in the 6 studied MS have faced huge changes.

Regional changes have been accompanied with changes in structure, as shown in Figure 27.

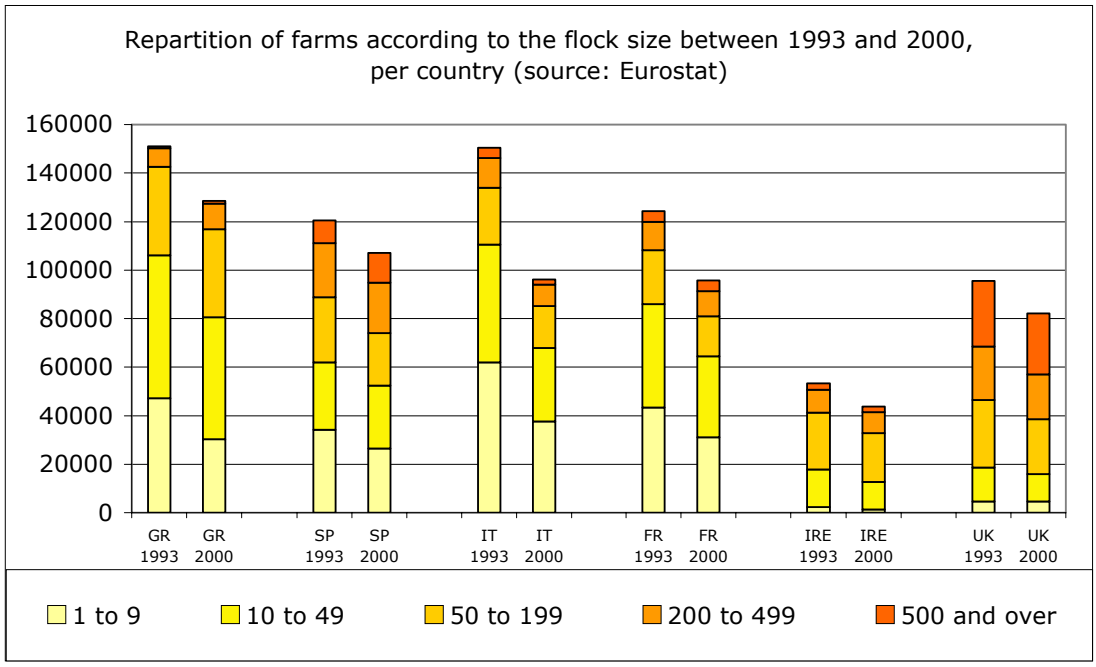


Figure 27: Repartition of farms according to flock size between 1993 and 2000 (source: FSS)

Changes in Atlantic region: an overall drop in animals, a concentration of farms

Compared to the previous period (1980-1992), the Atlantic region experienced a net stop in the increase of animals as a whole (see Figure 22). Livestock surveys for the whole period show that the number of ewes declined by 10% and 18% respectively in UK and Ireland between 1992 and 2000 (just before UK was affected by the F&M disease outbreak). In the meanwhile, as the overall production remained rather stable (+1% for UK for example; source Agris) and the average stocking density declined it suggests that there was improved productivity per animal on average, mostly in the most productive regions (e.g. Midlands).

The introduction of quotas following the McSharry reforms had little effect in Ireland. The allocation was 5 million units (there were 4.7 millions ewes and the rest were eligible hogs) but because of decreasing sheep numbers (again mostly in the lowlands) by the 2000 – 2004 period Ireland had between 0.5 and 1 million ewe premium rights not used, resulting in the breakdown of the trade in quota rights. Effectively quota had no value (DAFRD 2006).

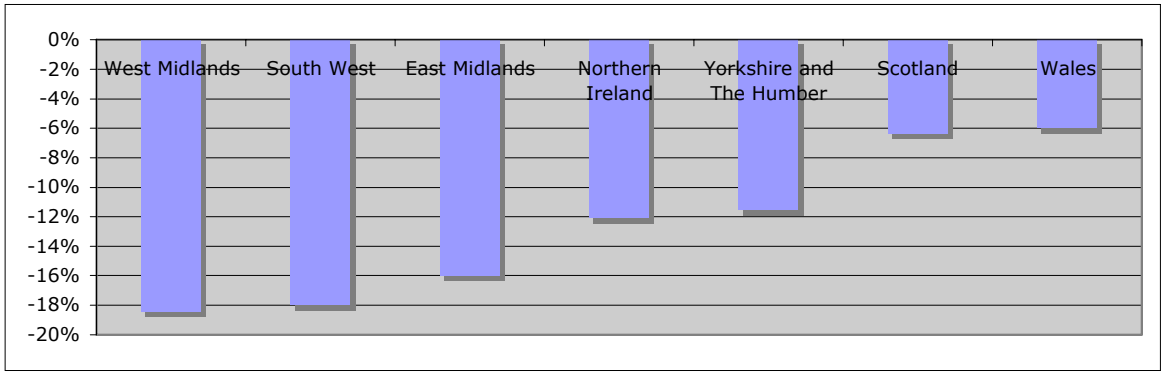


Figure 28: Rates of evolution of the number of ewes in Atlantic regions between 1992 and 2000 (livestock survey). Not all UK and Irish regions documented

These changes accompanied a huge restructuring of farms as shown in Figure 27. Generally speaking, flocks under 200 ewes declined as those over this threshold expanded.

The Irish REPS program on commonage and cross-compliance rules on stocking density in UK can also be identified as a major driver in Atlantic region on the period, accompanying the de-stocking trend with AEM payments and other schemes.

Atlantic	1992-2001
sedentary intensively stocked, managed grassland	Stabilisation in the number of farms and destoking of animals
sedentary sheep and arable	Decline due to more profitability in crop sector (cereals premium)
sedentary semi-natural forage	Relative maintenance due to favourable payments and policy incentives

Changes in continental regions

Generally speaking, same trends happened in continental regions, as shown in next figure.

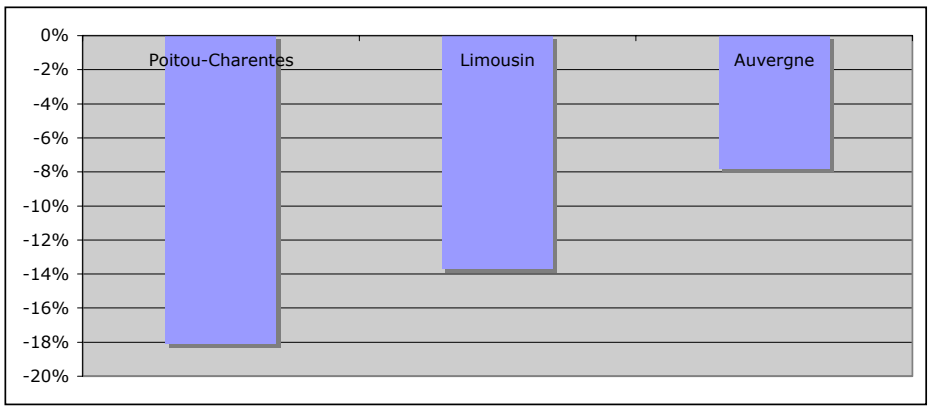


Figure 29: Rates of evolution of the number of ewes in some continental regions between 1992 and 2001 (livestock survey). Not all regions documented

Generally speaking, the trend continues the one observed in the previous period: the drop in number of animals goes hand in hand with replacement by more profitable enterprises: crops and/or goats in favourable regions such as Poitou Charentes, cattle in more grass oriented regions (Auvergne and Limousin), even if in these regions LFA support (RWP and specific payments for ewes under LFA scheme) and the grassland premium probably helped the relative maintenance of such systems.

Continental	1992-2001
sedentary managed grassland	Continued relative decline of meat sheep, towards more cattle. Sheep better maintained in LFA concentration of flocks Development of quality meat
sedentary crops+grassland	Decline due to more profitability in crop sector (cereals premium)
sedentary fodder crops	Development of milk-goat

Changes in Mediterranean regions

The stabilization of rights, both at national and individual levels brought instability in the sector (with regards to prices) since farmers kept more animals in order to press for higher quotas. Although it is difficult to separate the effects of the CAP regime from other factors, it seems that changes to the regime from 1992 probably also had a role to play in the stabilisation of national numbers.

Crops subsidies further affected most sheep and goat farming systems, since cereal prices decreased and concentrate feed costs decreased thus leading farmers to use them more. This affected sedentary and pastoral systems, as both of them made a similar use of bought food. Nevertheless, most intensive systems, with higher productivity, benefited more from this item. Benoît and Laignel (2004) in France and Zervas (2003) in Greece showed that the most important policy for S&G sector was the subsidization of cereals and the subsequent decrease of concentrate prices. The same trend was noted in Spain and in Italy. Moreover local MS policies could have an important impact to the sector. For example, in Greece, the characterization of rough grazing lands as forestry land and the allocation of responsibilities for this land management to different authorities had the result of reducing the "official " land area for grazing hence reducing the capacity of farmers to clarify subsidies related to land (Michailidou & Rokos, 2005).

Other significant tendencies include the notable increase in average flock size, and the increased use of bought-in feeds and housing. Many commentators believe that the CAP headage payments have acted as an incentive to the creation of very large meat flocks (e.g. over 1000 head). However, this tendency also coincides with the general trend towards the consolidation of farming into large units that has taken place in most sectors in recent years. Above all, it is unclear how the headage payment specifically supported larger farms, as, in general terms income was more supported and prevented some restructuring trends. Ashworth (2000) showed that the relative income of sheep producers both in LFA and non LFA grew

faster than the other sectors – though it must be remembered that this remained relatively low in comparison to other sectors in absolute terms.

In Mediterranean countries, the influence of headage payments on the size of milk flocks is thought to be less (the payment is smaller, it represents a lesser proportion of overall income, and for management reasons producers prefer to have flocks below a certain size threshold).

At lower levels of analysis, developments of animals in Mediterranean countries show contrasted situations, with continuities and changes compared to the previous period.

The continuities deal with the trend to concentrate farms in best placed regions for sheep production, with regards to fodder availability. As above, this availability can be explained by different factors (climatic, structural and due to the land tenure). In Spain, this led to the continued increase of animals in Extremadura, for example. Reversely, regions in which other productions were easier (cattle, cereals or olive in Andalucia for example), production dropped.

The change with regards to the previous period is linked to the situation of LFA, which clearly improved due to the specific payment (and rule up to 1994) towards them. The total number of animals in LFA stayed unchanged in broad figures (Ashworth, 2000), with limited restructuring as a whole: Figure 27 shows that in Mediterranean countries, restructuring mostly meant the decline of small flocks, as largest ones (above 500 heads) did not rise that significantly. This suggests an overall maintenance of medium-large flocks, associated to specialised system, with increase of heads within the same categories of flock size.

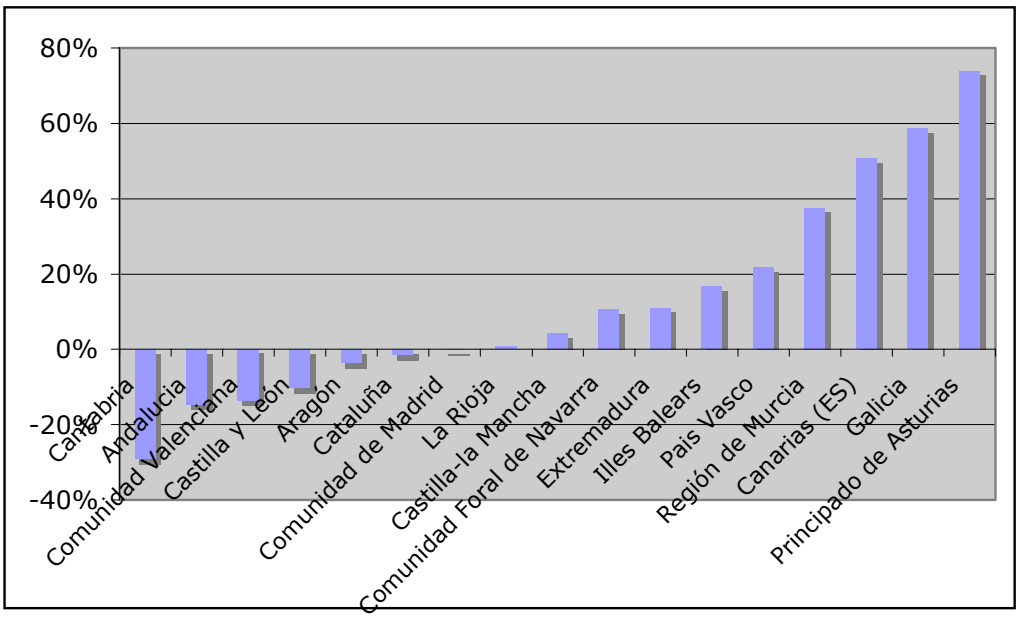


Figure 30: Rates of evolution of the number of meat-ewes in Spanish regions between 1992 and 2001 (livestock survey)

Mediterranean	1992-2001
sedentary managed fodder area	-Meat: relative stability due to favourable payments - Milk: development
pastoral	Relative maintenance due to favourable payments and cheaper bought-food, concentration of flocks, less shepherding
sedentary semi-natural grassland	Continued development of these meat systems due to favourable payments
pastoral on stubble and fallows	Decline of meat due to labour costs and lesser profitability in meat and restructuring in milk
indoor	Development of milk sheep/goat Anecdotal for meat

4.3 Analysis of the regulation (EC) n°2529/2001 and its impact on the 2001-2005 period

4.3.1 The 1999 regulation and its rationales

Objectives of the new regulation

The objectives are the following:

• Simplify the previous compensatory payment scheme based on complex calculation criteria.

• Introduce a decoupling signal (similar as the one introduced in the 1992 CAP reform: payments coupled to the nature of the production, but not to the level of production), linked to GATT concern.

• Introduce the payments for goats when bred on similar patterns as sheep and *mainly* directed towards meat production. This "mainly" will introduce some interpretation when the distinction between meat and milk purpose is not that clear.

• Continuation of the former Rural World Premium (named "Supplementary premium").

Main features

• A fixed € 21 premium for each meat ewe. For goat producers in some specific areas designed in the annex I of reg. 2529/2001 and for sheep milk producers, the premium is € 16.8/ewe and she-goat. The premia are to be revised given the market conditions. It must be noted that the calculation of the premium has been under relatively low price assumptions, so the level of the premium is rather high compared to the level of the previous years. .

• A supplementary premium in LFA — (EC) reg. 1257/1999 — set at € 7 per ewe and she-goat. A set of conditions defines the eligibility of farmers in relation to the minimum use of LFA lands.

• Within national ceilings, the possible use of national reserves of rights that can be used in order "*to avoid premium rights being moved away from sensitive zones or regions where sheep production is especially important for the local economy*" (art. 9).

• Additional payments (chapter II), that can be granted per animal or per hectare of forage area, in order to sustain quality and/or environmental and/or restructuring approaches. Subsidiarity is the rule in this domain. National envelops are defined for these additional payments. A limited shift from the direct payments envelop (fixed + supplementary premia) to the additional payments envelop.

• The possibility to prevent any regional shift of rights from sensitive zones (art 9.3)

• Other chapters of the regulation deal with private storage and trade with third countries issues, which are of less direct consequences with the environmental issue.

The national adaptations of the regulation

In general terms, it must be reminded that the mandatory payments, i.e. the "basic" premium (i.e. the € 21/ewe) and the supplementary payments represent most of the expenses.

Thus, additional payments are of minor importance, representing between 2-5% of the total expenses on the sheep and goat sector. Note that no MS out of the 6 studied has used the right to shift from the direct payments envelop to the additional payments envelop.

Though some MS identified priority beneficiary (young farmers in France, small flocks in Ireland), the national reserve is neither identified as a real policy issue in interviews, as the total number of ewes is declining in most countries and as the available reference envelope is higher in reality than the number of eligible ewes (given the minimum threshold of 10 ewes[20] for eligibility), as shown in the next table:

	1995	1996	1997	1998	1999	2000	2001	2002	2003
ELL	91	92	93	94	94	96	96	97	95
ESP	91	94	97	96	98		93	96	95
FRA	92	91	90	89	88	87	85	84	84
IRE	96	95	93	93	92	87	82	77	76
ITA	83	91	86	81	78	77	77	77	77
UKI	103	100	99	98	99	98	95	85	88

Figure 31: Percentage of premium quotas really utilised (source: DG Agriculture)

LFA adaptations in MS

Out of the 6 countries studied, only the UK, Ireland and France developed a significant policy under LFA schemes with specific provision for S&G.

In the UK, there are payments of £ 4.09 and 4.91 (around € 6 – 6.5) for ewes in respectively disadvantaged areas (DA) and severely disadvantaged areas (SDA). In this last category of SDA, there is £8.88 per eligible ewe of approved breeds in specially qualified flocks. Irish scheme also foresee a special premium per ewe (around £10 or €12). The French scheme introduces a bonus for compensatory allowance of 10% in simple LFA and 30% in mountain LFA.

Note that these provisions were introduced prior the 2529/2001scheme.

4.3.2 The main effects of the 2529/2001 regulation: hampered by the specificity of the period

As stated in the introduction of the document, it is rather difficult to analyse the specific effects of the regulation for two main reasons:

- The foot and mouth disease that occurred in the UK in 2001 led to a major drop in production in this country, which weight on the EU market is about 1/3 alone. UK lost 4.7 M heads in one year and 12% of ewes. The main automatic effect had been an increase in prices that mainly benefited to other countries. This price effect has even been reinforced by the BSE on beef, which provoked a transfer of consumption from beef to lamb. The blue tongue disease in Spain in 2004 has also affected the market and sustained high prices. Thus, the impact of the payment have been significantly "diluted" compared to the market effect.

- The CAP MTR of 2003, which scheduled decoupling and introduction of cross-compliance, which likely effects will be discussed in a specific section.

[20] — 50 in Italy.

The main impacts of this period are logically found in the UK, in which the F&M affected all size of flocks and regions. Thus, the drop in production has been generalised. Farms started to re-built their flock from 2002, but at limited rate (according a "wait and see" attitude reinforced by the MTR reform).

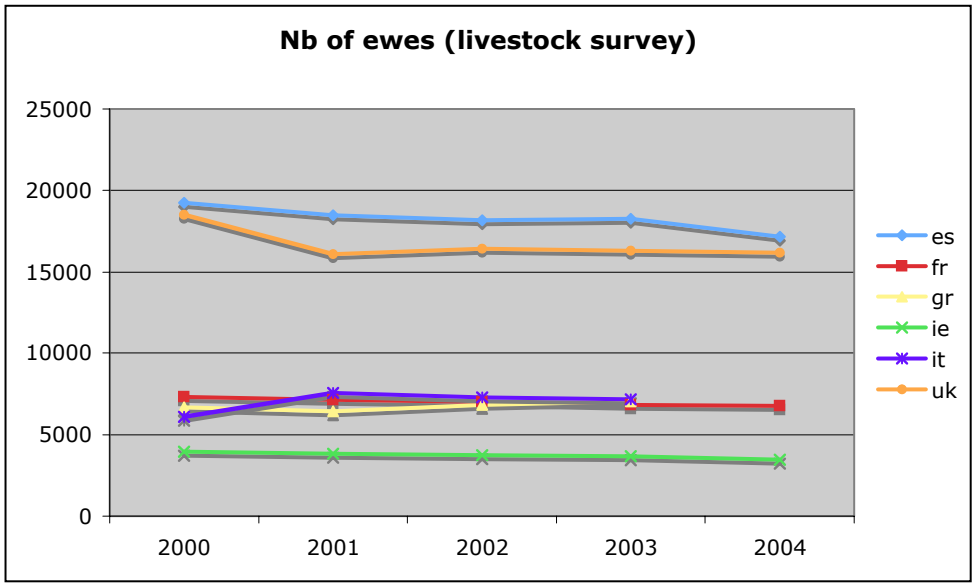


Figure 32: Development of ewes 2000-2004 (source: Livestock survey)

In other countries, the increase of production has not been accompanied by a significant rise in the number of ewes, thus corresponding to a general strategy of producing more meat per ewe (and increased bought-feed).

