Possible Options for the Better Integration of Environmental Concerns into the Various Systems of Support for Animal Products

Steve Goss, Eric Bignal, Guy Beaufoy and Nicola Bannister

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POSSIBLE OPTIONS FOR THE BETTER INTEGRATION OF ENVIRONMENTAL CONCERNS INTO THE VARIOUS SYSTEMS OF SUPPORT FOR ANIMAL PRODUCTS

VOLUME I

Final report for

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submitted by

CEAS Consultants (Wye) Ltd
Centre for European Agricultural Studies

and

EFNCP
European Forum on Nature Conservation and Pastoralism

Telephone: 01233 812181
Fax: 01233 813309
E-mail: 100451.44@compuserve.com

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This study was conducted by:
Dr Steve Goss
(CEAS Consultants Ltd)
Dr Eric Bignal
(European Forum on Nature Conservation and Pastoralism)
Guy Beaufoy
(European Forum on Nature Conservation and Pastoralism)
Dr Nicola Bannister
(CEAS Consultants Ltd)

Case studies were conducted by the following members of the
European Forum on Nature Conservation and Pastoralism:
Dr Eric Bignal
(EFNCP)
Guy Beaufoy
(Asociación para el Análisis y Reforma de la Política Agro-rural)
Dr Rainer Luick
(ILN-Singen)
Dr G Zervas
(Agricultural Universtity of Athens, Greece)
Dr C Bredy
(Alpine farming expert)
Dr F Petretti
(Conservation Consultants - WWF Italy)
K Héteau
(ALDIS)
C Donnars
(ALDIS)
G Jones
(European Forum on Nature Conservation and Pastoralism)

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The research was conducted during 1996, with most of the case studies carried out in the autumn, and so the study reflects the policies then in place, as well as the policy developments which occured over the course of 12 months. 1996 was also the year in which the BSE crisis exploded, leading to the worldwide ban on exports of British beef and a crisis in the EU beef industry; this factor was ignored in the study, on the grounds that the BSE crisis should be a much shorter-lived event than the "greening" of the Common Agricultural Policy.

As the main study team was based in the UK, many of the examples used for theoretical analysis relate to Northern European systems. However, the case studies where our policy proposals were tested and developed, were spread throughout the EU to reflect the full range of agri-environment conditions.

Contents

Market and green ecu exchange rates - 1996

	Currency	Green ecu	Market ecu[1]	£ Sterling[1]
Germany	Deutchmark (Dmk)	1.9195[2]	1.90686	2.33
Italy	Lira (Lit)	2,033.57[3]	1,963.17	2,396.13
UK	Sterling (£)	0.821868[4]	0.819309	-
Spain	Peseta (Pta)	165.198	160.502	195.90
France	French franc (FFr)	6.61023	6.48766	7.92
Greece	Drachma (Dr)	311.761	305.456	372.82

Notes:

1. Average value for the whole year.
2. The Dmk green ecu depreciated 9 times during 1996 and the figure given is the average value.
3. The green lira appreciated 3 times during 1996 (to a high of 1,973.93 on 1 October) and the figure given is the average value.
4. The green £ appreciated twice during 1996 (to a high of 0.809915 on 1 November) and the figure given is the average value.

Executive summary

The brief of this research project was to propose new forms of livestock support policy which benefit the environment, maintain farm incomes and do not increase budgetary expenditure. In recent years the broadening objectives of the Common Agricultural Policy (CAP) have led to considerable modifications to the original CAP yet the main instruments all remain production-supporting measures. The CAP "accompanying measures" have made important contributions towards introducing environmental considerations into agricultural policy and practice, but these measures are peripheral to the main driving force of the CAP. Furthermore, there are clear contradictions between what is regarded as mainstream agricultural policy (price support and headage payments) and much of agri-environmental policy.

In the introduction to the report we describe how the CAP attempts to achieve multiple objectives through the blunt instrument of production policies, albeit with ever more complex modifications. We draw the analogy with trying to chisel wood with a screwdriver: it can just about be done but it is not very easy and it does not do the job very well; it is far better to use the right tool for the job. This study is about trying to find the chisel - developing the right tool to achieve today's objectives for agricultural policy.

Attitudes to agricultural policy developments amongst politicians and the public are changing rapidly. When this study began in March 1996 it is fair to say that sudden and substantial cuts in agricultural support were regarded as politically unrealistic. A year on, and following increasing public interest in agricultural policy, the situation is considerably different. At the same time the attention of policy makers is clearly focused on the next round of GATT negotiations and the process of EU enlargement. Rural development and environment issues are increasingly being considered as fundamental to the next round of agricultural policy reforms, and it seems realistic to envisage a time when farmers will no longer receive production support as of right, but where money is clearly targeted on specific environmental or social objectives.

The recommendations of the report concentrate on the brief outlined above, together with suggestions on how this could be developed further to meet the agreements on GATT and move closer to the "green box " CAP of the future.

Chapter 2 of the report reviews the current livestock policies applied in the EU, both the direct support of headage payments and the indirect effects of price support. These two forms of support constitute a very significant proportion of the total returns to livestock producers: we estimate that beef and sheep producers receive only 40% of their returns from their output if valued at world market prices, with a further 40% coming from price support and 20% from headage payments; almost identical figures apply to sheepmeat. Headage payments do not apply to the dairy sector, where it is also more difficult to estimate the effects of price support because of uncertainty about how the world market would respond if EU milk price support were withdrawn; various estimates place the role of price support at somewhere between 25% and 63% of dairy farmers' total returns.

These "mainstream" CAP polices apply in almost the same form across all Member States, whilst the agri-environmental measures exhibit much more national and regional variation, and we present

only a brief review of agri-environmental schemes under Regulation 2078/92. The existence of a wide variety of 2078/92 incentives for farmers to carry out management practices which are not production-orientated has influenced our thinking on the practicality of new options for livestock policy in the future. An objective of the study has been to look at how a revised form of livestock support could integrate these existing measures more closely with basic support payments. This would not only have administrative benefits but would also help to build on the initiatives already taken to influence farmers' attitudes towards more environmentally benign management practices.

Chapter 3 reviews the economic links between policy and the environment, considering firstly how livestock support policies influence livestock systems, and how this in turn affects the environment. The high levels of price support in the grazing livestock sector encourage farmers to increase overall output, both output per animal (achieved through improved breeds, supplementary feeding etc.) and output per hectare (achieved through higher stocking rates, increased fertiliser usage etc.), whilst headage payments encourage farmers to increase the numbers of animals per hectare, even sometimes at the expense of individual animal output.

Over a dozen different ways are listed in which livestock systems influence the environment - either positively or negatively. It is observed that some of these, such as increased stocking rate or fertiliser use, may be directly linked to CAP support, whilst others, such as the replacement of hedges by barbed wire fences or of hay by silage, are largely the results of technological change, whose adoption CAP policy may at most have accelerated by a few years.

A theoretical, indicative model is used to consider the range of different objectives which society might set for the countryside, and to investigate how changing the emphasis between the different objectives affects the "optimal" level of production. The current emphasis on "extensification" can be seen as a shift in society's emphasis away from the social objectives of production, farm incomes and rural employment, towards the environmental objectives of landscape, species diversity and pollution avoidance.

Finally this model is used to look at the effects of agri-environmental conditions on optimal production. If the same weighting between agricultural and environmental objectives was employed in all areas, society's overall objectives would best be met by relatively intensive production in areas of high fertility (where the environmental goal of rich species diversity may already be almost unattainable) and much less intensive production in less fertile areas, where "environmental goods" can be produced efficiently. Clearly this broad conclusion needs to be fine-tuned to reflect the existence, within regions of intensive farmland, of areas of high environmental value, either because of their particular natural features or because of the value placed by residents on having attractive landscapes and wildlife where they live. However, this analysis does confirm that the targeted approach of encouraging particular features and habitats, and combating pollution, within areas of relatively intensive farming is much more efficient than aiming for a general de-intensification of production in these areas .