The impacts per regions are summarised in the following tables.

Atlantic	2002-2005
sedentary intensively stocked, managed grassland	Destocking due to F&M disease (UK), unchanged (Irl)
sedentary sheep and arable	Destocking due to F&M disease (UK), unchanged (Irl)
sedentary semi-natural forage	Destocking due to F&M disease (UK), agri-environemntal scheme and environmental concerns
Continental	2002-2005
sedentary managed grassland	Decline as a whole, but contrasted fates between regions
sedentary crops+grassland	Maintenance due the combination of high sheep price and low cereals price
sedentary fodder crops	Development of milk-goat
Mediterranean	2002-2005
sedentary managed fodder area	-Meat: relative stability due to favourable payments and high prices (except during the blue tongue disease in Spain) - Milk: development
pastoral	Relative maintenance due to favourable payments and cheaper bought-food, concentration of flocks, less shepherding
sedentary semi-natural grassland	-Meat: relative stability due to favourable payments and high prices (except during the blue tongue disease in Spain) - Milk: development
pastoral on stubble and fallows	Decline of meat due to labour costs and lesser profitability in meat and restructuring in milk
indoor	Development of milk sheep/goat Anecdotal for meat

4.3.3 Impact on farm income and share of payments

The payments have different importance in farm income, depending on the criteria. The following table shows the share of payments in the overall farm net value added (FNVA), depending on the main direction and location (LFA or not).

	Meat				Milk goat				Milk sheep		
	(1) not in less-favoured areas	(2) in less-favoured not mountain areas	(3) in less-favoured mountain areas		(1) not in less-favoured areas	(2) in less-favoured not mountain areas	(3) in less-favoured mountain areas		(1) not in less-favoured areas	(2) in less-favoured not mountain areas	(3) in less-favoured mountain areas
ELL	23%	36%	38%		37%	51%	42%		31%	39%	37%
SP	41%	38%	44%		12%	14%	16%		15%	24%	14%
ITA	26%		37%				20%		24%	30%	31%
FRA	78%	113%	148%		55%	83%	64%				82%
IRE	66%	88%									
UK	64%	104%									
EU 15	62%	84%	60%		37%	46%	34%		26%	30%	37%

Table 6: Percentage of total subsidies in the FNVA (source: FADN 2003)

This table shows the proportion of total subsidies (not only the S&G ones) in the FNVA. It logically shows that the meat systems depend more on payments than the milk ones. The most dependent holdings in average are found in LFA in France and in the UK, with subsidies exceeding the FNVA. Generally speaking, Mediterranean countries depend less on payments than Atlantic and continental ones (with the relative exception of the milk goat in Greece).

	Meat				Milk goat				Milk sheep		
	(1) not in less-favoured areas	(2) in less-favoured not mountain areas	(3) in less-favoured mountain areas		(1) not in less-favoured areas	(2) in less-favoured not mountain areas	(3) in less-favoured mountain areas		(1) not in less-favoured areas	(2) in less-favoured not mountain areas	(3) in less-favoured mountain areas
% S&G subsidies/total subsidies											
ELL	47%	45%	47%		32%	59%	53%		39%	39%	49%
SP	50%	34%	56%		73%	67%	60%		40%	45%	66%
ITA	26%		25%				41%		37%	62%	47%
FRA	11%	15%	23%		0%	2%	16%				29%
IRE	10%	8%									
UK	13%	29%									
EU 15	13%	22%	33%		16%	33%	42%		38%	42%	44%
% LFA/subsidies											
ELL		21%	23%			18%	18%			18%	19%
SP		3%	2%			3%	1%			16%	2%
ITA										9%	7%
FRA		7%	24%			6%	36%				31%
IRE		19%									
UK		18%									
EU 15		14%	14%			11%	20%			16%	18%
% AEM/subsidies											
ELL	0%	0%	0%		0%	0%	0%		0%	0%	0%
SP	0%	1%	0%		12%	0%	0%		0%	2%	1%
ITA	10%		9%				11%		9%	4%	9%
FRA	5%	10%	17%		6%	9%	17%				10%
IRE	5%	16%									
UK	6%	9%									
EU 15	6%	11%	11%		9%	4%	7%		4%	2%	6%

Table 7: Structure of subsidies (source: FADN 2003)

The share of sheep and goat subsidies in the total amount of subsidies varies across countries, reflecting the degree of specialisation of systems, as specialised S&G systems will logically have higher % of S&G payment in the total. LFA subsidies are significant mainly in the mountainous areas of France and Greece. AE payments are of lesser importance in average.

4.4 2005 – Future: the impact of decoupling

4.4.1 Main changes in drivers

The future of sheep market must be considered when analysing the future. In recent past, it "benefited" from BSE crisis, as the beef consumption is partly substitutable to sheep-meat one. Thus, with the disappearance of the effects of the BSE crisis, we can expect a slow decline in sheep-meat demand and more flexibility of prices. This economy signal needs to be integrated in the analysis. It gives more chance to systems which are relatively efficient, i.e. for those the ration gross product/costs is high.

Another key driver is the way decoupling has been implemented in MS: fully or partially. It will largely be analysed below.

Let us assume that cross compliance implementation is not expected to introduce huge changes for farmers (not even nitrate directive for intensive systems), except for animal identification new rules and from 2007 lambs welfare. Nevertheless, this could lead to breeding disappearance in farming systems combining a small flock with crops. Indeed, a sanction due to non respect of cross compliance rules for marginal sheep (in such systems) could lead to a decrease of SFP in their all. Moreover, cross compliance is more adapted to the issues linked with sedentary systems (except for identification and registration of animals where, as we will see, cross compliance could represent a real value-added).

The analysis of what could occur in the future is based on two main sources:

- The gathering of expert points of view, including the commentators of the present document and interviewed experts during the second phase of the present study[21], completed by relevant studies.
- The economical analysis of 5 archetypes characterised from FADN data per region:
  The table in appendix 2 and comments deal with 5 archetypes of meat-sheep farms.

  These archetypes aim at illustrating contrasted situations all over Europe. They were chosen with regards to the regions which faced most changes under the 1980-1992 period (see above).

In this analysis we will consider the impact of present policies, taking particularly into account the decoupling as implemented presently in each country (partially or totally).

4.4.2 Atlantic area

Future scenarios envisaged

Ireland: high SFP or lack of successors: 2 justifications for abandonment of sheep production

There is considerable concern that full decoupling and relatively high single farm payments (because of high receipts in the reference years) will lead to further decline in sheep production and could result in abandonment in areas where the extensive hill and mountain sheep systems predominate. There is already localized abandonment in County Galway. It is not wholly driven by the policy signals but if, as is widely advised and as expected, farmers are to respond more to the return from the market then there will be a very strong incentive to do the minimum possible or to abandon production. There are reports of abandonment already happening in Counties Donegal, Mayo, Sligo, Kerry and West Cork. There seems to be a much slower response in County Wicklow in the east. Because of high average the age of hill and mountain farmers and the lack of successors there is a view that we are witnessing the last generation of hill sheep farmers.

The Department of Agriculture have specified a minimum stocking density that is required to meet the cross-compliance conditions attached to the SFP (DAFRD, 2004) but this would not stop the concentration of activity on the best (low ground) land and abandonment of the hills. For ageing farmers the increasing amount of paperwork, rules and cross compliance checks might lead to them not claiming SFP.

The perspective on 2nd pillar payments is that the LFA payments are a crucial positive signal and aid to help to sustain agricultural activity in the most remote regions and should remain untouched into the future. Similarly the agri-environment payments are now seen as a permanent feature of future support payments. Having said this there is little in REPS specifically to encourage appropriate sheep or mixed sheep and cattle systems in the hills and mountains.

Farmers unions are asking for increased levels of direct payments linked to environmental outcomes and the implementation of breeding improvement programs for traditional native breeds of sheep (the continental market for the light weight lambs that are produced in extensive hill and mountain sheep systems has virtually gone in recent years).

United Kingdom: in uplands, concentration within specialised farm, loss of cattle in mixed systems. In lowland, increase in self-contained flocks

In general the old support system, whilst initially potentially encouraging overstocking, actually (and especially after the introduction of quotas) mostly acted as a barrier to reducing sheep numbers. This was because the number of sheep on which Sheep Premium was claimed had to be kept for a retention period and this was enforced through rigorous Ministry checks with penalties for transgressions. With a more market driven sector in future (Thornley, 2005), there is a fear that one scenario in the uplands is for specialist extensive sheep farmers to change to bigger more commercial sheep breeds and to concentrate activity on the best land (if available). This would be accompanied by more mechanization, housing of sheep and more supplementary feeding. This could result in virtual abandonment of the hills and increased environmental impacts on the better land (e.g. soil compaction and erosion and impacts on water courses). However another possible scenario is that upland mixed livestock farmers (sedentary

[21] The results of these interviews have been displayed in detail in the second interim report (April 2006).

semi-natural forage systems) would reduce cattle numbers or stop cattle farming and concentrate on sheep. This is considered a very real possibility and the loss of cattle is currently of more concern to environmental groups than changes in sheep numbers.

In Scotland and Wales where SFP is paid on an historic basis there is a feeling that change will be slow. At present there is an annual reduction of about 2% - 3% in breeding sheep numbers (The Welsh Assembly 2006). This is mostly from the hills and mountains (sedentary semi-natural forage systems) where the reliance on subsidy was most significant. Total abandonment would not be possible for farmers still claiming LFA payments (because of the minimum stocking requirement). Despite the overall reduction in sheep numbers, an increase in self-contained lowland flocks (sedentary intensively stocked, managed grassland) is predicted, for example on land receiving SFP based on arable aid on marginal land that might be reverted to grassland. In Wales this might happen in the cereal belts of Glamorgan, and Pembrokeshire; similarly, in the east of Scotland.

In England, where SFP will be regionalised, changes might be expected to happen quicker, starting in the uplands. In Northern Ireland there is a very small sheep industry which is linked closely with that in Ireland. It will tend to follow the Irish trends for a reduction because of a smaller export market; again with the implication of abandonment in the hills.

There is considerable debate about the future of the LFA payments in the UK. There is a strong lobby from farmers groups to retain these payments because, with decoupling, they are the only support payments that give farmers the signal to continue farming. However most environmental groups in the UK are pushing for the abolition of LFA with re-direction of the money saved into other agri-environment schemes. For example, the Welsh Assembly consultation on the future of LFA payments gives only two options - either to continue, with no enhancements (see above) to 2008 or come to an end in 2006. They argue that the £35 million, which is half the RDP budget and an eighth of total farm support, could be better targeted. The Countryside Council for Wales (CCW[22]) response to this (which differs from the view of agencies in Scotland and England on their schemes) is that it should be retained but should be re-defined as a very simple scheme that supports appropriate farming systems which can then be the target of more specific measures through agri-environment. Since there is quite a lot to suggest that agri-environment scheme often follow the "law of unintended consequences" (the rules are ok but the outcomes are not what you expect) there would seem to be a danger in such a radical change.

Illustration by the analysis of 2 contrasted situations (« archetypes ») [23]

Sedentary mixed system based on managed grassland (permanent) – not in LFA - England North

23% of livestock units are sheep and goat. Generally speaking, the stocking density is rather high. UAA is not only devoted to fodder, as the part of crops is 58% of the usable agricultural area. Fodder area is mainly constituted by permanent grassland.

Sheep productivity is high. Feed costs are average. Total costs are 45% of the gross product.

Subsidies represent more than half of the FNVA. 52% are crops subsidies.

To synthesise, we could say that the system is characterised by : high input (45% costs/gross product), high output (FNVA = 34 800 €/AWU).

Sheep production combined with cattle one is profitable in such systems.

In the future, these systems are likely to develop the same intensification strategy as in the past. Anyway, their present intensification should allow sheep production to be maintained even in a decoupled context.

Sedentary specialised system, on semi-natural land, with a very large flock, very large UAA – LFA not mountain - Scotland

These systems are quite specialised in sheep production, as 72% of livestock units are sheep. UAA is entirely devoted to fodder, mainly constituted by rough grazing. The stocking density is very low. The

[22] — The Countrysde Council for Wales is the Welsh agency for Nature conservation. The equivalent in England is English Nature (EN) and in Scotland it is Scottish Natural Heritage (SNH).

[23] — See appendix 7 for the detailed archetypes and calculation items.

productivity per sheep, in terms of sheep and goat gross product/ sheep and goat, is very low due to the climatic conditions. To synthesise, the system is characteristic of a low output/low input rationale. Feed costs are very low too (102.5 €/LU). Nevertheless, total costs still stand for 61% of gross product, which makes the system very sensible to prices variability.

These systems had a strategy of maximising the number of sheep rather than the productivity per sheep. That allowed in particular to receive more subsidy. Indeed, part of subsidies in their FNVA is 128%, of which 43% are sheep and goat subsidies.

The sheep and goat production is not profitable in these systems, as the amount of received subsidies is higher than the Farm net value added. Thus, one can assume that decoupling alone may lead to quit sheep and goat production and/or change production patterns (though alternative are unclear). With the regionalisation, larger areas may be advantaged.

To synthesise, we might foresee the following general evolution for each type of farming systems, given the policy context:

Atlantic	2005-future
sedentary intensively stocked, managed grassland	Likely to continue sheep meat farming on the same patterns or increase
sedentary sheep and arable	Opportunity for developping sheep meat (large scale?)
sedentary semi-natural forage	Likely to be big reduction in some areas

4.4.3 Continental

Partial decoupling is expected to lead to positive impacts when former "poor land" have been ploughed up for cereals (and associated coupled payments). Thus, decoupling might favour the replacement of specialised crops systems by mixed systems with extensive grassland in the regions where cereals/crops are not profitable *per se* even when counting the 25% coupled. This move is likely to occur when market conditions on meat are favourable on middle-term.

Full decoupling would likely entirely change the policy signals, with risks of abandonment when labour constraints are too high compared to Farm income (see previous period when the number of sheep decreased despite high prices and payments). Conversely, 100% decoupled dairy sector could possibly lead to the replacement of dairy farms by less demanding meat sheep or more profitable goat production. Nevertheless, the system of rights attribution at NUTS3 level could stand for a difficulty, mainly for pastoral breeder who need flexibility.

Sheep headage has recently increased in regions that were not traditionally ovine regions: North East (Lorraine, Champagne-Ardennes), grassland areas from North West (North of Picardie, Haute-Normandie). However, the profession seems to be very dynamic, since 2000. Nevertheless, except in the not traditionally ovine regions, the headage decrease, that lead to a flock decrease in 2005 in France.

The Young farmer subsidy (DJA) is increased for sheep breeders (a condition of a minimum headage, and the farmer has to engage himself to increase his headage by a certain percentage after 5 years). This is not the case for goat breeders.

For 3 years, sheep breeders union have implemented a plan for "relance ovine", based on information and formation. Generally speaking, labour constraints are very important, more than for bovine production. Nevertheless in the actual context, sheep and goat production could increase in France. Continuation of ovine activity in many regions will depend on the ratio between available area and available labour force. In the past, it has also depended on availability of dairy quotas (for cows) and quotas of suckler cow payment.

Illustration by the analysis of one « archetype »

Sedentary mixed system on managed grassland – in LFA not mountain - Bourgogne

Mostly geared toward breeding, this farm has 82% of the UAA dedicated to fodder production. The fodder area is mainly composed of permanent grassland. Nevertheless, sheep and goat, breed in flock of average size, are complementary to cattle breeding, and they represent only 14% of the total LU present on the farm. The stocking density is rather low.

Sheep productivity is average. The gross product per AWU is rather high, even if the part of S&G product in the total gross product is limited.

Despite a high output/a.w.u. – above EU 15 average —, as costs are rather high, leading subsidies, represent 113% of the FNVA as a whole. This suggests that the farming activity alone is not profitable in this context.

To synthesise, we could foresee the following evolution for each type of farming systems, given the policy context:

Continental	2005-future
sedentary managed grassland	Open future, depends on the relative development of other productions (dairy, cattle) Likely specialised systems on loarge flocks
sedentary crops+grassland	Opportunity for developping sheep meat (large scale?)
sedentary fodder crops	Likely continued development of milk-goat and possible large flocks of sheep

4.4.4 Mediterranean area

There has been far less policy debate in most parts of the Mediterranean region compared with the situation in the Atlantic region. In addition, there is far greater diversity of situations (physical, sociological, administrative, historical) across the three study countries of the Mediterranean region, compared with the British Isles. Consequently making predictions about future S&G scenarios and their possible environmental effects is extremely complex.

In general terms, it seems clear that shepherded systems will continue to decline, both on semi-natural vegetation and on arable plains. Without shepherds, stock will have to be kept increasingly on the holding. If the pastoral resource is not being used as in the past, feed will have to be provided in the form of purchased cereals, hay and concentrates (Caja and Rancourt (de), 2006).

Milk production seems certain to be concentrated increasingly in intensive, mainly indoor systems. Meat production in the more dynamic areas also seems likely to follow the pattern of recent years, with increasingly intensive management of flocks. This does not necessarily imply more intensive land use in situ, as the intensification is largely based on the use of purchased feeds.

In Spain, studies undertaken for the Ministry of Agriculture have shown the high risk of abandonment in sheep systems, especially those with medium sized flocks (MAPA, 2003). These have a high labour requirement, making it very difficult to combine with other economic activities. Combined with the low incomes generated, this makes such sheep systems are clearly less viable than comparable beef systems. Around half of interviewed sheep farmers had no successor, and approximately one third were inclined to give up farming if they receive a compensatory payment.

Critical questions emerging are:

- If large areas of extensive grazing are abandoned, especially in the uplands, how will authorities ensure the maintenance of biodiversity (e.g. grass and scrub Natura 2000 habitats) and the prevention of fires on this territory? (Rancourt (de) et al. 2006)

- What will happen to low-yielding, dryland arable land following decoupling? If there is widespread abandonment of cropping on the most marginal land, as expected, what uses might this land be put to? Sheep grazing might be an option, if the market situation allows. Energy crops might be another option, depending on the subsidy regime. In each case, relative competitiveness compared with other areas (in and outside the EU) probably is the key factor.

Illustration by the analysis of 3 contrasted situations (« archetypes »)

Specialised transhumant system, on semi-natural land, little flock, both meat and milk production - in LFA mountains - Sterea Ellas

Specialised systems (98% of LU is sheep and goat) standing on rather small flock. Very small UAA, with only 1.7 ha of fodder area declared. The apparent stocking density is very high. There are 85 days off farm/LU/year associated to average feed costs per LU (€ 233).

The gross product from milk production is complementary to the product from meat. It represents 38% of the sheep and goat product. That explain the high sheep and goat average product per animal (114.3 €/sheep and goat). As a whole, sheep production is very efficient in these systems.

Subsidies only represent 30% of the NFVA. Total costs are rather low, compared to gross product.

Decoupling alone does not allow to foresee how these systems are going to develop. The question is the relative maintenance of milk production relatively to meat production.

Sedentary mixed system, on managed grassland (temporary) - in LFA mountain - Umbria

The sheep flock is very small, the stocking density is low on small farms (18 ha), mixing productions.

The productivity of sheep and goat is quite high, with 107.8 €/sheep and goat. Nevertheless the sheep and goat product represents only 8% of the total gross product due to the limited number of animals as a whole.

This system is very independent from subsidies, as it represents only 19% of the FNVA. Costs are very low too, standing for 17% of the gross product, which seems to characterise a high output/low input system, but at limited scale.

The system appears to be rather efficient and independent from subsidies. As sheep is a profitable but marginal production, the direction for the future is quite indeterminate.

Sedentary specialised system, on semi-natural land, with large flocks - LFA not mountain - Extremadura

67% of the livestock units are sheep and goat. Flock is rather large and explains an overall important gross product on S&G (€ 20,000/a.w.u. the most important of the sample). The UAA is predominantly devoted to fodder area (permanent grassland, rough grazing). Moreover, some land are used off farm in average, consistent with the assumption of trasterminant systems (127 days off farm/LU/year).

It can be understood as a low output (58.3 € / sheep and goat) and low input (low feed costs per LU) system. Compared to Scotland, the efficiency is higher, as the share of total costs in gross product is 44% (similar to efficient high output/input North England archetype). Subsidies represent 47% of FNVA.

In the future, this system seems in good position to maintain their relative advantage on an efficient low output/low input strategy with large flocks.

To synthesise, we could foresee the following evolution for each type of farming systems, given the policy context:

Mediterranean	2005-future
sedentary managed fodder area	- Meat: open future, depends on the relative development of other productions (dairy, specialised crops,É) Likely specialised meat systems on loarge flocks - Continuation of milk
pastoral	Likely to continue sheep milk and meat farming on the same patterns (larger flocks, less shepherding); local futures depends on market opportunity
sedentary semi-natural grassland	Likely to continue sheep meat farming on the same patterns
pastoral on stubble and fallows (shepherded)	Likely to quit production?
indoor	Likely to continue sheep milk and even meat farming on the same patterns

4.5 The environmental influence of S&G policies

The purpose of these conclusive paragraphs is not to repeat the overall environmental analysis carried out in the previous section of the report, but to draw out the main environmental conclusions from the policy development described above. The discussion is led with regards to three main items:

- Changes in land use/management (e.g., marginalisation, preservation of existing agricultural land use, possible decline or disappearance of production), in particular in respect to grassland and forest areas.
- Changes in production technology and livestock systems (including overall trends of increasing or decreasing intensification, specialisation and production concentration), as regards use of water and agro-chemicals, veterinary medicines (antibiotics), biocides; stocking density (i.e. change in livestock numbers and/or grazing patterns); type of feed; energy consumption; manure and waste management, etc.
- Changes in management practices (e.g., shift towards organic farming or integrated farming)

4.5.1 Atlantic region

In Ireland from the 1980's to the mid-1990's there was a big increase in sheep production mostly in the lowlands where sheep subsidy payments made it the most profitable drystock enterprise.

It was however the parallel increase in the western and upland areas (also primarily driven by support payments) that resulted in the well documented ecological problems that really began to manifest themselves from the mid-1990's onwards. In the past 4 to 5 years sheep numbers have fallen dramatically from about 5 million to 3 million but the reasons for the decline (other than the compulsory de-stocking measures that applied to non agri-environment participants in western counties) are linked less with policy than with the relative attraction and rewards of "off-farm" work which has resulted in a lack of labour for what is a relatively labour-intensive enterprise. In fact the decreases have been greatest in the lowlands (probably more than 60%) and here there will have been little environmental effects because sheep production is mostly mixed with suckler cow enterprises which will continue. In the uplands the decline has been partly driven by market prices but again it is also associated with a lack of young people coming into farming, lack of skilled shepherds (and good dogs) and an ageing population.

The extensive hill and mountain sheep systems have been directly implicated with overgrazing in the west of Ireland. In the early 1990's in the six western counties there was severe overgrazing particularly on blanket peat areas. This was a reflection of poor management, primarily on commonage areas (pastures shared by several farmers), but also on some private land. The initial policy response was to try and address it through the agri-environment program and this had some limited success. This was followed by a voluntary De-stocking Plan and this removed 180,000 breeding sheep from the mountains mostly in County Mayo but also Counties Galway and Sligo. Because of the difficulty of making these plans work over whole commonage areas (the scheme was not compulsory and not all farmers would enter) a compulsory de-stocking scheme based on what is known as "commonage framework plans", was introduced. Theses plans required a compulsory 30% de-stocking for non agri-environment participants.

The consensus is that the scheme has worked well (some farmers would now say too well) and has significantly reduced sheep numbers in most of the affected areas. The biological response has been varied and it should be expected that in some places plant communities may take many years for recovery to be obvious. Overgrazing (or strictly speaking, over-stocking) is not predicted to be a major issue in the future because the combined effects of the Single Farm Payment, de-stocking and poor market returns are likely to encourage a decrease in agricultural activity in the hill and mountain areas.

In the UK the situation is similar with virtually no major environmental issues raised (specifically regarding sheep production) in the lowlands but with some significant issues about the high stock density affecting the vegetation communities in many areas of the uplands. But the combined effects of the policy measures introduced to address the problem (LFA supplements, agri-environment measures, SAP national envelope) and the more recent likely de-stocking effects following the introduction of fully decoupled payments mean that it will be less of an issue in future. Part of the objective of recent policy reforms is to let "the market" have a more dominant influence on farmers. However there is nothing to indicate that "market forces" will keep sheep-farmers in marginal areas - quite the reverse. Many past policies (both pillar 1 and pillar 2) have followed the "law of unintended consequences", that is that the rules seem okay but the outcomes are not what you expected. It seems highly likely that this will apply in future to the effects of the Single Farm Payments and decoupling.

Currently in both the UK and Ireland there is growing concern amongst nature conservationists about the lack of grazing in pastoral areas. In fact the environmental issue of "lack of sheep grazing" may soon become more important (both in the lowlands and the uplands) than the issue of excessive sheep numbers that has dominated the debate in the past. In policy terms the LFA payments and various environmental payments are the important policy measures that are currently buffering the signals that sheep farmers are getting from decoupling.

The following conclusions result in relation to the project brief:

- Changes in land-use / management (e.g. marginalization, preservation of existing agricultural land use, possible declines or disappearance of production), in particular in respect to grassland and forest areas

In the upland areas of the UK and Ireland the main effect of the S&G regime has been through its effect on sheep density rather than the distribution – initially it caused big increases in sheep numbers in upland areas that were historically always producing sheep. A proportion of these farms would also have been involved in cattle production. There is no doubt that the S&G regime (together with LFA payments) has been a significant factor in keeping sheep farming in the hills and mountains; although at stocking densities that were often in excess of the ecological optimum. In the lowlands the regime has driven both an increase in numbers and distribution but most sheep enterprises are on mixed farms and this did not result in significant land use or management changes. Neither did it apparently have much influence on the overall intensity of management

In the mountains and uplands many farms were traditionally specialist sheep farms but there has also been a tradition of mixed livestock farms especially on the poorer land at mid- and low-altitude and around the coast. During the period when sheep numbers went up cattle keeping in these areas has declined; to what extent it was the sheep policies that discouraged cattle keeping it not clear; although it is certain that in parts of Ireland the agri-environment measures have been directly implicated. The ecological response of the grassland pastures (the Atlantic Molinia grasslands in particular) is, in the absence of burning, a shift to more rank vegetation which eventually becomes less plant-species rich and less diverse floristically and for associated insects and birds.

Currently the most significant land use change is the increasing trend to abandon hill pastures and to concentrate farming activity on the best (lower altitude) land. This is not always an option for all farmers but even in some of the most remote parts of the UK and Irish uplands sheep are being taken off the hills – in parts of Donegal, Mayo, Sligo, Kerry and West Cork in Ireland; in the Highlands of Scotland, for example, what was Europe's largest sheep farm (31,000 acres) was sold early in 2006; and in Wales there have been sales of big farms in the mountains of Snowdonia. Much of this sale of former sheep pastures is to "lifestyle buyers" who either only actively manage a small acreage or retain a small acreage and sell the rest to a neighbouring farmer.

During the past, sheep farming in these upland areas continued partly because of the S&G regime, partly because of LFA payments and partly because change was buffered by farmers that regarded there work as "a way of life"- often elderly farmers. With decoupling, low profitability, lack of labour and people

leaving the land because of the economic and social attractions of non-farm employment (there is little or no social life associated with hill farming in depopulated rural areas), the prognosis is not positive.

In lowland areas of the England and Wales the surviving areas of semi-natural grasslands (as well as heathlands, coastal vegetation and saltmarshes) that have historically been maintained by grazing are already considered by the nature conservation authorities to be at risk. In fact there are over 20,000ha of Sites of Social scientific Interest in England that are considered to be currently under-grazed. In Wales the same is true for lowland heaths and commons and for coastal areas. The land-use trend by farmers is to maximize productivity on the best land and abandon the poorer, more difficult areas. – e.g. those that are poorly fenced, are crossed by roads or where there is high public pressure. In many places former sheep pastures have been abandoned following the Foot and Mouth disease outbreak because of the movement restrictions that resulted from this. This is coupled with what many farmers regard as excessive bureaucracy and paperwork and the poor economic return from a relatively labour-intensive enterprise. The (eventual) area-based single farm payments in England may make sheep farming more attractive than cattle keeping but it is unlikely to affect the trend to concentrate activity on better land, and it will only continue if profitable.

- Changes in production technology and livestock systems (including overall trends of increasing or decreasing intensification, specialization and production concentration), as regards use of water and agro-chemicals, veterinary medicines (antibiotics), biocides, stocking density (i.e. changes in livestock numbers and/or grazing patterns), type of feed, energy consumption, manure and waste management

The S&G regime mostly affected the number of sheep kept and generally during the period under consideration changes in production techniques and livestock systems have mostly been driven by the market. So for example in the lowlands of Ireland where there was a big increase in numbers, "mid-season" lamb production dominates with ewes lambing in February or March and lambs being finished from July onwards. In contrast, in the uplands and mountains traditional hill sheep breeds are used and these are bred pure. To hit the market at the optimum time and to produce a product that the supermarkets and the factories prefer involves and intensification of the systems in all areas, for example, involving housing at lambing time, supplementary feeding and the more intensive management of grass fields. Supermarkets want "peas in a pod" – a consistent product that fits neatly into a polystyrene tray. So something of a myth has developed that, for instance, Blackface lamb cannot produce a 20kg carcass of adequate conformation. Accordingly the market for Blackface and other traditional hill breeds has virtually collapsed. By the time hill lambs mature (lambing does not start in the hills of Scotland until late April or May) in January or February, New Zealand lamb carcasses of 16/17 kg with not such a strong flavour are available at very competitive prices. This means that finishers are reluctant to purchase "store" lambs from the mountains in October or November because they could end up losing money on them.

S&G policy changes have essentially worked in two ways – they initially kept sheep farming in marginal areas (although at inappropriate stocking density in some places) where the economics have in recent years become increasingly suspect; at the same time they have made sheep production in the lowlands as attractive (if not more attractive) than cattle farming. In the absence of strong signals from Pillar 2, decoupled payments and market signals will tend to lead to abandonment in the mountains. In the lowlands it is more difficult to predict – for instance it might be expected that land formerly used for cereals in England and Wales might be used for sheep production. However this would depend on market price and demand as well as the relative price of beef and cereals. In Ireland social factors (such as the shift to part-time farming) will have a strong influence.

An important point is that sheep systems have always been evolving in relation to technology and market opportunity (or collapse), guided to varying degrees by policy interventions. It seems unlikely that technology and the market will encourage low-intensity, environmentally benign systems. This is the area where policy intervention is most needed from an environmental perspective.

- Changes in management practices (e.g. shift towards organic farming or integrated farming)

During living memory in the uplands and mountains of the UK and Ireland we have gone from a system of close-shepherded flocks of regionally distinctive breeds of sheep, (such as Herdwicks, Swaledales, Blackface and Galway producing 2 and 3 year old castrates eaten as mutton and providing a valuable wool clip, grazed at relatively low intensity with cattle) to the current systems described in this report. These changes in management practices cannot be attributed to the S&G regime policies – farmers have responded to technological opportunities that make life easier and farming more profitable. A similar pattern of change has happened in the lowlands. What is important is the prognosis. This realistically has to be that, without policy intervention, management practices will either continue to intensify or will be abandoned altogether. Unfortunately in many places the sheep sector has fallen below the critical mass

that is needed to sustain it, for example in parts of the English lowlands; and this should be seen as a warning for the uplands. Many management practices are difficult or impossible to re-introduce once lost and many traditional practices have a social stigma attached to them.

A recurring comment in the interviews was that schemes aimed at farmers' management practices were both too complicated and often, although well-intentioned either missed their target or had unforeseen consequences. Future schemes should be as simple as possible and should support the structure of farming that delivers the environmental benefits. A relatively uncomplicated farm management system can produce complex environmental benefits (biodiversity, nature conservation).

4.5.2 Continental region

The trends described in the continental regions are mostly unchanged over the period of time considerer: continuous decline in animals number, larger farms getting more and more specialised. In fact, it can be assumed that the changes in the CAP S&G regime have been of second order compared to other drivers. As S&G payments probably have prevented or slowed down the process of decline of sheep production as a whole in the continental context, they have not been able to stop the main drawback of the production in the continental context: its lack of attractiveness compared to other easier productions, mainly cattle. It is remarkable to note that, even in the context of rather favourable prices and high payments, the trend continues as farmers weight the opportunity to breed sheep with the labour task demanded. Thus, structural factor such as ageing of farmers is one main driver probably more at play than the CMO. Changes in level of payments and/or rules did not fundamentally affected the rationale for farmers, all the more that, in the continental context, their room of manoeuvre is larger than in other regions, more affected by the "last option" issue.

In broad terms, the development of farm structures allows to draw the following conclusions from an environmental point of view:

- Changes in land use/management

The relative and continuous decline of sheep production does not lead to major, visible impacts in the continental context. This is mainly due to the fact that the "last option" characteristic is not obvious at large scale in this geographical context. Most land previously used by traditional flocks of sheep are taken up by other production as cattle, preventing from a land abandonment issue at large scale. This explains why, relatively, the literature and studies hardly mention sheep farming in this context, from an environmental point of view. Nevertheless, it can be assumed that some localised effects will be spread out and visible at regional level. When observing the agri-environmental menus at regional level, it will be obvious that the traditional land use of meadows or semi-natural grassland by shepherded flocks still represent an issue (Mollard et al. 2002; Véron and Parfait, 2005). Reversely, the loss of grazed dry meadows (by encroachment or ploughing up) will only be visible at very detailed level. In regions where HNV areas are scarce and scattered (Andersen et al. 2003), such impacts can be significant on the envelope of nature conservation areas. A paradox is the fact that the most obvious impacts are encountered in the most favourable regions, where the risk of replacing grazing by another production is the most likely.

The main issue dealing with this environmental theme is not the number of sheep as a whole at regional level, but the number of grazing sheep on ad hoc patterns (i.e. shepherded or extensively fenced). Traditional systems – managed grassland or arable – are the best placed to continue such favourable land-use producing HNV farmland. With regards to this theme, it can be assumed that the policy scheme did not positively influenced the trend in this respect. The absence of capping in payments favoured larger flocks which are more difficult to environmentally-friendly manage. All the more, as the policy issue was to maintain a certain number of sheep at regional level, regardless of their actual landscape management, extensive patterns were not really favoured *per se*. "Mass approaches" such as CMO payment but also LFA or the "prime à l'herbe" scheme (under AEM) have reached some of their effects – by globally supporting the income of grassland breeders — but have not been selective enough with regards of the range of the required stocking densities to really address the issue (Véron and Dobremez, 2003; Tertia consultants, 2003; AScA 2003).

- Changes in production technology and livestock systems

On the period considered, the technology of livestock systems has not changed of nature. The issue for the sheep breeder will always be to find the balance between the outputs and the inputs. The two main strategies at place: maximising the output (mainly in the intensively managed fodder crops systems) or

minimising the costs (in grassland and arable systems) have been described for years (Revue Purpan, 1999) and are still valid (Benoît and Laignel, 2004; OFIVAL, 2002; Quetier et al., 2005). The way to intensify production through de-seasoning of birth and more indoor management — with more concentrate and medicines — has been, in broad terms, the same for the last 30 years. It is unclear how policy have affected the choice towards one strategy or the other. One could assume that the per kg payment would favour an animal intensification strategy and the per head payment would be an incentive to maximise the number of heads. But, at end, the two issues are not that different in the continental context where the forage availability determines the whole management of the farm. A good way to maximise the production of meat is to get the larger number of ewes giving birth to lambs as a whole and, reversely, having a large number of animals does not mean that you don't make profit on the meat production. To sum it up, there is no contradiction between the two issues and the technological choices will be made considering the structural constraints of the farm.

A key issue in the choice of farming systems is the feeding strategy with use of bought grain. A sheep farmer will face two embedded choices: (1) feed the animals with grass or grain (2) produce the grain on farm or buy it outside. A policy factor which probably affected the "grain" option has been the cut in cereal's price in the 1992 CAP reform, as analysed by Benoît and Laignel (2004). This cut has been the main margin of progress in economical terms on the period. Nevertheless, it does not mean the whole replacement of grazing by grain and the two forage strategies can be conducted complementary on the same holding.

- Changes in management practices

Generally speaking, ovine and caprine systems are not the most advanced ones in the development of organic farming (CE, undated). In France, the percentage of sheep and goat farms that benefited of AEM in the 2000-2002 years represented 16% of the whole farms (this % being 11% at national level). This percentage is, in fact, rather low considering the fact that the step for organic conversion for S&G is rather limited. The blockages towards organic farming are numerous, but one can be proposed as structuring in our domain: the fact that organic farming compete other quality schemes (e.g. *Label Rouge*). For example, the most appreciated meat from the continental market and defended under suche scheme is light-white lamb, fed with a high percentage of grain, which makes more difficult the conversion towards organic farming (AScA, 2003). More significant has been the impact of AEM on extensive farming practices for landscape and biodiversity management.

4.5.3 Mediterranean region

There has been very little analysis or debate in Mediterranean countries of the environmental effects of the CAP S&G regimes, in contrast to the situation in the UK and Ireland. Interviewees could provide only very general opinions and generally could not differentiate between the different systems existing from the 1980s to the present.