The detailed economic relationships in one important system - lowland dairying - are developed in Chapter 4 through detailed modelling. This shows, as expected, that CAP price support encourages more intensive production, with higher stocking rates and nitrogen use than would be employed at world price levels. However, it also shows that the technical and economic

relationships in lowland dairying are such that, at any level of prices which justifies dairying at all, the farmer has a strong incentive to use quite high stocking rates and fertiliser applications (e.g. 2.5 LU/ha and 300kg N/ha - easily sufficient to wipe out most floral species diversity). Thus the relative lack of environmental interest on most intensive dairy farms cannot be attributed to CAP price support.

Moreover, milk quotas go a long way to offsetting the effects of CAP price support, and where farmers are either constrained by their milk quotas or have had to buy or lease additional quota, their current level of intensity is probably very close to that which would be optimal under a situation of world prices and no milk quotas.

However, CAP milk price support considerably increases the "cost" to a farmer of entering any kind of environment scheme which would require him to reduce his intensity of production and hence his milk output. With the current high price of milk he stands to lose much more by reducing production than he would at world prices, and thus any voluntary environmental scheme has to offer much greater incentive payments than would be required in the absence of CAP price support - a concrete example of the current contradiction between agricultural and environmental policy.

Some of the scientific links between livestock systems and the environment are reviewed in Chapter 5, again using the example of northern European lowland grasslands, as employed in the dairy modelling of Chapter 4. The examples cited - the relationships between stocking rate, fertiliser use and cutting date, and the botanical diversity of grasslands or the breeding populations of meadowland birds - are used to draw out some of the ecological complexities rather than to act as indicative models of wider biological relationships. It became obvious in our researches that many of the ecological relationships on farmland are not fully understood (even by agricultural ecologists) and few have been documented. Even where there is a good understanding of the causal relationships between farming operations, habitat creation and wildlife populations, value judgements have to be taken to set the optimum management priorities.

It also became clear that the "environmentally optimum" levels of stocking rate and fertiliser use (0.6-1.25 LU/ha and $<$25kg N/ha, respectively) are very much lower than the agricultural optima for fertile lowland grasslands. Here there is a strong conflict of interests, and on many soils the natural and residual fertility has already rendered them of limited value to many plant species. However, on less fertile grasslands, such as those found in many mountainous or Mediterranean areas, the agricultural and environmental optima lie much closer together, and it is quite realistic to pursue environmental goals through appropriate livestock systems.

Having identified the substantial national and regional differences in both livestock system and environmental characteristics, it is clear that some form of regional division is needed to analyse and develop new policy options. In Chapter 6 the concept of "agri-environmental zones" is introduced: areas of broadly similar environmental conditions where a similar set of livestock systems can potentially be found. If the effects of livestock policy vary between places, then there must be a case for differentiating policies between different zones. Such zonal polices have other advantages and zonation is an approach already applied within the CAP to some extent. The zones defined in this report have both administrative and biological meaning; their primary division is into the six biological regions of the EU Habitats Directive (Atlantic, Continental, Mediterranean, Alpine,

Boreal, Macronesian). The secondary division is into mountain and non-mountain areas following the already recognised boundaries of the Mountain Less Favoured Areas (LFA). The study focuses on seven zones (Macronesian and Boreal are not considered) but it would be desirable to further subdivide these zones to enhance the effectiveness of policies when agricultural support changes from the current pan-EU approach to a zonal basis. Statistical data for the seven zones are summarised in a series of tabulations at the end of Chapter 6.

It is in Chapter 7 that we develop our thinking on how alternative systems of livestock support might be introduced, review the potential options and explain why we believe the system we have recommended - the Forage Area Payment Scheme (FAPS) - could meet our objectives of redistributing current support in a more production-neutral and environmentally beneficial manner. Our proposals are essentially a unified system of area payments for all of the livestock sectors, which would provide a much more robust basic level of support upon which further levels of environmental measures could be applied without any fundamental contradiction.