Existing publications reflect a generalised view that CAP livestock regimes have encouraged the intensification of livestock farming through headage payments, which has in turn stimulated overgrazing of certain areas (Suárez et al., 1997).

The interviews showed a general consensus that the headage premium system has played a role in driving up sheep numbers in some regions, and in encouraging individual farmers to keep more ewes than they might have in the absence of the headage premium.

In areas where sheep stocking levels became excessive during the 1980s and 1990s, the CAP regime therefore can be considered to have had some negative influence on the environment. However, within the extensive range of sheep and goat farming in the Mediterranean study countries, there are no data or studies available to determine where and when stocking levels should be considered excessive. From available expert opinion, it seems that only certain areas have clearly experienced excessive stock levels.

Furthermore, it is well documented that separating the effects of the CAP from other drivers of agricultural intensification, such as changes in market conditions, technological development and changes in the wider economy, is extremely difficult even in precise cases.

To take an example, the south of Extremadura (Spain) has become one of the main sheep producing areas of the Mediterranean region, with sheep numbers increasingly continually since the 1980s, even in recent years when numbers have been declining in other regions. The greatly increased sheep stocking levels in the areas have caused considerable concern among environmentalists because of their potential impact on

the habitats of steppeland birds (Beaufoy, 1996), and would appear to be one of the clearer cases of a change driven by CAP subsidies since Spanish accession to the EEC in 1986.

Although the interviews confirm that headage payments have contributed to the rise in stock numbers, they also suggest that farmers would have moved to more intensive and productive systems involving higher stocking numbers in order to maintain profitability, even in the absence of CAP headage payments. In this case, it appears the CAP has played a complementary role, but is not the sole or even the main driver. The decline of transhumance and the ready availability of manufactured feeds have also been key factors.

It is also unclear to what extent increased sheep *numbers* have had significant environmental effects, as opposed to other management trends, such as increased use of fencing, and the almost total decline of transhumance, which removed the pressure of stock for several months of the year.

On the positive side, it is clear that S&G regimes of the CAP have played a role in maintaining the viability of these production sectors, and thus of the farming systems that currently maintain patterns of land use in many dryland areas of the Mediterranean that are of high nature value, even if these systems have undergone tendencies that are unfavourable to species' conservation. In the absence of the CAP regimes, there may have been more pressure to convert such areas to other uses, such as afforestation, irrigation and permanent crops, with the consequent total loss of existing natural values.

Yet paradoxically, the CAP sheep and goat regime has not provided a sufficient incentive for the maintenance of sheep and goat farming in some of the most marginal and environmentally sensitive areas of the study countries. Production has tended to be rationalised and become concentrated in areas with a competitive advantage. This process has witnessed the decline of grazing in some areas with consequently negative effects on the environment, particularly in uplands.

Nevertheless, for many meat-orientated sheep and goat farms, the CAP headage payment has been roughly equivalent to the net income generated, so that in the absence of the payment, many farms would not produce a positive income. This is an important consideration for the future of the support policy.

Finally, the policy context in Mediterranean countries differs from the Atlantic and Continental regions in some important aspects. LFA and agri-environment schemes have far less influence, because the payment levels are lower in the case of LFA and agri-environment schemes have not been developed on a significant scale for extensive grazing systems. This is especially the case in Spain, the principle sheep producing country in the region, where LFA payments are capped at 2,000 Euro/holding, and are considered to have no effect on land-use patterns (Escuela Técnica Superior de Ingenieros Agrónomos U.P.M. y Saborá Sociedad de Estudios, 2003).

Consequently the S&G regime (and other Pillar 1 regimes) have a relatively more dominant influence than in the UK, Ireland or France, where LFA and agri-environment schemes act as complementary or contradictory drivers alongside Pillar 1.

This is an important consideration for the future: the decoupling of S&G support (partial in the case of Spain, total in the case of Italy and Greece) removes much of the incentive for farmers to keep sheep and goats, yet "alternative" incentives through Pillar 2 measures are relatively little developed.

The following conclusions can be drawn for the considerations set out in the project brief:

- Changes in land use/management

The S&G regime until now has played an important role in propping up the incomes of S&G producers, especially in meat orientated systems. To some extent, this support has enabled marginal farming systems to survive that probably would have disappeared or undergone more radical change, particularly pastoral systems. In the absence of the S&G regime, there would almost certainly have been more abandonment of marginal grazing lands, with mostly negative consequences for the environment (increased fire risk, reduced landscape and biodiversity values). The type and extent of these consequences would depend on the uses that replaced S&G (for example, afforestation produces a more immediate impact than natural succession). Overall, the regime probably has slowed land-use change, but has not prevented it. Without a rigid system of ring-fenced area quotas, production inevitably has tended to become concentrated in certain regions and areas, and more marginal grazing (steeper slopes, land furthest from villages, etc.) has been abandoned in many areas.

The abandonment process is expected to continue and probably to accelerate following decoupling. The change to the support system is seen as an important factor, but equally significant is the advanced age of many S&G farmers in more marginal situations, and the lack of successors. Considerable land-use

changes are expected, especially in uplands and on common lands, raising fundamental questions about how authorities will fulfill their land management obligations (fire control, maintenance of grazed habitat types and associated biodiversity) if sheep or goats are not present.

On the dryland plains, some commentators expect a considerable decline in arable cropping following decoupling. Potentially, such land could become extensive sheep grazing, although it is not clear whether market and economic conditions would favour such an expansion of sheep production in the EU. The environmental consequences of such a shift are equally unclear, and would depend on the type of sheep systems and their management.

- Changes in production technology and livestock systems

The only clear effect of the S&G regime has been to encourage farmers to keep more ewes in order to ensure a certain minimum level of annual income. In some situations this has resulted in higher stocking densities. However, the tendencies of farming systems (towards greater use of fencing, concentrates, housing and medecines) do not seem to be significantly influenced by the regime. Rather, farmers have pursued this path in the search for greater productivity and quality, and more consistent production during the year (avoiding peaks of output). With the decoupling of support, there will be more pressure on farmers to be fully competitive and to seek increased productivity and efficiency. This implies a continued tendency to tighter control of flocks (fencing, housing, feeding) and less pastoral activity.

- Changes in management practices

One of the most significant changes in management practices taking place in recent years, and predicted to continue with important environmental consequences, is the decline in shepherding. The decline of transhumance has also had very significant consequences (reduced seasonal grazing in uplands, increased stock pressure in lowlands). Again, the S&G regime cannot be considered as a significant driver of this process. However, neither have policy mechanisms been introduced to the S&G regime in order to slow or reverse the trend, for example, through supplementary support for shepherding. Without a concerted policy initiative to support shepherding, it seems inevitable that these systems will continue to decline, resulting in a continued loss of the environmental benefits associated with them.

5 The identification and registration scheme

5.1 Introduction: the issues associated to the identification and registration of animals

The specific regulation on animals identification and registration has been implemented more recently than in other sector, such as bovine. Even if it is difficult to have a precise idea of the implementation of identification rules in sheep and goat sector, for several reasons that are developed in this section, the proportion of non identified animals is higher than for bovine. Nevertheless, after several crises (BSE, Foot and mouth), public opinion is more and more aware of liability of traceability systems. A new regulation was set up in 2004, to be implemented in two phases, from July 2005 and 2008.

In the present report, we will discuss how the identification scheme will have a likely impact on environmental issues. Generally speaking, environment is not a central objective of EU regulation about identification and registration, which objectives are:

"- the localisation and tracing of animals for veterinary purposes, which is of crucial importance for the control of infectious diseases; and

- the management and supervision of livestock premiums as part of the reform of the common agricultural policy." [24]

Thus the description and the analysis carried out in this section will mainly interpret how the identification and registration issue will be an issue from an environmental point of view.

5.1.1 The difficulties in counting the sheep

One first issue associated to the identification of sheep and goat will simply be the knowledge of the number of animals. In sheep and goat sector, the implementation of identification rules will face with some particular issues due to the several characteristics of the animals:

- The number of animals varies across the year, with peak in Spring and decrease in Winter. Some animals are slaughtered when they are quite young (few weeks in some cases);

- Transhumant systems may have a more variable number of animals through time, due to natural hazards (storms, attacks from wild animals including wild dogs, bears, lynxes and wolves,…). For example, the mortality in Summer has been estimated at 6% in the French Verdon in the Southern Alps (Sarrazin, 2004).

- The system of placing animals from one holding to the other across the year will be developed in some countries, where "summer shepherds" will host animals from other breeders. Thus, one animal will move from one holding to the other during the year, this system being more developed in the case of S&G sector.

- There are lots of very little flocks (less than 9 heads) kept on farm for domestic and/or local market purpose only, that are not always taken into account in census, and a fortiori not known by the control bodies. It is difficult to assess the implementation of animals identification in such systems, but it is assumed by national official bodies to be poor. This factor will be strengthened by the fact that such small breeders will be below the threshold for getting payments and thus, will not be encouraged to declare their animals. Let us remind that, for the 6 MS studied, 22% of sheep are kept in flocks with less than 9 sheep (FSS, 2003).

[24] — From the DG Health and Consumer - Food and Veterinary Office webpage.

- A more qualitative factor but which can be of importance is that S&G breeders are frequently elder than in other sectors and might be reluctant to fill forms and declare animals. S&G farmers frequently manage a flock rather than a collection of individual animals.

As a conclusion, we can assume that it is more difficult to give a precise number of animals in the case of sheep and goat compared to more stable (in time and space) productions. This general characteristic will be exacerbated in the case of nomadic animals and/or traditionally managed farms. This factor explains some changes in methodology and database, leading to some discrepancies in long term data in some cases. The obligation of identifying and counting animals has been introduced quite recently, in 1992 for the main features described below. The legacy is managing flocks of sheep (without 's' for plural, which is an indication in itself), accepting a proxy of several %, rather than counting individual animals (Landais and Deffontaines, 1990).

This does not mean that it is impossible to count animals, and the trend is recognised as more and more precision in doing it. It means that the starting point from which analysing the identification and registration scheme in the case of S&G sector has to be recognised.

5.2 The EU regulation for identification and registration of sheep and goat

The new regulation (EC) 21/2004 amends the regulation (EC) 1782/2003 and the directives 92/102/EEC and 64/432/EEC.

5.2.1 Previous rules laid down by the directive 92/102/EEC

This Directive was intended mainly to establish common and regular veterinary and zootechnicial checks applicable in intra-Community trade and internal market.

According to the article 4. 1. (b), any keeper of sheep or goats "shall keep a register including at least the total number of sheep and goats present on the holding each year on a date to be determined by the competent authority".

"The register shall also include:

- an up-to-date statement of the number of live female sheep and goats which are over 12 months of age or which have given birth present on the holding;

- the movements (numbers of animals concerned by each entering or leaving operation) of sheep and goats on at least the basis of aggregate movements stating as appropriate their origin or destination, their mark and the date of such movements."

Identification marks must be applied before animals leave the holding of birth.

There was no obligation of identifying each animal individually. The identification marks had to make it possible to determine the holding from which the animal came and to enable reference to be made to any accompanying document mentioning the identification mark and the holding. (see article 5 (3) from 92/102/EEC).

The directive 92/102/EEC was not specific to sheep and goat, concerning all farm animals. As mentioned in the 21/2004/EC regulation, previous experiences and especially the foot-and-mouth disease crisis, "has shown that the implementation of Directive 92/102/EEC has not been satisfactory and is in need of improvement. It is therefore necessary to lay down more stringent and specific rules, as has already been done for bovine animals".

5.2.2 New identification and registration rules lay down by the directive 21/2004/EC

From the 9th of July 2005 the identification system of sheep and goats is governed by Regulation 21/2004/EC. The regulation is to be implemented in 2 phases. Some provisions are applicable from 2005, others from 2008. For instance this is the case for electronic identification which has to be organised before 2008.

From 2005

As stated by the article 3 (first paragraph), "the system for identification and registration of animals shall comprise the following elements:

1. Means of identification to identify each animal;
2. Up-to-date registers kept on each holding;
3. Movement documents;
4. A central register or a computer database."

Means of identification (see annex A. of 21/2004/EC):

Animals shall be identified within a period to be defined by each member state and in any case before leaving the holding. That period shall not be longer than 6 months.

By way of derogation, animals kept in extensive or free-range systems shall be identified until 9 months after the birth (and in any case before leaving the holding).

The mean of identification have to contain:

- The country code: the first characters identify the Member State of the holding where the animal was first identified, by a two-letter or three-digit country codes.

- An individual code of no more than 13 digits.

The identification of animal species on livestock farmers has to be performed through the:

- assignment of farm code number including personal identity data of the farmer

- use of numbered ear-tags which have to applied after the birth of the animals and in particular for sheep and goats within six months (Art. 4 of 21/2004), even if a derogation until nine months is possible in extensive systems.

- any animal imported from a third country within the territory of the Community are concerned from third countries within 14 days eartags have to be applied - see Art 4(4).

From 2008

Indeed, from 1998 to 2001, the Commission (DG Agri - Decision 98/562) monitored a large multinational project on the electronic identification of animals (IDEA). The main objectives of the IDEA project are the study of the feasibility and the performance evaluation of an electronic identification system in ruminants (cattle, buffalo, sheep and goats) and the organisational structure needed for any possible future implementation of such a system on European Union livestock on livestock (cattle, sheep, goats and buffalo). The project, in accordance with Directive 92/102/CEE, aimed to develop and to test different types of electronic devices for static and dynamic identification of animals. The results of the project, lasted four years, were exhaustive and very positive. "That project demonstrated that a substantial improvement in ovine and caprine animal identification systems could be achieved by using electronic identifiers for those animals". (source: council regulation (EC) 21/2004)

Thus, in all the Member States, the system is to go towards electronic identification system. This can be implemented through ruminal bolus bearing an electronic chip or electronic eartag.

5.2.3 Overview of the general implementation

Most of the studied countries chose to use the derogation possible for animals intended for slaughter on national territory before the age of 12 months to be identified by only one eartag.

UK asked and obtained a derogation for maintaining a system with only one eartag, firstly until April 2006, that could be reconducted until 2008. this was under condition of the adaptation of its system to the new regulation requirements.

	France	Greece	Italy	Ireland	Spain	UK
Specific derogation to continue with previous system (adapted)	no	no	no	yes	no	yes
Derogation for animals intended to be slaughtered on national territory before 12 months old (*Derogation 4(3))*	yes	yes	yes	no	yes	no
Maximum delay for identification after birth (in any case before the animal leaves the holding)	6 months	6 months	6 months	9 months	6 months	6 months
Maximum delay for identification after birth in extensive or free range farming conditions	6 months	6 months	6 months	9 months	9 months	9 months
Individual identification	From 2005	From 2005	From 2008 (before: identification per batches)	From 2001	From 2005 1 eartag + a ruminal bolus with electronic ship (latter not required if slaughtered within 12 months of birth)	From 2001

Table 8: Overview of national implementations of reg. (EC) 21/2004

5.3 Overview of the implementation per country

We propose to analyse the implementation of the regulation (EC) 21/2004 by using the same analytical frame for each country:

- ✓ Brief overview of the previous identification and registration system (before 21/2004/EC)
- ✓ Description of the new system implemented under regulation 21/2004/EC:
  - Respective national legislation;
  - Requirements of this legislation;
  - Concrete implementation (responsible services, results if available yet);
  - Further evolutions in requirements, impact of the new system at farm level.

5.3.1 United Kingdom

Previous system

Until 2005 all sheep producers had to register a farm holding number and a flock number. Sheep had to carry a tag with the flock number (UK followed by 6 digits) and a unique animal number. Any movement

of sheep was recorded in a flock movement book and on a movement document a copy of which was also sent to the appropriate country registry (e.g. Scottish Animal Movement Unit in Scotland).

New system implemented under 21/2004

Derogation

When the Regulation EC 21/2004 was adopted, it proposed the double tagging of all animals and various other conditions. However the Regulation says that Member States that have adequate systems in place can apply for derogation to continue with their national system. This was applied for by the UK. The inspection carried out by FVO in January 2005 resulted in a number of recommendations, resulting in the Competent Authorities providing a detailed response and an action plan in April 2005. A further inspection was carried out by the FVO[25] in December 2005. This leads to the adoption of Dec. 2005/617, on December 2005, granting a temporary derogation to UK until April 2006. Following further audits by the European Commission the derogation has been extended to June 2007.

Respective UK legislation

England: The Sheep and Goats (Records, Identification and Movement) (England) Order 2005. Statutory Instrument 2005 no. AAA, of 30th November 2005.

Scotland: The Sheep and Goat (Identification and Traceability) (Scotland)Regulations 2006.

Wales: Welsh Statutory Instrument 2003 No. 167 (W27). The Sheep and Goat Identification and Movement (Interim Measure) (Wales) (no.2) (Amendment) Order 2003.

Northern Ireland: The Sheep and Goats (Records, Identification and Movement) Order (Northern Ireland) 2005. Statutory Rule 2005 No. 535.

Not withstanding the improvements requested by the Commission the systems in place are basically the same for all the devolved regions although there are some small differences for Northern Ireland because of the interactions with the Irish Republic (see below). There are also different procedures for notifying sheep movements in the devolved regions.

Requirements

Means of identification

Animals born after July 2005 must be tagged within 6 months of birth if intensively reared and 9 months of birth if extensively reared or before it leaves the holding of birth, whichever comes first. All other animals still on the holding of birth must be tagged before leaving.

Tags must bear the letters UK, followed by the flock mark of the holding of birth followed by a unique 6 digit individual number. Animals moving off a holding that is not the holding of birth and not already baseline identified, have to carry a additional tag with the letter S, followed by the flock mark of the current location and a unique 6 digit individual number. Animals imported from outside the EU must be identified with an F tag on the holding destination within 14 days of arriving in the UK.

When an animal (already baseline tagged) moves from any holding, other than the holding of birth, it must carry an S tag with the flock mark of the holding it is moving from (no individual number). Replacement of lost tags can be with the next sequential number available if the animal is still on the holding of birth. If not it must be with a red "R" replacement tag with the flock mark of the current location followed by a unique 6 digit individual number and the letter R.

In Northern Ireland sheep are tagged as described above but the baseline tag has to be green and in the left ear. Animals that are exported to southern Ireland have to carry a second "export" (intra Community trade) tag which is blue and in the right ear.

[25] DG(SANCO)/ 770/2005 Final Report of a Mission carried out in the United Kingdom from the 12 – 16 December 2005. In order to evaluate the operation of the Ovine and Caprine Identification Systems.

The Movement Document requirements

All movements of sheep in the UK have to be accompanied by a movement document. These are in triplicate form and have to be completed by the departure location keeper (who must keep a copy for 3 years), the haulage contractor and the receiving location keeper. All moves have to be notified to the relevant country authority by the receiving keeper within three days of the move.

In addition farmers must maintain a register for each permanent holding that they keep animals on.

There are special arrangements for farmers that use common grazing and in Scotland all the crofts and common land that form a crofting township will be regarded as one epidemiological unit.

Further evolutions in requirements, impact of the new system at farm level

The new identification and traceability scheme in the UK have generally been welcomed, but farmer's organizations point out that if there is a disease outbreak this would be dealt with on a flock or a batch basis not an individual basis.

5.3.2 Ireland

Previous system

There has been a compulsory system for the ear-tagging and recording sheep in Ireland for many years but this was radically changed in 2001 with the introduction of the National Sheep Identification System (NSIS) which was introduced because of the outbreak of Foot and Mouth Disease in the UK. This required that every sheep carries a tag with the farm holding number of birth and an individual animal number. These details had to be recorded on a dispatch document if and when the animal moved. These details were also recorded in a farm animal register. There were stringent inspections to monitor compliance.

New system implemented under 21/2004 for sheep

As UK, Ireland applied for a derogation to continue with its national system. It was granted in August 2005 by Dec. 2005/597.

Irish regulation

Current Irish regulation is Statutory Instrument number 281 / 2001 (currently being amended).

Now the situation is that (for all Irish holdings) all sheep are tagged on their holding of birth before they are 9 months old or when they leave the holding if earlier. Each carries an individual number and the holding number. When they move this is recorded on a dispatch document, a copy of which travels with the animals. When the receiving farmer takes the sheep he records this in his records and he also puts his tag in the sheep's other ear.

In Ireland most movements (of lambs and old sheep) are from farm to factory for slaughter. If a sheep moves to a third farm the farmer has to has to remove the second tag and replace this with his own tag and record the details in his register, correlating the numbers. For sheep moving to a commonage (from which they will return) only the movement is recorded and there is no requirement for additional tagging.

An inspection by the Food and Veterinary Office of the Commission[26] in February 2005 found the system satisfactory.

Further evolutions in requirements, impact of the new system at farm level

Further evolutions

[26] DG (SANCO)/754/2005 Final Report of a Mission carried out in the Republic of Ireland from 1- 4 February 2005. In order to evaluate the operation of the Ovine and Caprine Identification Systems and to assess their performance with Council Regulation 21/2004.

Regarding the requirement to have electronic tags by 2008 the Department are looking into the feasibility of this in relation to cost (see point above) and how well it actually works.

One effect of decoupling is that with the end of livestock inspections for ewe premium claims (there were 100% inspections) the inspection of flocks and the checking of tagging requirements has become an element of cross-compliance checks for SFP. These are targeted at 1% of claimants.

Social acceptability

However the Farmers Union regard the secondary tagging at point of entry to be difficult to operate in practice and have proposed tagging at exit, pointing out that sheep are always managed in batches not as individuals. They also point out that sheep prices are so low that the cost of tagging (including management and labour costs) in many cases exceeds the value of the animal.

Identification of goat

Ireland introduced a system for goat identification in 2005 that does fully meet the requirements of Regulation 21/2004, namely the double tagging of all animals at 6 months old with registration requirements as for sheep.

5.3.3 Italy

Previous system

Until 1996[27], the Directive N° 92/102 EEC was not implemented in Italy. The national rule gave the Local Veterinary Services (USL – Unità Sanitarie Locali) the responsibility of creating and updating a complete list of farms or nomadic flocks and the animal owner to tag the animal with an ear tag provided by the USL or tattoo within 60 days after birth (due to the possibility of early slaughtering).

An annual census of holding and animals was estanblished on the 15th of March. On this basis the local Veterinary Services trnsmitted the collected data to the Ministry of Health (Veterinary services) which passed the information reported in Eurostat Agricultural data base.

The Veterinary services at local level (ASL, Aziende Sanitarie Locali, formerly USL) kept the registers were all the farmer/shepherd were identified. The animals had to be identified with an ear tag. the same number was also used for selection purposes. The farmer was obliged to transmit the ear tag number within three days, to produce an inventory of all the animals present in the farm on the 15th of March of every year and every 90 day for ewes and she-goats. Lambs send to slaughter houses within 60 days from birth were not obliged to be ear tagged.

The application of this system was relatively slow, but produced useful results in the veterinary sector and animal products safer exchange and market.

New system implemented under 21/2004 for sheep

Respective national legislation

The implementation of the European system for the identification and registration of ovine and caprine animals started in July 2005, as stated by the Council Regulation[28].

The Council regulation came in force through the Circolare 28 Luglio 2005 del Ministero della Salute "*Indicazioni per l'applicazione del regolamento (CE) n. 21/2004 del Consiglio del 17 dicembre 2003 che istituisce un sistema di identificazione e di registrazione degli animali delle specie ovina e caprina".*

[27] Decreto del Presidente della Repubblica del 30/04/1996 n. 317, "*Regolamento recante norme per l'attuazione della direttiva 92/102/CEE relativa all'identificazione e alla registrazione degli animal"i.* Gazzetta Ufficiale - Serie generale - del 14/06/1996 n. 138 pag. 3

[28] Council Regulation (EC) N° 21/2004, Article 8. 1: "….as *from 9 July 2005 each National competent Authority shall set up a computer data base for each holding…*".

Requirements

Means of identification

- ✓ the individual identification is now requested only for animal kept for reproduction;
- ✓ individual identification for each animal should compulsively be implemented from 01/01/2008.
- ✓ animal are identified by an ear tag on the left ear (as described in annex A.2 of the UE Regulation N° 21/2004) and by a second identical ear tag or by a tattoo; animal with a tattoo could not be exported[29].

Some Regions, as Sardinia and Sicily, have asked to use an ear tattoo instead of the second ear tag.

Registration

The main legal criteria according to the national legislation for enforcing the National data base are:

- ✓ The local Veterinary Services (ASL –Aziende Sanitarie Locali) must identify and register on the NDB every structure temporary or permanent were sheep and goats are present;
- ✓ The register include identification code of the holding, the geographic coordinates or address (locality), data of the owner and of the keeper, the type of production and the species kept (sheep, goat, mixed) and other useful veterinary information.
- ✓ The animals owner must pass on to all the previous information to the local Veterinary authorities and any variation within 30 days.
- ✓ The keeper has to make an inventory of the animals at least annually;
- ✓ The keeper registers batches of animals, including the number of animals for each batch; each batch has the same identification;

Concrete implementation

The new system is on the way of application, and the data base will be managed by the Veterinary Service of the Ministry of Health[30]. The National Data Base (NDB) is located in Teramo, where also the National Register of cattle and buffaloes was constituted.

The activity of the National Register of sheep and goats really started September 2005. During the last months the keeper could accede directly to data base and register holding and animals. The same Institute has an telling call centre to give information on NDB to individual animal keepers, technicians, local and central Veterinary services, breeders associations and other agencies. The Institute provides the flock holder the new ear tags.

Results of the implementation of the national database

Until December 2005 the NDB collects 126.062 holdings which is a large part of national consistency, but the number of animals censed was hardly 629.491 belonging to 4.602 farms, and the National Service Centre had consigned 470.711 individual identification codes/ear tags The number of documents of incoming movements into the farm were 115, the exit movements to other holdings and/or slaughterhouse 506.

As usual, on March, farmers and shepherds were asked to supply the Veterinary Service with a census of all animals present in each holding. This year the information was collected trough the NDB.

The Central Veterinary Services of the Ministry was disappointed by the result of the census, where only the 14, 2% of the sheep and 9,6% of the goats holdings, had registered the total number of heads. To speed up the registration a Circolare (Ministero della Salute – Dipartimento per la sanità pubblica, la nutrizione e la sicurezza degli Alimenti - 2nd May 2006) threatening a reduction or suspension of premia payment to the holders was sent out. But, in a fully decoupled regime, this could apply only to payments ex article 69 Reg. (CE) 1782/2003.

29 Ministero della Salute – Circolare 28 Luglio 2005 –

30 Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise – Teramo

The number of animal increased during the last three months of 2006, but until now it represents less than the 40% of the national flock. The number of holdings providing full information is 33.566, about one third of those registered in NDB. But at present the individual identification and registration is not compulsive and so the number of animal reaches around the less than 40 % of that of previous years. The more recent Eurostat quotation (2003) is of 9.065.206 heads in 109.910 holdings.

The fact is that until 1 January 2008 (EC) No 1782/2003 the farmer/shepherd is not obliged to register neither individually all the animals nor the dimension of the flock, but only batches.

During the first six months of 2006 the number of farm increases of about 6,5%.The number of holdings present and their breakdown in classification at 30/06/2006 in each Region is reported in Table 9– **Format of holdings classification in the National data base (Italy)**.

The number of holdings producing meat and milk is prevailing. This means that the majority of animals belong to dual purposes breed or are crosses. The 70 % of milk farms and flocks are located in Sardegna (7.402 holdings), which largely keeps distance from Lazio and Toscana.

*Table 9– **Format of holdings classification in the National data base (Italy)***

	30/06/2005	31/12/2005	30/06/2006
Open sheep holdings	88.156	96.047	99.548
- meat	19.943	23.947	25.516
- milk	12.068	12.070	12.320
- for self consumption	182	138	490
- dual purposes	49.750	53.496	55.382
Closed sheep holdings	8.164	11.213	15.322
Open goats holdings	23.018	32.483	37.316
- meat	9.268	13.495	15.019
- milk	1.934	2.519	2.992
- for self consumption	167	132	480
- dual purposes	7.205	11.691	14.530
Closed goats holdings	2.124	3.775	5.866
Source: Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise – Teramo) -2006			

Further evolutions in requirements, impact of the new system at farm level

On the basis of the results from IDEA project, in Abruzzo, Lazio and Sicily also the electronic identification was temporarily tested. At the moment the electronic identification is not still used. The Central and local Authorities assert that there still some technical and administrative problems to solve.

It is common view of those working at the new identification and registration scheme that until 2008 the system would not provide an exhaustive information on the national herds. The prevision appears realistic, having regard to Regulation (EC) No 1760/2000 establishing a system for the identification and registration of bovine animals, the Italian authorities undertook to implement the system for the identification and registration between 2000 and 2002 (DPR n° 437, 19th October 2000 and Decreto del Ministero della Salute, 31st January 2002 (G.U n° 72 – 26/03/2002)). The bovine NDB was recognised fully operational by the Commission on the 13th February 2006 (Commission decision 2006/132/EC)

The solid experience acquired managing the other national livestock registers represents a favourable condition, but the less developed reality of the sheep and goats breeding system compared to cattle one is a clear limit.

5.3.4 Spain

Previous system

Directive 92/102 was implemented in Spain by Real Decreto 205/1996, establishing a system of identification and registration of bovine, porcine, ovine and caprine animals. This system required

holdings to keep a register of animals and to mark them with an ear-tag or tattoo before reaching 12 months of age or before leaving the holding.

New system implemented under 21/2004

Respective national legislation

The new identification system is implemented in Spain by Real Decreto 947/2005.

Requirements

Means of identification

All sheep and goats born after 9th of July 2005 must be identified within 6 months and before leaving the holding. This period may be extended to 9 months in the case of extensive production systems.

The identification system is a right-ear tag and a ruminal bolus bearing an electronic chip.

Animals slaughtered in Spain within 12 months of birth require only an ear tag that identifies the holding of origin (derogation 4(3) of 21/2004).

Animals for export can be identified with a double ear tag.

Further evolutions in requirements, impact of the new system at farm level

The Ministry believes the system will be beneficial for the management of animals on larger holdings, as producers will be able to keep detailed electronic records of individual animals and monitor their development and needs. Commentators from the production sector regard the system as potentially useful, but only for the most modernised holdings. To get these benefits of the electronic system, farmers will have to invest in new technology and training, and many will not be prepared to do this. (see also Saa et.al., 2005).

5.3.5 Greece

Previous system

In Greece, sheep and goat identification has not been compulsory. It was only applied on the animals involved in programmes of genetic amelioration and for this purpose eartags of identification were used and movements were registered.

New system implemented under 21/2004 for sheep

Respective Greek legislation

The legal framework is according to the National Legislation through the Ministerial Decision 263493/2004 (B' 1253) of the Hellenic Republic for "Supplementary Actions on the use of a system to identify and register sheep and goats farms and all the animals according to the Council Regulation 21/2004".

Requirements

Means of identification

According to the national legislation, the keeper shall:

- ✓ Produce and fix two ear tags with individual identification number (ear tag type 1) for every animal within 6 months after birth, when leaving the holding and intended for fattening or reproduction in another holding. Provide one ear tag with the holding identification number (ear tag type 2) for every animal within 6 months of age when intended for slaughtering.
- ✓ Provide two ear tags with individual identification number (ear tag type 1) in animals imported from third countries within 14 days and before leaving the holding. However the animals transported from the Borders Veterinary Inspection

Station (ΣΥΚΕ) to the abattoir, that are not tagged their initial ear tag and the identification of the third country must be kept while they are slaughtered within 5 days from the inspection.

- ✓ Provide new ear tags in the event of falling them out of the animal, with the same identification number only after the approval of the competent authority (KANA).

Registration

Animal breeder shall:

- ✓ Provide to the Veterinary Authority of the local Prefecture (KANA), a document supplying details about the holding and ask permission for the use of ear tags to the animals.
- ✓ In the movement document every animal movement must be recorded.
- ✓ Keep the inventory of the holding containing animal numbers and notify that to the competent authority. Every keeper must keep and inform constantly the holding record. The record can be in electronic or handwritten form (size A3). Every keeper must keep and inform constantly the holding record. The record can be in electronic or handwritten form (size A3).

Breeders are registering their animals once a year (December) and inform the competent authority (KANA) for the inventory results within 30 days, by submitting a copy of the movement document. They should provide to the local authority in whose responsibility the holding belongs to, the appropriate document in cases of ceasing the farm operations changing owner.

They must provide access to all files and health records of the holding helping the inspectors of the competent authorities such as Regional Veterinary authorities (KANA), authorities of Ministry of Rural Development and Food or European authorities to the inspections for the application of any existing and new regulation.

1. Keepers are required to take an annual inventory of animal numbers during December. The competent authorities, Veterinary authorities and Ministry of Rural Development and Food can request more inventories if needed.

2. After the inventory and within 30 days, the keeper notifies a copy of the document to the competent local authority while keeping the initial copy at the holding. This copy is used for the registration of the holding in an electronic database.

3. In the time between the two inventories the keeper records every change in the holding related to births, deaths, slaughters etc.

The record must include the following information:

1. The name of the keeper and the person responsible for the holding.
2. The code number of the holding.
3. The tax-payer's and the ID numbers of the keeper.
4. The municipality, the place, longitude latitude of the holding, the code of the pasture where the animals graze during both winter and summer.
5. The address and post code of the owner and the person responsible.
6. The holdings that are under the same roof.
7. The type of the production.
8. The inventory result.
9. Any change in the number of the animals related to births, deaths, slaughters etc: The number of the animals, the date and the reason that enter the holding (new-born, bought), the date and the reason that left the holding (sold, death, slaughter), the name of the person who transfer the animals together with the car number, the code number of the initial holding, the code number of the new holding and in case of slaughter the code number of the abattoir.

10. Information about the replacement and the management of the ear tags (i.e. the correlation between the initial identification of the third country and the new identification adopted by the Greek holding etc.).

Any new information must be accompanied by the appropriate document which must be kept from the keeper of the holding in a special envelope for at list the last three (3) years.

The start and the end of a holding operation and any modifications made must be recorded and reported from the keeper to the competent authority, within seven (7) days from the event according to the specific document.

Database

The local authorities (KANA) supply data to the Veterinary database of the Ministry of Rural Development and Food concerning the information related to the holdings and the animal numbers (start, end of the operation, name of the keeper of the holding, inventory of the animals etc.).

The database includes the following information:

- Full records of the holding
- Records for type of animals and annual inventory of the holding.
- Approval for buying ear tags
- Approval for buying transmitters-receivers.

Concrete implementation

Ear tags are provided with the expenses covered from the breeder of the holding after the approval of the competent authority. The keeper must buy and fit ear tags exclusively approved by the Ministry of Rural Development and Food. The keeper is responsible for fitting the ear tags to the animals.

The responsible services to implement this Regulation at the Hellenic Ministry of Rural Development and Food are the veterinary ones. On a prefectural level (NUTS3) responsible are the Directions of Veterinary Services.

Inspections

The number of the annual inspections that have to be done from each responsible authority (KANA) could be no less than 5% of the total number of the holdings included in the database. The selection of the holding to be inspected in made after risk analysis.

Inspections can be done either isolated or at the same time with the application of a reform programme for the animal numbers or in relation to any inspection that are foreseen by the European or National legislation.

Difficulties in implementing the new regulation

Nowadays, the application of sheep and goat identification Regulation (EU Regulation 21 of 2004) is very variable through the country, unlike that for bovines. This is the result of both administrative problems, since the contractor for this task failed to comply with the requirements, and practical problems, since animals are often with small ears and their grazing through sclerophyllus vegetation results in the eartags falling.

The linkage of animals registered with land used is relatively easy since the milking animals are not moving over long distances.

The identification and registration system for sheep and goats in Greece has been applied to all the Greek territory and it is estimated that a 60% of the farms representing the majority of S&G of the farms have been registered in this system. However, the accuracy to which the system is updated is questioned since many of the S+G farmers are not familiar with keeping records and in fact their formal education qualifications are very low. Moreover, the veterinary authorities are in shortage of personnel, for the various responsibilities they have, and not in the position to train S+G farmers (who are in large numbers) how to run the system. Another serious problem arises from the rangelands, where animals graze, where the sclerophyllus vegetation causes the tags to fall from ears or even worse to produce infections to the S+G ears where the tags are.

5.3.6 France

Previous system

In France, sheep and goat identification have been compulsory for about 20 years. In 1987, the aim of the regulation was more geared toward genetic amelioration. This regulation implied eartags of identification and movements registration.

Then the regulation was strengthened in 1997, taking into account EC regulation from 1992. The movements' registration was strengthened, and animals had to be identified with a new eartag in all the farms it went through.

New system implemented under 21/2004 for sheep

Respective French legislation

The regulation 21/2004 was specified in French legislation by several orders and decrees, specifying responsibilities, sanctions, and mode of implementation.

- ✓ decree n° 2005-1557 of the 13th December 2005, dealing with sheep and goat identification, specifying owner's and local breeding organisms' responsibilities, and penalties.
- ✓ order of the 19th December 2005, dealing with sheep and goat identification, describing implementation of identification measures on national territory. This text is completed by an appendix. It replaced legislation implemented since 1997.
- ✓ order of the 22nd December 2005, setting the agreement of identification tags brands (for sheep, goat and bovines).
- ✓ order of the 5th June 2000, dealing with breeding register.
- ✓ order of the 20th September 2001, implementing the constitution of national sheep and goat identification database.

Requirements

Means of identification

French minister of agriculture decided to limit the age application of eartag at 6 months old. The Ministry of Agriculture decided to use the derogation 4(3) 21/2004 for animals to be killed on national territory before 12 months old to be identified with only one eartag.

For sheep and goats each year the following rules have to respected:

the 15th of March the total presence of animals has to be registered

during the year each 90 days the number of ewes which have produced lambs or have an age of 12 months have to be recorded

each 12 months the entrance or sales of animals have to registered

Holding register

This has been simplified compared to previous French regulation. France decided to change it into a **compilation of documents**, not an exhaustive registration any more. The documents to be compiled are:

- — Copy of the movement document,
- — Annual census of animals declared to EDE and transmitted at national level,
- — List of eartags received by the farmer, and date of their installation on the animal,
- — Table listing correspondence between yellow eartags and red-one (temporary replacement eartag in case of loss).