To develop the FAPS logically (if not necessarily chronologically) policy adaptation would proceed through three stages: initial re-balancing of livestock support to make it completely production neutral (de-coupling); monitoring the effects of the revised policy against specific objectives for each zone; followed by further re-balancing towards payments targeting the specific environmental objectives of each region.

The methodology using a zonal (or sub-zonal) basis for calculating payments would require the following steps:

- define zones in which livestock systems and forage productivity are relatively homogeneous (e.g. the agri-environmental zones described in Chapter 6);
- calculate total receipts in the zone from livestock support for a reference year or years;
- divide total receipts by total forage area in the reference year(s) and use this as the standard forage area payment for the region, incorporating an adjustment to take account of the area of land used by dairy cows.

We propose that the straightforward re-allocation of all existing livestock support to an area basis would comprise the new basic level of support; this we have called "Tier 1" payments.

Subsequent tiers would provide additional rates of payment for more targeted environmental management activities. For example a three-tier support system might comprise:

- Tier 1 - basic livestock support, paid on an area basis without any special environmental conditions;
- Tier 2 - broad environmental conditions, such as maximum and minimum stocking rates, or cattle to sheep ratios, which could be applied across large numbers of farms without excessive administrative cost, and would not be seen by farmers as conflicting too seriously with the business of farming. Potentially, Tier 2 , applied using zonal targets, could come to influence a large proportion of all forage land in the EU;

- Tier 3 - detailed environmental management targeted at areas where environmental objectives can best be delivered through agricultural and at particular features and activities within or alongside livestock systems; this would affect a far smaller proportion of land in the EU.

A key issue in the calculation of payments in the FAPS (or any form of area-based payment) is the variation in productivity of different types of forage land; if no account was taken of this, then there would be massive “winners” and “losers” in the switch from headage to area payments, as those with good land and high stocking rates found most of their subsidy withdrawn whilst those with large areas of extensive grazing received windfall gains. We have presented a system of "Adjusted Forage Hectares" (AFH) to address this and proposed how the Commission could develop this idea into a valuable part of practical policy. It would be possible to develop this to allow direct comparison between different types of forage land and could be applied in policy just as routinely as Livestock Units (LU) are used now. The new way of quoting (adjusted) stocking rates could become LU/AFH.

The FAPS system seemed to us to be the best and most realistic variant of all the options available, for the following reasons:

- area payments offer the potential of relatively production-neutral support;
- support would be linked to objective agricultural parameters (land area and land use) and would not be a radical departure from current support systems;
- area payments are already used in other CAP regimes, for example in cereals, and the IACS system could potentially be developed to administer it;
- importantly for this study, area payments would facilitate greater integration of environmental objectives by moving emphasis away from the livestock towards the land, thus providing a sound basis on which to develop further environmental measures.

The remaining chapters of the report concentrate on area payments - developing the principle, describing a methodology for calculating payments, empirically testing in the main agri-environmental zones, and assessing the potential in the light of the reactions of the farmers interviewed in the case studies.

Chapter 8 is in many respects the acid test for FAPS - an empirical test with farmers in areas situated in each of the seven main zones, namely:

- Pays de la Loire, France (Atlantic lowlands) - primarily dairying;
- The Inner Hebrides, Scotland (Atlantic mountains) - mixed sheep and suckler cows;
- The Black Forest, Germany (Continental lowlands/uplands) - dairying, full-time and part-time;
- Feneos, Greece (Mediterranean mountains) - sheep and goat rearing for milk production
- Extremadura, Spain (Mediterranean lowlands) - dehesa: livestock, cereals and tree crops;
- Valle d'Aosta, Italy (Alpine) - mountain dairying for cheese production.

Previous attempts at introducing environmental objectives into agricultural policy have often found that farmers’ reactions are rather different to those that were expected. The overall objective of the case studies was to obtain some "grass roots" reaction to the ideas being developed, across all of the main agri-environmental zones. Using the EFNCP network, and focusing primarily on

systems subject to significant influences from CAP livestock regimes, we were able to explore the implications on the ground of the introduction of FAPS and its various options.

The case studies are not intended to be statistically representative of farmers' reactions across the zones, but to test the general principle and to add more detail and local "colour" to the general picture. Each targeted a minimum of six farms regarded as being typical of the area's main farm structure and grazing livestock systems, adopting a methodology that included flexibility to adapt to the local situation.

Inevitably the case studies revealed some interesting aspects of the psychology of farmers, their national characteristics and prejudices and the strong links between regional cultures and land management activities.

Our first question was designed to test how farmers would respond to a form of support which had practically no links with land use or production, by offering them an annual lump-sum payment equivalent to their current receipts from headage and market support, with the only condition being that they continued livestock farming in some manner. The most general reaction was that they would simply continue as before, though in the mountain sheep systems and in lowland dairying there was some indication that farmers would lower the intensity of production. However, it must be said that most farmers found this idea difficult to take seriously and so gave it only rather limited consideration.

Reactions to the FAPS concept was positive from virtually all of the farmers interviewed. They regarded it as giving them greater flexibility, which in most cases would lead to the lowering of livestock numbers or the abandonment of current plans to increase. One notable exception was Greece where the small size of the mountain goat and sheep farms - despite high stock numbers - would mean that they would be significant "losers" in a change from headage to area payments, unless some account was taken of the large areas of land off the holding which were seasonally utilised (there may also have been some underestimation of the level of FAPS payments which these farmers would have received). In both Greece and Scotland the issue of common grazing land emerged as an important issue, and one which would require further consideration before the system was implemented in these areas.

Reaction to additional tiers of payments built upon the basis FAPS for environmental management produced some interesting regional differences. At Tier 2, in five of the six study areas, over half of the farmers said they would enter. At an hypothetical Tier 3, again over half of the farmers in Germany, Scotland, Spain and France would enter. In Italy (where the Alpeggio dairying probably represented our most "traditional" agricultural system) Tier 3 was considered a step too far, and all of the farmers said that they would cease farming rather than enter at this level. It was clear that in the systems which were more traditional, the farmers had continued to farm in this way because farming was for them "a way of life" - their farm management decisions were not influenced by economic considerations alone. It was clear that these farmers wanted to remain as farmers and not to become some sort of park-keeper or nature reserve warden.

The overall reactions of the case study farmers to the FAPS can be summarised as follows:

- a move away from headage payments to a more production-neutral form of support does tend to favour the environment by removing part of the current pressure on farmers to maintain high (in some cases excessively high) livestock numbers. As such we believe that it is a goal worth pursuing energetically;
- the FAPS is acceptable to farmers in principle, as long as it is implemented so that farmers do not stand to lose significant amounts of subsidy;
- a system of forage area payments forms a good basis on which to build successive tiers of environmental management;
- the environmental characteristics of agricultural land differ widely across the EU, forage area payments provide a good focus for developing a more regionally targeted livestock support policy, linking payments directly to environmental value;
- the FAPS would present some new practical and administrative difficulties which we believe are not insurmountable but do require further investigation.

Chapters 9 and 10 present the final discussion, the principal conclusions and our recommendations to the Commission.