Movement notification: « movement document »

This point is implemented in France as required by EC regulation.

For transhumance, a former system has already been existing in France. Before leading animals to transhumance, farmer had to ask for an authorisation to DDSV that gave its response according to potential former controls having done on the farm.

Central database

This includes name and addresses of farms having some sheep and goat (120 000 registered in the database), census of animals corresponding, with their own identification number (there was already in France a unique numbering of each animal before 2005). The new 2005 Regulation gave the ministry of agriculture the opportunity to develop an important communication and public awareness campaign, particularly addressed to farmers with little headage. Indeed, these latter are known as often none complying with identification rules.

Concrete implementation

In France, the EC regulation 21/2004 was implemented in July 2005, between 9 and 31st, according to *départements (NUTS3)*.

The French ministry of agriculture has given delegation of public service to départemental breeding organisations: EDE (établissement départemental d'élevage) for centralizing data. They are also responsible for selling the marks to the farmers, the circulation documents, and to provide information and advice to farmers. If they observe any bad practices in a farm, they have to inform DDSV. There are about 100 EDE in France, often depending on "chambres d'agriculture". These administrations has been existing since 1966, but initially they were principally involved in genetic amelioration. The EDE can also be associations (4-5% of French EDE).

Other stakeholders are GDS (groupement de défense sanitaire). These associations are responsible for farmers information concerning sanitary aspects. They could play the role of EDE if the EDE decides to delegate it.

Organisation of controls

DDAF and DDSV are responsible for controls. These are devolved services, at NUTS3 level, of the Ministry of agriculture. DDSV (direction départementale des services vétérinaires) are départemental (NUTS3) directions of veterinary services. DDAF (Direction Départementale de l'Agriculture et de la Forêt) are départemental (NUTS3) directions of agricultural and forestry services. There are three kinds of controls, that are coordinated by DDAF:

- DDAF controls eligibility for CAP subsidies.

As far as identification rules are concerned, farmer has to comply with 21/2004 regulation. The controls address 10% of French headage each year.

- DDSV makes "routine controls".
- Cross compliance controls.

From 2006, identification rules are included in "Hygiene pack" (that group together regulations concerning pharmaceutic products, animal health, animal feeding and identification). As controls in the name of "paquet hygiène" should address 1% of total livestock units, percentage of sheep and goat farming controls will depend on the importance of sheep and goat in each *département*.

The control points have been drawn from each point of the regulation.

A difficult point to control is the number of circulation documents, as it can concern either only one or a lot of animals.

Further evolutions in requirements, impact of the new system at farm level

In France something concerning notification of S&G death is foreseen to be included in the French regulation in 2008. France decided to implement the electronic system with eartag.

Nowadays, the implementation of sheep and goat identification regulation is very heterogeneous, much more than for bovines (but more recent too). The 20 000 farms benefiting from ewe and she-goat premium are mostly well implementing the regulation, as it is a condition of eligibility to these aids. In other breeding, it is difficult to assess compliance with regulation, but it is supposed to be much less.

Moreover, there are different marks, some of which are less solid. The less solid marks (*barrettes métalliques*) are used for animals to be killed young. That's why the type of marks used determines the future of the animal. The sooner the mark is applied, the sooner the farmer has to decide what will be the outlet of his animals. This was one of the arguments of farmers representative during the negotiations between farmers and the Ministry of Agriculture concerning the limitation of age for lamb and kids to be identified. Finally France chose the maximal limit of age, i. e. 6 months old.

For extensive breeding, the new legislation could imply more costs (one eartag cost = € 0,17), but that would mean these breeding did not apply the previous regulation before.

5.4 Conclusion: the environmental effects of identification and registration issues

5.4.1 Improved identification for refining the stocking density calculation?

After this description of schemes at MS levels, we come back to the environmental dimension of identification and registration.

From an environmental point of view, the most obvious issue linked to animal identification is to make the link between a given number of animals and an amount of land utilised by such animals, at least in principle. The associated technical issue will be the stocking density, identified as a central agri-environmental indicator, with associated risks of overgrazing and/or excessive concentration of manure. To say it more explicitly, the calculation of a stocking density implies to know both a number of animals (addressed by identification) and an amount of land. The interest of such an indicator is quite obvious in the case on intensive animal production (pig and poultry for example), for which the overarching information is the number of animals. It can also be mobilised, on the other extreme, to define a minimum desirable stocking density to prevent encroachment, for instance. One might consider that, as the stocking density is a crucial environmental issue in general, a more precise identification scheme will support, in principle, a better environmental monitoring.

Nevertheless, more detailed analysis suggest that the identification scheme is not really be adapted for capturing environmental issues of sheep and goat through a stoking density issue, for the two following reasons:

- Compared to intensive animal production which environmental impacts can be derived from structural features — a 3 LU/ha in average in most intensive regions of the Netherlands, Bretagne, Spain or Italy is a rather informative environmental indicator in itself —, sheep and goat stocking densities are not that high that they can lead to clear environmental conclusions. Even in S&G sedentary systems with high stocking density (more than 2 LU/ha), there is no clear evidence of classical problems of water pollution for instance, due to drought and low N percentage of manure produced. On the contrary, overgrazing problems might occur in rather extensive situations, the problem being concentration in space and time that can not be captured with average SD [31]. To sum it up, the average stocking density is a general indicator which is useful for a broad understanding of farming systems, but not for environmental monitoring. The new identification scheme will contribute to reduce the uncertainty on the actual stocking density, but with little progress on environmental monitoring. Shepherding will be a much more accurate indicator with this regard.

- The calculation of a stocking density needs to assess the amount of land really used for S&G purpose. It is useless to reach a high precision on the number of animals if a huge uncertainty remains on the amount of land. This issue if of particular importance in many S&G systems. In sedentary systems, when sheep are bred in association with cattle or dairy cows, it is rather difficult to allocate a specific amount of land for sheep purpose only. In UK and Ireland, the high stocking density in sedentary systems are often due to bovine more than ovine. In transhumant and nomadic systems, the importance of common land use in some sheep and goat farming systems, that are quite

[31] — That is the reason why the UK cross-compliance control scheme from 1999 stood on physical evidence of overgrazing at field level and not on stocking density.

numerous in pastoral areas (Mediterranean humid and dry mountains) should be reminded. The typology shows that the highest stocking rates on farm are reached for systems with extensive use of space off farm. In this case, it is quite difficult to estimate the amount of land effectively used by sheep. One pastoral unit managed by one farmer might be 1,000 ha "on the paper" and, in truth, 800 ha (due to encroachment) or 1,200 ha (due to undeclared lent land [32]).

The above discussion does not mean that a better identification scheme is irrelevant in itself, it simply concludes that it does not fully address the environmental impacts of S&G farming systems through better information on stocking density.

5.4.2 Potential indirect impact associated to identification and registration issues through cross compliance

If the above discussion suggests little progress in the field of stocking density issues, the new identification system is recognised to have potential impacts on farming systems through the rules of cross-compliance. Identification issues are central in the statutory requirements dealing with S&G, much more for example than the nitrate directive (sheep farms are mostly below the constraining threshold of 170 kg N/ha).

The issue is then associated to the fact that cross-compliance sanction might cut the payments at the whole farm level. In case of diversified farms, where sheep/goat production is marginal, the risk of being sanctioned on 100 ha of crops for some tags lost on few sheep might, in principle, lead the farmer to quit sheep production. Let us remind that this risk is higher in the sector as, in the 6 MS studied, 32% of farms have less than 20 sheep, which represent only 2% of the heads (source: FSS 2003). This shows how the risk might be exacerbated when production is "spread". There is no evidence yet of what is and will be the magnitude of this risk, but it has been theorised and found economic rationale in research field (Bergschmidt et al., 2003). This risk has also been raised in some interviews.

Full decoupling and little specialised farms logically increases this risk, all the more when the net margin of the sheep is negative, which is frequently the case (see discussion above about the economic impact of the new CAP). The key factor in the future will be the application of sound "proportional" sanction, which concept still is under discussion. For professional and cost-effective farms, the risk is much limited.

If this new system encourage small breeders to stop sheep breeding, this could have some scattered and localised negative environmental impacts. Indeed, the little flocks present on farms orientated towards other production than sheep and goat (either crops or cattle) are often using the poorest lands. These rough grazing would not have value enough for cropping or feeding cattle. In this way, the preservation of little sheep and/or goat flocks, even in intensive cropping or breeding area, participate to prevention from landscape encroachment and/or landscape intensification.

Whatever the development of this risk of quitting the production of sheep, identification rules and cross-compliance can not be recognised as the main driver. It is one factor amongst others, which reveals more fundamental economic problems faced by farmers (i.e. non profitability), which decoupling will make obvious.

Box 2: the case for identification of dead animals: combining biodiversity and sanitary objectives

The identification and registration of dead animals can also be identified as a specific issue, mostly in transhumant systems. Linked to the natural hazards quoted above, the mortality of outdoor animals is relatively high, frequently placing the breeder in position of displaying carcasses of dead animals. The economic cost of withdrawal of individual animals can be significantly high when they are to be taken out from remote places. This issue has been studied in the case of wild vultures (*Gyps fulvus*) populations, which future would be endangered by a strict implementation of regulation (2003/332/CE) vis a vis the disposal of dead carcasses (op. cit.). Under pressure of birds NGO and research body, adaptation has been proposed with authorisation of open-air disposal of dead animals

[32] — In some cases, land owners are reluctant to declare land let for grazing as it might imply legal obligation towards the farmer (AScA, 1996).

under the condition of adapted veterinary controls proving the absence of disease in the carcasses (2005/830/CE). This question of dead bodies is also an issue for extensive pastures in Atlantic areas. There are species of Moth, beetle, fly, small mammal and of course birds (including the chough which feeds on the blow-fly larvae in the carcass) that depend on either open carcasses or shallow buried ones.

Most information in this box from (Sarrazin, 2006)

6 Conclusions and recommendations

6.1 The environmental dimension of S&G farming

Compared with other agricultural sectors, S&G farming is of relatively small direct economic importance for the EU as a whole and in most Member States, even those with a large part of EU S&G production.

Yet S&G farming is a predominant land use over very large areas of land, especially in the more marginal regions of the Atlantic and Mediterranean. This great territorial significance has also a relevant economic importance if all the aspects and environmental effects would be considered in economic terms.

As with most farming sectors, S&G can have both negative and positive environmental effects. However, S&G stand out particularly for their beneficial effects over these large areas of territory, on land that is mostly environmentally fragile. These effects, or potential effects (not always fulfilled), include:

- Maintenance of valued open and diverse landscapes.
- Maintenance of valued grazed habitats, ranging from marshes and steppelands to Alpine pastures, thus leading to the maintenance of biodiversity and the preservation of many rare flora and fauna species.
- Fire prevention, especially (but not exlusively) in Mediterranean regions, and thus prevention of a cycle of fire and soil degradation that can lead to severe land degradation.
- Environmentally positive integration with extensive dryland arable systems (dunging, stubble grazing) in Mediterranean regions.

In addition to this "maintenance" role over extensive areas, the most widespread S&G systems make relatively little use of external inputs (agro-chemicals, manufactured fertilisers and feeds) and thus have a relatively small ecological footprint compared with many farming sectors in the EU.

On the other hand, S&G farming can have negative environmental effects, and has done so in certain areas in recent years. With the data available it is not possible to quantify the negative effects, only to quote examples from particular areas:

- Overgrazing of semi-natural vegetation, including grass, scrub and forest habitats, with negative impacts on the habitat itself as well as on species of fauna associated with the habitat. This problem has affected certain areas with particular environmental sensitivity, such as blanket bog in parts of the west of Ireland, and uplands in parts of Wales and England. In Spain, there has been concern about greatly increased stocking levels in some steppe areas, e.g. in Extremadura and Aragón. In Italy this was true in the past, but now could apply to a very limited part of grazed land.
- Water pollution resulting from stock concentrations and sedimentation affecting water courses (uplands) and from intensified production systems (lowlands) may occur locally in the Atlantic region.

The main negative effects are those resulting from excessive stocking levels and concentration of stock. Although not the only factor, the present study indicates that the CAP S&G regime has played a very significant role in driving up stock numbers since the 1980s (see Policy Section), alongside with other market and technological factors. In other words, while not laying the blame exclusively at the door of the CAP regime, it is clear that the negative environmental effects of S&G farming in recent years have taken place in a particular policy context that encouraged high stocking levels. Without this distorting factor, environmental effects related to overstocking should be less of a concern.

Environmental considerations for the future are in many ways different from those of recent years, due to the dismanteling of the previous S&G support system. Some of the more extreme cases of overstocking are being dealt with already by other policy measures (e.g. in Ireland and parts of UK). In other areas with this problem, the CAP reforms seem likely to result in some destocking, and a more rational approach to stocking from farmers, with potential benefits such as:

- More favourable conditions for semi-natural habitats and associated species
- Reduced risk of soil erosion and water pollution incidents.

Although problems of overstocking seem likely to decline, this does not mean that intensification will cease. In fact, it is likely that only the more rationalised farms will survive in the future, and in some cases this will mean a decline of shepherded grazing systems, and a continued increase in the use of fencing and of sedentary stock using purchased feeds.

However, perhaps the greatest environmental concern expressed during interviews was the threat of abandonment of the particular systems that are most positive in environmental terms, partly because of the characteristics of the systems themselves, and partly because of where they operate.

The process of abandonment in more marginal areas and concentration and intensification in areas with a comparative advantage is well known in Europe for other farm sectors. In the case of S&G this process is of particular concern because of the large areas of environmentally fragile land that currently are maintained by S&G farming systems.

A common feature of the systems that are most beneficial to these environments is management of stock by shepherds. The increasing difficulties in employing skilled shepherds appear to be common to many of the areas in question. Whilst the shepherding function is regarded as essential by many environmental experts, the tendency for policy makers and agronomists is to regard shepherding as an historic curiosity whose disappearance is inevitable.

The process of concentration and intensification on better land, in parallel with abandonment of extensive S&G farming in marginal areas can be expected to have several consequences for the environment:

- A decline in, or cessation of, grazing would lead to a loss of a range of habitats to scrub invasion or afforestation, especially in uplands and mountains and in poorer steppelands, probably contributing to a further decline of already endangered species.
- Declining maintenance of small areas of semi-natural vegetation (grasslands, heaths, marshes, moorlands) in primarily arable or ley grassland landscapes.
- Declining biodiversity value of semi-natural grasslands increasingly under more intensive management (divided into fenced lots, increased use of fertiliser).
- Loss of shepherded flocks on extensive arable steppes in Mediterranean areas and the loss of hefted flocks of sheep in the hills and mountains of the Atlantic region.
- Increased fire risk and increased intensity of fires, due to the accumulation of dry matter on scrub and forest land.
- Increased soil erosion following forest fires, and risk of desertification in the case of repeated fires on the same land.
- Increased use of purchased feeds, more housing of breeding sheep and more intensive, housed finishing of lambs (environmental costs of manufacture and transport and concentration of dung).
- Potential problems of waste disposal from increasingly larger-scale intensive milk systems.

6.2 Analysis of past and present policies: too general to achieve environmental goals

The environmental analysis of the S&G policy must take into consideration the specificities of the sector. Without overlapping the conclusions of the environmental report, one of this specificity is its ability to produce environmental benefits at large scale, mainly in “producing” HNV farmland along with quality products. On the long term, the legacy of traditional S&G farming systems is paramount for European biodiversity, due to the diversity of the sector itself and the way sheep and goats can utilise habitats on semi-natural patterns. Geography and history have been so that when the EC S&G policies take place, in the early 1980’s, large part of this legacy are still in place, even if they had been changing for the last decades.

Previous and existing policy (CAP sheep regime accompanied by other parts of the CAP) has witnessed broadly negative tendencies, in the form of intensification in areas with a comparative advantage and abandonment in others. The sheep premium has contributed to encourage systems that were (more or less) positive to change their management practices (eg stocking density, feed systems) so that they are less positive, and in some cases very negative. Generally speaking the former S&G regime regulated and accompanied the structural changes at play in the sector: increase in productivity on the one hand — the

overall production remains quite stable as the number of animals decreases continuously — and relative maintenance of production in some areas. But in a common market with different farms competing, in the long term, this approach can only alter the trend, not fundamentally change it.

The main mechanisms existing within the CAP are financial incentives, i.e. payments to farmers for doing certain things. The sheep/goat premium is a very simplistic incentive to keep female sheep and goats. Although it has included certain additional mechanisms (such as the option for regional ring-fencing, supplementary payment in LFAs), these have been rather crude and the system has functioned as a blanket support system for keeping sheep and goats.

Although this can help to maintain socio-economic viability of sheep and goat farming in general, such a blanket approach has no guarantees of generating environmental benefits and is in danger of generating environmental problems.

While the S&G premium system cannot be said to have caused all of the tendencies that have created environmental impacts, it is also true to say that no mechanisms have been introduced to provide a greater level of support to less intensive S&G farming systems (as occurred in the beef sector), to farmers keeping smaller flocks, or to support such widely beneficial practices as shepherding. Most Member States have chosen not to take up options existing under the regime, such as national envelopes.

S&G policy questions are not limited to support payments and control mechanisms. One policy concern that emerged from interviews were the difficulties faced by more marginal S&G farms in receiving grant aid for the improvement of basic farm infrastructure (e.g. sheds, livestock handling facilities). Such aid often depends on the preparation of a full modernisation plan, compliance with economic thresholds and the availability of capital, factors that act as serious barriers to many farms. Concern was also raised about the EU labelling system for "traditional" products and for "geographical origin" that do not distinguish between different farming systems (e.g. intensive and extensive).

The decoupling introduced in the CAP reform of 2003 will dramatically change some signals. In some cases, it might lead to positive impacts due to a reduction in animal numbers; in others it might lead to land abandonment or ever more intensive farming systems, which will interpret the more market oriented policy as a signal to maximise productivity and respect the mandatory rules (through cross compliance for example). In other words, the new CAP shares with the previous policies its "blanket" approach. It is unclear how it can maintain the positive legacy from certain S&G systems and help the sector to cope with its future issues.

However, the new policy situation post-CAP reform is not the only driver of the abandonment threat, perhaps not even the principle driver. Social and economic factors are of great significance. Especially in more marginal areas, fundamental issues include the advanced age of many farmers, the limited attractions of S&G farming for young people and the consequent lack of farm successors, the difficulty and expense of finding skilled labour. Partly these issues can be traced back to the farming conditions themselves (long hours of hard work, no holidays or weekends, poor on-farm and off-farm infrastructure, marginal incomes). Decoupling of CAP support adds a further level of disincentive. This socio-economic reality is a major challenge for policy makers, and one which needs to be addressed if environmental objectives are to be achieved.

6.3 The need to set specific objectives

In many of the agricultural areas of Europe with highest Nature Value, sheep and goat farming is virtually the only livestock farming option (either as a specialist system or in combination with others, such as hardy breeds of cattle). The current nature value has often developed over hundreds of years of sheep and goat farming although in recent years policy has often given signals to producers that have resulted in negative environmental effects.

The objective of any new policy approach (in the context of decoupling and letting market forces drive farming activities) should be to help maintain sheep and goat farming in places where it makes an important contribution to the social and economic well-being of rural areas and where it is integral to the preservation and maintenance of High Nature Values.

The environmental objectives of the S&G policy should be:

- To maintain a regional distribution of S&G systems across Europe, avoiding excessive concentration, as this implies a decline and disappearance of systems from many areas where they are beneficial, thus favour the transportation of animals between regions when adapted (in order to reach even distribution).

- To maintain S&G grazing systems on the most marginal land within regions (this requires the identification of the most sensitive areas and farms, and the identification of animals). This might include to favour the cultivation of strategic fodder crops (adapted to regions) to maintain the numbers of grazing S&G in time.
- To specifically support sheep farming with environmental benefits, i.e. grazing on-farm and off-farm according to extensive patterns [33]
- To favour shepherding (an integral element of the most environmentally valuable farming systems, and one which is becoming economically unviable).
- To favour appropriate stocking levels and grazing regimes (minimum and maximum densities, seasonal movements of stock where environmentally beneficial)
- To discourage the tendency to increasingly intensive feeding systems (housing and reliance on concentrates), especially in milk-orientated production but also in meat systems.

National and regional authorities need to develop more concrete objectives, adapted to their particular circumstances. S&G farming should be treated purely as an agronomic-economic sector by agricultural authorities, nor as a land use simply to be regulated by environmental authorities. Rather, an integrated territorial approach is required, in which a viable future for S&G farming is seen as helping to address issues such as wild fires, maintenance of biodiversity and landscapes, soil conservation, and the social fabric and cultural heritage of marginal areas.

6.4 What kind of mechanisms are needed and what are the policy options?

The above objectives can be condensed into two primary aims, for which policy mechanisms need to be implemented:

- To maintain the *basic socio-economic viability* of the more environmentally-valuable sheep/goat farming systems in the areas where their presence is most environmentally positive.
- To encouraging certain farming practices that are environmentally beneficial (e.g. shepherding, hay-making), and discouraging certain practices that are damaging.

The main policy options to be considered in the present study are those available, or potentially available, under the CAP sheep/goat regime. The reality is that these options are rather limited. Fully decoupled premium (as in UK, Ireland, Italy) has few opportunities options to influence the type and pattern of sheep and goat farming. The options are:

- Cross-compliance
- Article 69 envelopes

Cross-compliance should have a role in addressing problems of overstocking, although such problems may well be reduced with decoupling of the headage premium. Minimum stocking levels are also established, in order to fulfill the requirements on land maintenance (preventing scrub invasion). This mechanism may provide an incentive for some farmers to keep some livestock and for land to continue under grazing, whereas in the absence of cross-compliance the economically rational response to decoupling would be land abandonment. However, this is not a secure approach, and is almost impossible to implement on the vast areas of public and common grazing that are under sheep/goat use at present. Neither is the obligatory approach a secure option for maintaining farming systems that are inherently inviable and unattractive in socio-economic terms, especially for young people.

Partially coupled premium (France, Spain, and to some extent Greece) may continue to provide an incentive for sheep/goat farming (meat orientated), but without addressing the problem of competition between the more intensive systems on better land, and the marginal systems that are increasingly not viable. Hence the process of concentration and abandonment is not addressed.

A key conclusion of the study is that such general mechanisms alone are insufficient [34] and there is a need to provide *targeted* measures such as:

[33] — Farming system analysis showed that this could not simplistically be equated to simply "low stocking density" or even absence of high stocking density. Pastoral systems associated to HNV are frequently based on a rather intensive forage area.

- Incentives targeted on specific areas (much more tightly defined than existing LFAs, and with incentives for the most marginal areas or the most marginal farms that are set sufficiently high to maintain the economic viability of low-intensity farming in these areas or on these farms)
- Targeted on specific farming systems, especially those that exploit natural resources at a lower intensity (e.g. lower stocking densities than the average within the specific area).
- Targeted on specific farming practices, such as shepherding, local cultivation of fodder crops, transhumance.
- In addition to incentive payments, there is a need for investment aid in farming infrastructure. Again, this needs to be targeted on specific objectives (such as improving the viability of farms in the most marginal areas), otherwise investment aid tends to be exploited only by the more dynamic farms.

Currently the only mechanism potentially available for a targeted approach under the S&G regime is Article 69 envelopes. These could be used to provide a higher level of aid to certain farming systems and/or areas, for example, with stocking densities below certain thresholds, using shepherding, or grazing more remote and inaccessible pastures. However, it is not clear that Article 69 envelopes are intended for such specific environmental targeting.

Pillar 2 measures are more appropriate for a targeted approach. Although not a focus of the present study, it is apparent from the research undertaken that there is considerable work to be done in developing a more effective package of Pillar measures on the ground in S&G areas.

In particular, there is a striking contrast between the relatively more developed situation in the Atlantic (UK and Ireland) and continental regions (France), where LFA and agri-environment schemes are being used to influence the pattern of livestock farming in sensitive areas; and the situation in the Mediterranean region, where the LFA scheme is far less influential (in spite of the large proportion of land included in the designated areas) and where agri-environment schemes generally have paid less attention to extensive livestock systems.

However, it is important to assess the effects of the new CAP policies not at the end of the policy period, but early enough (for example every two years) by studying the trends in animal numbers and farming types, so that any deviations from the specific environmental targets could be corrected. Environmental changes can sometimes become irreversible if not addressed in proper time.

[34] — For example, the simple shift from an headage to a surface payment would probably be too general and sometimes not adapted (e.g. for pastoral systems) to reach environmental goals

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APPENDIX 1: THE FADN DATA PROCESSING

The FADN data processing intends to capture different types of S&G farming systems combining the following different descriptors (year 2003):

- The location of the farm: in LFA or non LFA area

- The general direction of the farm: meat or milk sheep or milk goat

This indicator is approached comparing the relative gross product of each production.

- The livestock density

In order to keep an overall farm-level approach, this indicator is approached at farm level, considering the whole CAP livestock. 5 classes of LD have been distinguished. Common land is not taken into account in the calculation of the SD.

- The size of flock class (ewes + she-goats)

Four classes of flock size are considered:10-49 ewes+she goats, 50-199, 200-499, more than 500.

According to these indicators one farm type can be described as the combination of the previous indicators. For example: extensive (LD < 0,4 LU/ha) small (10-49 heads) meat farms in mountainous Greek LFA will be one type [35].

For each of these types, several attributes are displayed covering: structure, livestock issues, land use issues, forage systems, economic and policy (payments) issues.

The detail of variables

Population: farms with more than 10 sheep and/or goats (D40AV + D 38AV≥10) [this exclusion criteria excludes around 1-2% of ewe and less than 5% goats representing 10-20% of farms having S&G ; it corresponds also to the minimum size for being eligible to S&G CMO]

Geographic units :

- 6 MS (Greece, Spain, Italy, France, UK and Ireland) with distinction between non LFA, LFA non mountain, LFA mountain
- FADN regions with same distinction LFA/non LFA

Sorting tree

1st level: meat/milk and milk sheep/milk goat

Type = meat;
Type = milk
Milk sheep = (milk+cheese sheep > milk+cheese goat)
Milk goat = (milk+cheese sheep ≤ milk+cheese goat)

2nd level: livestock density

For each previous type, following classes of livestock density:
CAP livestock density > 3 LU/ha [36]
3 ≥ CAP livestock density > 2,5
2,5 ≥ CAP livestock density > 1,8

[35] — In the following pages, when referring to the concept of "farm type", it will be in this meaning.

[36] — Assumed as representing pastoral and landless farms ; we will have an ex-post check with (a) the use of rough grazing (b) the nb of days grazed outside the farm.

The high number of classes is needed by the range of agro-ecological situations: UK requires very low stocking densities and Greece, with a high % of pastoral and landless farmers + intensive systems requires high stocking dentities.

1,8 ≥ CAP livestock density > 1,3
1,3 ≥ CAP livestock density > 0,8
0,8 ≥ CAP livestock density > 0,4
0,4 ≤ CAP livestock density

3rd level: size of flock class

For each previous type x livestock density, four classes of flock size

Type = meat 10-49 ewes+she goats
50-199 ewes+she goats
200-499 ewes+she goats
more than 500 ewes+she goats

Type = milk sheep 10-49 ewes+she-goats
50-199 ewes+she-goats
200-499 ewes+she-goats
more than 500 ewes+she-goats

Type = milk goat 10-49 ewes+she-goats
50-199 ewes+she-goats
200-499 ewes+she-goats
more than 500 ewes+she-goats

Variables displayed

§1 General (8 variables)

Nb of farms in FADN sample
Nb of farms represented [37]
Average nb of ewes
Average nb of she-goats
Nb of labour units
Nb of paid labour units
Average age of main farmer
Total UAA (SE 025)

§2 Farm economy (21 variables)

Gross product from : S&G meat, including purchases and sells; sheep milk; sheep cheese; goat milk ; goat cheese
Specific, general and variable costs
Salaries/wages
Total subsidies and detailed: for crops ; livestock ; for sheep and goat ; for cattle ; Agri-environmental payments ; Compensatory allowances for LFA
Added value/labour unit

§3 Land use (10 variables [9 new variables])

Total UAA (SE 025)
Rented UAA (SE 030)
Arable land (SE 035+SE 041+SE 073) (including set-aside SE 073)
Fallow land (SE 072)
Fodder crops (SE 071)
Temporary grassland (K 147)
Permanent grassland (K 150)
Rough grazing (K 151)
Woodland (K 173)

[37] — For the meaning of underlined variables, see "**Error! Reference source not found.**" below.

Nb of LU*days grazed outside the farm (A 9 (42))

§4 Livestock (8 variables [2 already in "general" §] = 6 new variables)

Total LU (SE 080)
Sheep and goat LU (SE 095)
Nb sheep (D40 AV)
Nb she-goats (D38 AV)
Cattle (SE 090)
Dairy cows (SE 085)
Milk yield/ewe (K 164+K167)/D40 AV
Milk yield/she-goat (K 165+K168)/D38 AV
= 44 variables

Representativeness of data

It should be reminded that FADN covers only professional farms, with different levels of minimum economic size depending on countries.

In addition, each FADN farm represents a certain number of farms at regional level. Nevertheless, when the number of FADN farms is below 15 at a given geographic unit, for reasons of statistical secret, the results are not displayed. This explains why some farm types (according to our approach) are not represented in the processing and only the most represented are captured.

In a word, the data is mostly adapted:

- to capture the general features of professional farm types at member states level, with distinction between milk and meat production,
- to build on qualitative and economic analysis of most represented farms.

APPENDIX 2: PROTOCOL FOR THE INTERVIEWS

General protocol

Each partner set an early list of about 10 experts (researchers, technique institutes, agricultural ministry…) (task 2.2.a), identified as "key" persons.

The expert was first contact by telephone, to expose the project, precise his fields of expertise, and fix an appointment with him, for a further interview by telephone (or in his office when possible).

Before the interview, a *description of the project* -written in his mother tongue- was sent to the interviewee, with an interview guideline (according to his field(s) of expertise, one or several of the 4 guidelines were sent to him).

The *description of the project* is a 6-pages document, including the description of the problematic and methodology of the study, particularly the typology proposed by the team and a table explaining possible environmental impacts according to different breeding practices (figure 15 of the present deliverable).

Task 2. 1. The interviews guidelines

The interview guides and questionnaires were submitted to the steering group on March 8th and formed the conclusive sections of each chapter of the first deliverable.

The following pages show the semi-structured interviews guidelines for each theme, that have been slightly improved compared with deliverable 1:

Environmental impact assessment : questionnaire

Theme considered: Water / Soil quality / Landscapes and biodiversity / Air (GHG, ammonia) / Fire

Short description of the interviewee position according to the themes:

Geographical area of expertise

Experiences within the domain, sources of data mobilised…

General review on the issue considered:

What are the general mechanisms explaining environmental impacts (positive or negative)?

What is the geographical coverage of issues? In which situations is the impact occurring most? What are the evidences?

What are the main factors, linked to agricultural practices or geographical context, explaining the environmental impact? (wider approach than only S&G)

What have been the main changes of these environmental issues through time (for 20 years)? Were some environmental policies determining?

Link with S&G farming:

To what extent S&G farming impact the considered issue? Do you see any difference with regards to farm types?

What are the main characteristics of S&G farming systems that explain the environmental issue?

Alternative to S&G farming: positive vs. negative impacts. (What would happen if sheep and goat farming disappeared? What would replace it?)

Future possible impact of CAP reform on the environment

Key reference: literature, database, contact

Missing data and/or information

Farming systems : questionnaire

Short description of the interviewee position according to the themes:

Scope of the expertise: one production (meat/milk + sheep/goat) and/or one geographic unit (region, country)

Experiences within the domain, sources of data mobilised…

General:

Comments on phase 1 typology (based on structural indicators)? What types of farming systems are present in the geographical area you know?

Description of farming systems (rationale and attributes)

What is economic rationale of the different FS?

Market approach

Production factors (labour force, access to land, capital, know-how,…)

What are the technical consequences on the management of the farms?

Flock size and management of the flock

Forage system

Other (sheep-fold…)

What are the possible alternatives, is S&G a "last option" production or one amongst others?

Trends

What are the main factors explaining the development of the FS? Role of public policies?

Generally speaking, what are those with open future? What are those declining? Which could be the consequences on the environment?

What are the environmental impacts that you recognise associated to the farming systems described?

What need to be sustained/continued, how? What are the improvements needed?

Future possible impact of CAP reform on farming systems

Key reference: literature, database, contact

Missing data and/or information

The sheep and goat premium system: questionnaire

Short description of the interviewee position according to the themes:

Scope of the expertise: one production (meat/milk + sheep/goat) and/or one geographic unit (region, country)

Experiences within the domain, sources of data mobilised…

Some clarification points

(about the level and structure of payments ; conditions on transfer of rights)

Past consequences of CMO (before 2001 and since), on:

geographical repartition of production

intensification of production systems (number of ewes per farm), on breeding practices (sheep-fold/ grazing)

land use (forage systems)

Expected effects of the new policy, on:

- geographical repartition of production

- intensification of production systems (number of ewe per farm), on breeding practices (sheep-fold/ grazing)

- land use (forage systems)

Key reference: literature, database, contact

Missing data and/or information

Identification and registration of animals: questionnaire

Short description of the interviewee position according to the themes:

Scope of the expertise: one production (meat/milk + sheep/goat) and/or one geographic unit (region, country)

Experiences within the domain, sources of data mobilised…

Identification and registration of animals in the country considered

Proportion of animals identified? Does this proportion depend on the category of animals (ewes, lambs, rams…)?

Description of implementation plan

Main changes since 2005 (21/2004/EC regulation).

Possible difficulties: for control organisms, for breeders (what kind of difficulties is it : time, costs, … ? do you think they could lead little breeder to stop breeding ?)

Description of the different databases counting S&G available

Organisation/purposes/validity.

Is it possible to link animals registered with land used by S&G (and particularly with common lands)

Movements registration (register), circulation document: what about transhumant systems? What does happen if an animal dead during the transhumance?

Key reference: literature, database, contact

Missing data and/or information

Task 2.2. list of interviewees by Member State

Greece

Name	Organisation	Position	Address (city, region)	Issues covered, fields of expertise
1. G. Zervas	Agricultural University of Athens	Professor - researcher	Athens, Attiki	S&G farming systems, environmental impacts
2. D. Papavasiliou	TEI of Epirus	Teacher - Researcher	Arta, Epirus	S&G farming systems
3. K. Tsiboukas	Agricultural University of Athens	Professor - researcher	Athens, Attiki	S&G farming systems, policies
4. F. Vallerand	INRA and University of Thessaly	Researcher and consultant	Volos, Thessaly	S&G farming systems, environmental impacts
5. A. Papatheodorou	Ministry of Rural Development	Head of Department on Sheep and Goats	Athens, Attiki	S&G farming systems, policies
6. M. Bisti	PASEGES (farmers organization)	Researcher	Athens, Attiki	S&G farming systems, policies
7. N. Emmanouil	Agricultural University of Athens	Professor - researcher	Athens, Attiki	Fauna biodiversity, landscape
8. C. Kosmas	Agricultural University of Athens	Professor - researcher	Athens, Attiki	Landscape, biodiversity (soil erosion)
9. R. Thanopoulos	Ministry of Rural Development	Functionary-Researcher	Athens, Attiki	Policies, environmental issues
10. G. Vlachos	Agricultural University of Athens	Researcher	Athens, Attiki	Policies, environmental issues
11. I. Zarzouras	Leading milk industry	Veterinarian - consultant	Athens, Attiki	S&G farming systems
12. S. Siokos	PASEGES (farmers organization)	Researcher	Athens, Attiki	S&G farming systems, policies
13. C. Ligda	NAGREF	Researcher	Thessaloniki	S&G farming systems
14. G. Georgiadis	VAKAKIS	Researcher	Athens, Attiki	S&G farming systems
15. P. Giamas	Museum of Natural History	Researcher	Athens, Attiki	Flora and fauna biodiversity Enviromental issues

Spain

Name	Organisation	Position	Issues covered
1. Antonio Fernández 2. Ana Redondo 3. Pedro Díaz	MAPA, Subdirección General Vacuno y Ovino, Madrid.	Sub-director General Head of section	Characteristics of the sector, production systems, trends. Economic situation. CAP implementation. Environmental effects. Further contacts.
4. Juan Antonio Robles Martínez	MAPA, Ordenación y Buenas Prácticas Ganaderas, Madrid	Sub-director general	Identification system.
5. Rafael Caballero	CSIC Toledo	Researcher	Extensive livestock systems studied under LACOPE project. Castilla la Mancha sheep systems. Environmental effects. Policy effects.
6. Alejandro Argamentería	SERIDA Asturias		Situation and tendencies in Asturias. Environmental effects. Policy effects.
7. Benito Fernández Rodríguez-Araujo	Servicio de Desarrollo Rural, Gobierno Regional de Cantabria	Head of service	Situation and tendencies in Cantabria. Environmental effects. Policy effects.
8. Juan Carlos Cirera 9. Tomás Escriche	Sociedad Española de Ornitología / Birdlife Aragón	Representative SEO Member SEO	Sheep systems in Aragón steppelands. Environmental effects. CAP. Agri-environment.
10. Eduardo de Miguel	Fundación Global Nature, Madrid	Director	Environmental effects. Policy effects.
11. Alberto Llona 12. Helen Groome	EHNE Basque Country		S&G systems in Basque Country. CAP. Geographical denominations. Environmental effects.
13. Antonio Guerra Cabanillas	Oviso S.C.L Cabeza del Buey (Badajoz).	Manager	Production systems and tendencies. Environmental effects. Policy effects. Identification system.
14. Alfonso San Miguel	ETSI Montes, Universidad Politécnica Madrid	Profesor	Environmental effects. Past and future tendencies.