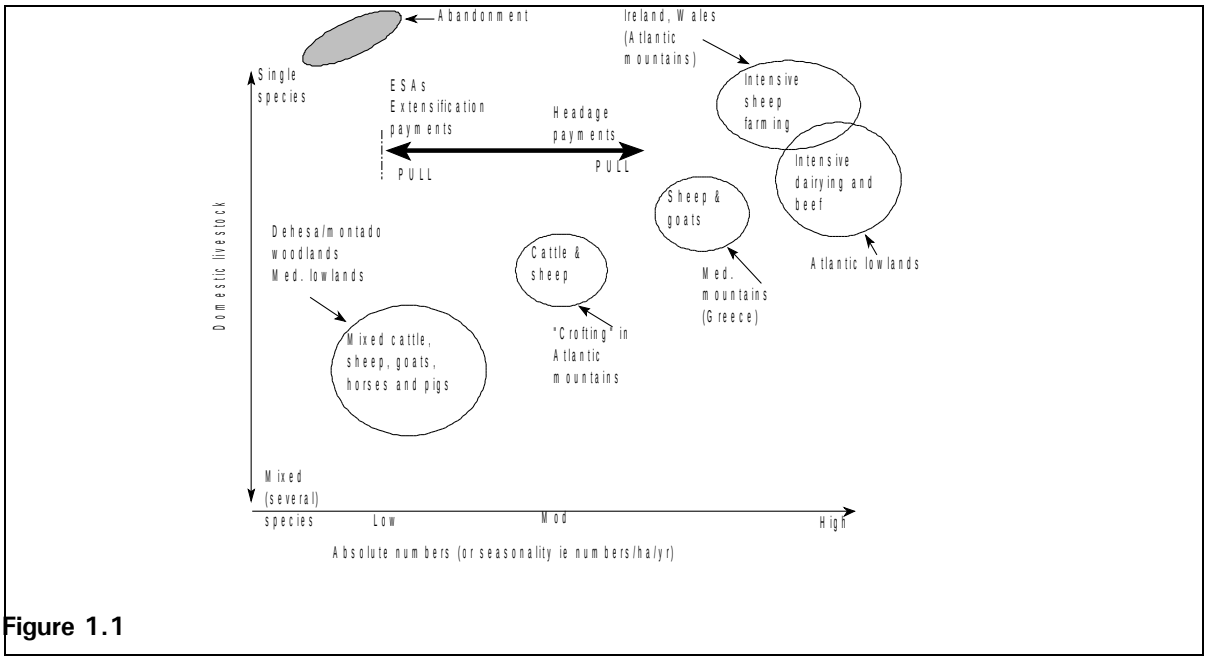


Figure 1.1

The figure above shows some of the different livestock systems referred to in the report, viewed on two main axes representing grazing pressure and mix of livestock. We are of the opinion that one of the principal influencing factors leading to the intensification of livestock production systems is the current EU system of headage payments and price support. Headage payments in particular tend to lead to specialisation and maximisation of livestock numbers. From an environmental perspective the two most damaging trends to farming systems of high nature conservation value are excessive intensification (e.g. over-stocking) and abandonment.

The diagram shows that, where the main risk is abandonment, the intensifying influences of CAP support will tend to resist this pressure and thus may help to protect the environment, but in the many livestock systems where the danger is excessive intensification, CAP support only exacerbates this danger. In these cases, a clear contradiction arises between current mainstream agricultural support mechanisms and the CAP's accompanying measures (shown as arrows pulling against each other in the figure).

The concept of moving away from direct production support to area based payments is not new. We do believe however that in this report we have teased out some of the potential environmental benefits likely to accrue from a change to area payments in the livestock sectors, in particular moving away from a system which tends to encourage intensification irrespective of the system's starting point or local environmental conditions, to one which is essentially production neutral and can easily be adapted to meet specific local conditions. We have developed a methodology for applying such a system and attempted to reveal some of the potential strengths and weaknesses. There are without doubt a number of potential difficulties but this would be true of introducing any significant policy change.

Our immediate recommendations are:

For beef, sheep and goats:

- remove all headage payments and replace with Forage Area Payments;
- remove all related limits and quotas;
- introduce the Forage Area Payment Scheme (FAPS) with three tiers:
  - Tier 1 = compensation for headage payments withdrawn, without environmental constraints, paid as an area payment related to the quality of the forage land;
  - Tier 2 = higher levels of payment for broad environmental targets;
  - Tier 2 = details environmental management schemes.
- establish "agri-environmental zones" with different payment levels and environmental conditions applying to the tiers within each zone;
- review the continuation of price support.

For dairying:

- extend the full FAPS to land used by dairy cows with the same payment rates as for beef or sheep in the same zone;
- reduce the milk support price to slightly more than offset the additional income provided to dairy farmers by the FAPS;
- maintain milk quotas unchanged.

In our view these changes would reduce the current CAP incentives to intensify production, this would be very significant for beef and sheep, with a 40% drop in the overall price of beef and sheepmeat, and a reduction of over 60% in production-increasing CAP support. For dairy the impact would be less significant, probably a 15%-40% reduction in the milk price. Together this would go a long way to reducing farmers' resistance to entering higher environmental tiers.

The FAPS would be a step towards an integrated system of agricultural and environmental support, representing a continuum from basic levels of support to much higher payments for targeted

environmental management practices. It would provide a mechanism for rewarding farmers for actions beneficial to the environment, yet allow them to regard themselves as farmers rather than park-keepers. The establishment of zones would act as a sound basis for defining longer term objectives and targets, for further developing rural policy and for focusing attention on the importance of regional differences in biological potential and the interactions between the natural environment and agricultural practice. Not only would there be potential environmental benefits but the proposed changes would also produce significant reduction in production-increasing and trade-distorting support, which is currently the subject of major concern with respect to the next round of GATT discussions.

Although we believe this research has made some important steps forward, there will be a number of other steps needed before a workable system of area-based payments could be introduced. The final section of Chapter 10 looks at the political choices and at the way the CAP might develop given different political perspectives. We believe that the reality of world trade politics is such that, certainly in the medium to long term, farm support will have to be clearly linked to real environmental (and probably social) benefits rather than to production. The policy options we have discussed in this report do seem to have potential for developing the CAP in this direction. Achieving the objectives will, however, depend not only on agricultural policy *per se* but also on how well the ecological processes on farmland are understood, on the way that environmental schemes and policies are presented to farmers and farmers' organisations, and also on the political will and enthusiasm of Member States have to truly integrate environmental concerns into agriculture.

Introduction

Limitations of the present CAP

The CAP began as an agricultural production policy designed to ensure food supplies and agricultural incomes. Since then its objectives have changed and broadened considerably, to include a number of social and environmental aims, as well as budgetary and trade constraints. These objectives have generally been pursued through modifications to the original CAP instruments, such as amended prices and subsidy levels, headage and stocking rate limits, quotas on milk production and set-aside of arable land. Yet the main instruments of the CAP, the driving force of some 37 billion (market) ecu per year[1], are all production-supporting measures: price support, area payments and headage payments. These measures say to the farmer on the one hand "Produce more!", whilst the headage limits and quotas say on the other hand "Thus far and no further!". This is the fundamental contradiction of today's CAP, and the source of much economic inefficiency.

Thus the CAP must now achieve multiple objectives, much broader than simply agricultural production, yet is still attempting to achieve them through the blunt instrument of production policies, albeit with ever-complex modifications. This is rather like trying to chisel wood with a screwdriver: it can just about be done but it is not very easy and it doesn't do it very well; it is far better to use the right tool for the job. This study is about finding the chisel - developing the right tool to achieve today's objectives for agricultural policy.

Alongside this we must recognise two essential facts. Firstly, that the CAP is a very strongly established policy: farm incomes, structures and employment, upstream and downstream industries, land and asset values have all taken their current shape in response to the CAP and it would be politically and socially unrealistic to propose sudden changes which would have major effects on the distribution of income throughout the agricultural sector. Secondly, that the EU budget is limited and so proposals which would cost substantially more will require very strong justification. The cost to the consumer is another very important aspect of the CAP, by some estimates equal to twice the direct budgetary expenditure, but this does not at present have a high political profile.

This suggests the main objective for this study as being:

> *"To propose new forms of livestock support policy which benefit the environment, maintain farm incomes and do not increase budgetary expenditure"*

This must surely be an objective which would be widely acceptable, and is one which will be developed and refined in the following sections.

[1] FEOGA Guarantee Expenditure - 1995 budget estimate.

Principles for a new CAP

We would propose the following principles for a revised CAP, each of which will be developed below:

- it must be a *multi-objective policy*;
- it must be an *economically efficient policy*;
- to achieve these overall aims, we would suggest that it must be a *well-targeted policy*, which addresses the *diversity and complexity* of agricultural and environmental systems throughout the EU.