France

Name	Organisation	Position	Address (city, region)	Issues covered, fields of expertise
1. M. de Rancourt	ESA Purpan	Teacher-researcher	Toulouse, Midi-Pyrénées	Sheep farming systems, environmental impacts
2. E. Tchakérian	Institut de l'élevage (technique institute)	Coordinator of sheep services	Montpellier, Languedoc Roussillon	Sheep farming systems
3. E. Caramelle Holtz	Institut de l'élevage (technique institute)	Coordinator of goat services	Toulouse, Midi-Pyrénées	Goat farming systems
4. JP. Legeard	CERPAM	Director (and president of AFP)	Manosque, Provence Alpes Côte d'Azur	Pastoral systems, fires and landscapes
5. Annick Gibon	INRA SAD Toulouse	Researcher	Toulouse, Midi-Pyrénées	Spatial management, landscape
6. Jean-Claude Souty	CORPEN	Director	Paris, France	Air pollution
7. Séverine Farineau	Agence de l'eau LB	Service agriculture	Poitiers, Poitou-Charentes	Water pollution
8. Jérôme Gauthier	Ministry of agriculture	DPEI	Paris, France	Policies
9. MB Barral	OFIVAL (payment agency)	Study service	Paris, France	Policies
10. Pascal Marty	CNRS	Researcher	Montpellier, Languedoc-Roussillon	Landscape, biodiversity, (soil erosion)
11. Claire Le Bigot	Ministry of agriculture	DGAL – bureau d'identification	Paris, France	Identification

Italy

	Organisation	Position	Address (city, region)	Issues covered, fields of expertise
1. Anna Acciaioli	Università di Firenze	Teacher Researcher	Firenze, Toscana	Sheep farming systems and products
2. E. Isocrono	Istituto Zooprofilattico Sperimentale Abruzzo e Molise.	National Register of sheep and goats - Director	Teramo, Abruzzo	Identification
3. T. Chiarini	Federazione Nazionale Agricoltori	Policy and payments Sector - Head of office	Roma, Lazio	Policies
4. G. Pulina	Università di Sassari Facoltà di Agraria	Teacher Researcher	Sassari, Sardegna	Farming systems, products and policies
5. V. Simbolo	Ministero Politiche Agricole	Dip. Agricultural Policies - Director	Roma, Lazio	Policies
6. F. Steidl	A.G.E.A.	Payments zoothecnical sector	Roma, Lazio	Policies, payments
7. P. Ruocco	Ministero della Salute	Dip. Public Veterinary Health - Director	Roma, Lazio	Identification
8. M. Bianchi	Università di Torino Facoltà di Agraria	Teacher Researcher	Torino, Piemonte	S&G farming systems and products
9. G. Bracciaferri	ASSONAPA	Technical sector, responsible	Roma, Lazio	S&G farming systems
10. R. Rubino	Istituto Sperimentale per la zootecnia	Section Sheep and Goats - Director	Potenza, Basilicata	Pastotal systems, fires
11. A. Lanza	Università di Catania Facoltà di Agraria	Teacher Researcher	Catania, Sicilia	Farming systems, products, environmental impact
12. Carla Fabro	Università di Udine	Teacher, Researcher	Udine, Friuli	Farming systems, landscape, biodiversity
13. G. Martemucci	Università di Bari Facoltà di Agraria	Teacher, Researcher	Bari, Puglia	S&G farming systems
14. G. Menchini	Agenzia Regionale per l'Ambiente	Technical Scientific Director	Palmanova, FVG	environmental impact

Ireland

Name	Organisation	Position	Address (city, region)	Issues covered, fields of expertise
1. Ton O'Donnell	DAFRD	Principal Agricltural Officer	Dublin	In charge of Animal Health and Animal Welfare. Identification
2. Kevin Kinsella	IFA	Policy and Livestock Specialist	Bluebell, Dublin	Environmental impacts, policy effects and framing trends
3. Oliver Healy	DAFRD	Senior inspector	Johnstown Castle,Wexford.	Agri-envionment schemes in Ireland
4. Andy McGarrigall	DAFRD	Principal	Dublin	Environmental issues
5. Liam Lysaght	Heritage Council	Wildlife Officer	Kilkenny	Farmland and biodiversity (HNV)
6. Andy Bleasdale	NPWS	Researcher	Galway	Overgrazing by sheep and remedial measures
7. Andrew Kinsella	Teagasc	Advisor	Coolruss, Co Wicklow	Ewe Premium Scheme
8. Gerry Gunning	IFA	Policy Officer	Bluebell, Dublin	Support payments and LFA

United Kingdom

Name	Organisation	Position	Address (city, region)	Issues covered, fields of expertise
-Peter Morris	NSA	Chief Executive	Malvern, Worcestershire, WR13 6PH	Environment, policy and Identification
-Gareth Morgan	EN	Agriculture Policy Officer	Northminster House, Peterborough	Environmental impacts, policy effects and framing trends
- Brian Pawson	CCW	Senior Land Use Policy Officer	Swansea, South Wales	Agri-envionment schemes, rural development and policy
- Christine Reid	EN	Agri-environment Officer	Northminster House, Peterborough	Environmental issues
- Georgina Dobson	EN	Livestock and hill farming policy officer	Northminster House, Peterborough	Agriculture policy in the uplands
-Dan Hunt	EN	Deputy Manager for the Lake District	Kendal, Cumbria	Overgrazing by sheep and remedial measures
-Barbara Bremner	SNH	Agricultural Advisor	Inverness	Biodiversity, environment and agriculture
-Edward Adamson	NSA Northern Ireland	Secretary	Belfast, NI	Sheep production systems in NI
- Stuart Ashworth	QMS	Economist and senior business analyst	Inglestone, Edinbugh	Sheep typology, trends in production

APPENDIX 3: DETAILED TYPOLOGY FOR ATLANTIC REGION

The typology includes 9 sheep meat production systems (AC1 to AC9). All of these systems can be found in the UK and five of them (AC1,3,4,5 and 8) in Ireland

AC 1 – Arable / sheep systems. This is a specialized system characterized by arable production on good agricultural land in the UK lowlands with sheep (mostly lambs for fattening) being grazed on the poorer uncultivated land, on stubbles and in some cases on crops grown specifically for them. In Ireland these have in the past included oats, grass, turnips and sugar beet. The removal of the sugar beet subsidy has ended sugar beet production in Ireland and is likely to have the same effect in the UK. This may further reduce the number of sheep associated with this system.

AC 2 – Specialist Systems on natural grasslands. This is not a common system but there are areas of southern England such as the Brecklands of East Anglia, Salisbury Plain and parts of Kent where sheep farming (producing early lambs) is a commercial option. It may also occur in the Continental region in parts of Germany and France (North of Massif Central, Limousin)

AC 3 – Dairy and other specialist cattle / sheep systems. A mixed system with less than 10% sheep, found on productive farms on the best agricultural land, where there was no beef extensification premium incentive. Stocking density could be some of the highest found reaching 2.0 LU/ha or more.

AC 4 – **Lowland suckler beef / sheep systems**. This is the most common type of farm that includes sheep production in the lowlands. Some farms also include arable production and stocking densities would generally be close to 1.4 LU/ha or 1.2 LU / ha when the extensification premium was in place.

AC 5 - Specialist lowland sheep systems. These farms are 100% sheep farms, maintaining a flock of breeding ewes on high productivity grasslands producing mid-season fat lambs for slaughter. Stocking densities would be high (no extensification payment was paid on sheep) often reaching 2.5 LU / ha. One example from Northern Ireland was of 3LU/ha. As a proportion of total sheep farms their importance is small, for instance in Ireland less than 5% of farms with sheep.

AC 6 – Upland cattle / sheep systems. This mixed system is mostly found on the better land in the LFA in the UK, where there is a relatively high proportion of natural or managed grasslands. It is distinguished from AC7 by having approximately 60% of the Standard Gross Margin from cattle, more than 50% cattle in the LU and a stocking density of between 0.8 to 1.8 LU/ha.. It is found in Scotland in the Black Isle, Easter Ross and Orkney, also in parts of Northern Ireland and parts of Wales. It is not a system that is recognized in Ireland

AC 7 – Upland sheep / cattle systems. This is the equivalent system to AC6 but on poorer agricultural land in the LFA where there is less grassland and more natural vegetation. More than 60% of the farm Standard Gross Margin would be from sheep (selling 60% of lambs for slaughter). Cattle would represent between 10 and 50% of the LU and stocking densities vary between 0.2 and 1.4 LU/ha. It occurs in the Highlands and Islands and the southern uplands of Scotland and in England on Dartmoor, Exmoor, Bodmin Moor and the east side of the Yorkshire Dales. In Ireland it is found around the margins of the western upland areas although during the past twenty years many of these farms have stopped keeping cattle – effectively putting the farm into the AC8 category.

AC 8 – Extensive hill and mountain sheep systems. These are the systems of the

Welsh mountains, the English Lake District, the southern Uplands of Scotland as well as Perthshire, NW Sutherland, Wester Ross and the crofting areas of the Highlands and Islands. It is the most well known Irish sheep system and that which is found throughout the western counties of Ireland. Hill breeds of sheep are used, either bred pure or crossed with a low-ground breed sheep to produce a better meat lamb and a female sheep that can be sold for breeding in the lowlands. Pastures are predominantly natural vegetation. Stocking densities typically vary from as low as 0.15 LU / ha (lower in some parts of Scotland) to 0.6LU / ha and higher in areas that would be regarded as overgrazed.

AC 9 – Conservation grazing systems. There are parts of the UK (and the Netherlands and Germany) where livestock farming has virtually ceased and where the semi-natural vegetation (often now on nature reserves or special sites) originated under pastoral farming. In these situations grazing is needed maintain the open habitats and to prevent reversion to scrub and woodland. Contract farmers graze these areas seasonally using traditional breeds grazing at very low stock density (< 0.2 LU/ha).

APPENDIX 4: SHEEP FARMING TYPES AND DISTRIBUTION IN SPAIN

This map does not include the Canary and Balearic islands. Goat farming systems are not shown. These are present on a considerable scale in southern Spain (Andalucía and Canary Islands especially). The table following the map describes the main characteristics of each system, and their tendencies.

Map 3: Broad distribution of sheep systems in mainland Spain (background of Natura 2000 sites, rivers and regional borders). See following table for key to the coloured rings.

Zones		*Main production in order of inportance*	*Breeds*	*Systems*	*Tendencies*
	Atlantic	Three-milk cheeses (Cabrales, Gamoneu,Picón) Meat	Lacha (north) Churra (south) Castellana (south)	Extensive grazing on upland grasslands. Combined with cattle and horses. Flocks smaller than national average (50-100 head).	Abandonment of upland summer pastures. Changes to cattle and horses. Problems with wolves.
	Pyrenees west	Milk/cheeses (Idiazabal, Roncal). Meat	Lacha Carranzana Rasa-Aragonesa	Lowland grassland in winter, upland commons in summer. Not shepherded (flocks are visited daily). Some sedentary flocks in valleys.	Abandonment as older farmers retire. Intensification of milk production (more time indoors, more imported feeds). Less shepherding, abandonment of marginal land (e.g. steep slopes). Problems with wolves in more marginal areas of south and west add to abandonment pressure.
	Pyrenees central	Meat (Ternasco de Aragón)	Rasa-Aragonesa, Arenesa, Ansotana.	Arable stubbles/fallows and dry rough-grazing in winter, upland and alpine grasslands in summer. Shepherded.	Tendency to very large flocks on dry rough-grazing. Decline of shepherding on the plains. Replacement of sheep by cattle in mountains.
	Mediterranean mountains	Meat. Early-weaned lambs	Segureña, Ojalada Castellana, Alcarreña, Merina	Shepherded systems using valleys in winter and uplands in summer. Still some trashumance to southern Spain (by lorry).	Abandonment at higher altitudes.
	Castillian plains north	Milk/cheese (Castellano, Zamorano) Meat	Castellana, Churra	Landless sheep farmers using private arable stubbles and fallows. Also private fenced land and indoor systems.	Decline of shepherding, rapid development of intensive indoor systems.
	Castillian plains south	Milk/cheese (Manchego) Meat	Manchega, Ojalada, Alcarreña, Segureña	Landless sheep farmers using private arable stubbles and fallows for part of the year. Shepherded.	Poor motivation of young farmers. Lack of co-operative behaviour between arable and sheep farmers. Trend to indoor feeding. Consolidation in fewer, larger flocks.
	West	Meat. Some milk for local cheeses (e.g. La Serena, Casar, Pedroches)	Merina	Flocks mostly on private fenced land in dehesas and steppelands, not shepherded. Some landless flocks with shepherding.	Ownership of pastoral resources provides greater economic and social stability than in other regions. Competition with cattle, Iberian pig, and big game operations.
	Mediterranean coast	Meat	Various	Grazing on horticultural crop residues.	Concentration of finishing of early-weaned lambs from other regions.

APPENDIX 4: S&G farming typology abd distribution in Italy

Continental	Regions	Sheep systems
Alpine	Piemonte Lombardia Trentino Alto Adige Veneto Friuli Venezia Giulia	Systems mainly producing meat. Lamb, Heavy lamb, and castrated and in some case light lamb (Agnello sambucano). Seldom milk as accessory production to obtain in farm traditional local cheese (Ricotta, pecorino, mixed cheese). Sedentary natural grassland. Sheep use high proportion of natural during grazing period limited by height; requires winter feed, mainly hay produced during summer from grassland in the bottom of the valley. Also off-farm feed could be used. Transterminance and vertical transhumance during grazing period (100 150 days). Flocks are more frequently shepherded. Quite frequent the association with cows. The stocking rate of sheep is variable.
Plains, Hills	Piemonte Lombardia Veneto Friuli Venezia Giulia Emilia Romagna	Systems mainly producing meat and milk; sometimes only meat or milk. Lamb, light lamb and, in some case, heavy lamb. Milk is transformed on farm or collected to produce local traditional cheese Sedentary crops+grassland
Apennine	Emilia Romagna, Toscana Umbria Marche Abruzzo Molise	Systems mainly producing meat and milk; sometimes only meat or milk. Lamb, light lamb and, in some case, heavy lamb and castrated. Milk is transformed on farm or collected to produce local traditional cheese Sedentary crops+grassland Pastoral in transitional areas between Continental and Mediterranean zones
Mediterranean		
Centre	Liguria Toscana Lazio	Systems mainly producing meat and milk; sometimes only meat or milk. Milk is often collected by creameries to produce traditional and labelled cheese. Tuscany profile is now influenced by the presence of Sarda breed. Sedentary crops+grassland
South	Campania Puglia	Systems mainly producing meat and milk; but also only meat or milk. Lamb, light lamb and, in some case, heavy lamb. Milk is transformed on farm or collected to produce local traditional and labelled cheese Pastoral on and stubble and fallow
Mountainous	Basilicata Calabria	Systems mainly producing meat and milk or only meat. Lamb, light lamb. Milk is transformed on farm or collected in small cremeriesto produce local traditional cheese Pastoral on and stubble and fallow
Islands	Sicilia	Systems mainly producing meat and milk; but also only milk or meat . Lamb, light lamb. Milk is transformed on farm or collected to produce local traditional and labelled cheese Sedentary crops+grassland
	Sardegna	Systems mainly producing milk; light lamb (Agnello Sardo) Sedentary managed forage area

APPENDIX 5: Archetypes from FADN used for 2005-future analysis

The following table and comments deal with 5 archetypes of meat-sheep farms. They were characterised from FADN data, displayed at NUTS 2 level, according to the location of the farm (in LFA or not), the stocking density class and the flock size class.

These archetypes aim at illustrating contrasted situations all over Europe. They were chosen with regards to the regions which faced most changes under the 1980-1992 period (see above).

They belong to both Atlantic and Mediterranean area, but none belong to continental area, as no detailed data were available for this area at NUTS 2 level (i.e. no data available in the French database).

	ATLANTIC		MEDITERRANNEAN			CONTINENTAL	EU
NUTS2 region	England-North	Scotland	Umbria	Extremadura	Sterea Ellas-Nissi Egaeou-Kriti	Bourgogne	EU 15
size of flock	50-199	> 500	10-49	200-499	50-199	50-199	205
location of the farm	not in LFA	in LFA not mountain	in LFA mountain	in LFA not mountain	in LFA mountain	in LFA not mountain	/
stocking density (LU/ha)	1.8 < SD <= 2.5	SD <0.4	0.4 < SD <= 0.8	0.4 < SD <= 0.8	SD >3	0.8 < SD <= 1.3	1,1
type denomination	sedentary mixed system on managed grassland	sedentary specialised system on semi-natural land	sedentary mixed system on managed grassland	sedentary specialised system on semi-natural land	transhumant specialised system on semi-natural land	sedentary mixed system on managed grassland	European average
average UAA (ha)	98,4	**1470,2**	18,0	96,6	**5,8**	**134,8**	**87,2**
UAA/a.w.u	55,9	700,1	15,5	85,4	4,4	78,9	56,6
total ewes and she-goat	117,6	1047,7	24,6	289,8	132,9	104,8	205,5
% sheep and goat	**23%**	**72%**	**44%**	**67%**	**98%**	**14%**	**46%**
days off farm/LU	6,7	25,3	0,7	**126,6**	84,9	0,0	18,4
% foder area/UAA	42%	100%	62%	84%	30%	82%	74%
total foder area (ha)	40,8	1468,3	11,2	81,5	1,7	110,4	64,9
% permanent grassland	**69%**	5%	10%	**59%**	63%	96%	45%
% temporary grassland	26%	1%	**89%**	0%	0%	3%	13%
% forage crops	4%	0%	1%	1%	37%	1%	3%
% rough grazing	2%	**94%**	0%	**40%**	**0%**	**0%**	**39%**

Gross product/a.w.u.	**82384,1**	32617,6	29708,6	29503,5	17133,6	46827,5	39191,6
S&G product/a.w.u.	7593,2	**20068,6**	2285,3	14949,6	**11594,7**	**5109,9**	**9802,6**
S&G product/sheep+goat	113,6	40,2	107,8	58,3	114,3	83,4	73,5
% milk on S&G product	0%	0%	0%	7%	38%	0%	5%
% S&G/gross product	**9%**	62%	8%	51%	68%	11%	25%
Total costs/a.w.u.	36663,1	19738,1	4922,4	12837,2	5271,8	20397,1	16693,5
Total feed costs/a.w.u.	15536,9	10183,3	3007,8	11117,7	3929,8	10895,3	8012,3
Feed cost/LU	259,7	102,5	505,7	258,5	232,9	157,0	177,5
% costs/gross product	45%	61%	17%	44%	31%	44%	43%
Farm Net Value Added/a.v	34779	27801	22279	24696	13321	29380	21569
Total subsidies/a.w.u.	19512,5	**35510,5**	4145,7	11696,5	**4056,5**	**33299,4**	**15144,2**
S&G subsidies/a.w.u.	1581,3	15174,3	514,7	5328,3	1796,9	1567,8	3188,3
% S&G subsidies/subsiidi	8%	43%	12%	46%	44%	5%	21%
% LFA subsidies	0%	27%	11%	9%	27%	5%	10%
% AEM subsidies	1%	8%	8%	0%	0%	11%	10%
% crop subsidies	**52%**	0%	38%	12%	27%	18%	26%
% subsidies/net FNVA	56%	**128%**	19%	47%	**30%**	**113%**	**70%**

(Source: FADN, 2003)