We will look at how these multiple objectives can be defined and achieved in an economically efficient manner, in two stages:

- firstly, through the *re-balancing* of agricultural support within current budgetary limits and to maintain farm incomes;
- secondly, through *further measures* to achieve environmental (or social) objectives at additional cost to society.

Some dangers in "greening" the CAP

Whilst the CAP has been in a state of continual evolution since its earliest days, it has usually taken some kind of crisis to provoke substantial reform. Most commonly this has been a budgetary crisis linked to overproduction, but the 1992 reform was certainly influenced by the Uruguay GATT round and the consequent need to reduce the level of agricultural protection in the EU. Whilst the reforms have tackled their objectives of controlling overproduction or budgetary expenditure, an important constraint has always been to preserve farm incomes, with each Member State trying to build a case on grounds of equity or social need to continue the flow of funds to its farmers. Thus, the cuts in cereal prices which formed the centrepiece of the 1992 reform were accompanied by the new arable area payments as "compensation" for the drop in price.

In fact, a cynic might claim that the main objective of reforms to-date appears to have been how best to preserve farmers' incomes within the constraints of the Community budget and the GATT negotiations.

To these long-standing issues has been added the current problem of implementing the political goal of eastwards enlargement, without bankrupting FEOGA or provoking a revolt, either in the acceding countries because of discriminatory treatment on agricultural policy, or from existing EU farmers if their support is cut.

Because of the continued major role of price support, the budgetary constraint is intimately linked to the level of production and anything which reduces production will tend to ease the budgetary pressures, as well as reducing criticism from trading partners.

Shifting agricultural support to "environmental" schemes seems to offer an almost-perfect solution to many of these problems: production will be reduced, the CAP will appear more "green" and

environmentally-friendly - and farmers will continue to receive regular payments for environmental management.

However, this would basically be a farmer-support policy wearing environmental clothes, rather than an environmental policy, or even a multi-objective rural policy. It is thus likely to continue to suffer from serious economic inefficiencies. The main dangers include:

- producing little real environmental benefit, or producing the wrong environmental goods in the wrong place - this is particularly likely to result from using broad-brush policies on factors like stocking rates across very diverse environmental systems;
- producing environmental goods at excessive cost - this again may stem from broad-brush measures, such as input restrictions;
- paying farmers to do what they would have done anyway - this is perhaps the greatest danger of all: paying farmers to reduce their intensity of farming when simple removal of existing support would achieve the same end.

One issue amongst environmentalists is whether or not a "compensation" approach should be used when replacing price support and headage payments by some form of output-independent support, such as area payments. This approach will continue to give the greatest payments to the most intensive farmers and so can be regarded as "rewarding" those who have damaged the environment most. However, the farmers (and their powerful representatives) would reply that these farmers have only responded to the policy incentives which existed at the time, and that they have responded quite logically and correctly to the signals from support systems which pay farmers more the more they produce. Given the fact that it is DGVI which holds the purse strings, that supporting farm incomes has always been a non-negotiable element of the CAP, and that any attempt to bring in greater environmental considerations must do so in the face of suspicion or even direct opposition from the farming lobby, any radical CAP reform could only gradually withdraw support from intensive farmers.

Therefore to have any real chance of being adopted, proposals for more environmentally-beneficial livestock support must compensate those farmers who currently receive large support payments -at least initially. The scope for changing this could come over time, with a gradual reduction in the guaranteed support offered to all farmers and a shift of funds into more environmentally-related payments. Those farmers who have not intensified so much might find that they could qualify for the extra environmental payments with relatively little disruption to their farming systems and so capitalise on their past environmentally-friendly practices. However, the question of value for money comes in here: if a low-intensity farmer will continue to provide the environmental goods which society desires for little or no additional payment, why should the taxpayer pay any more?

Recent developments in CAP reform

When this study was commissioned in early 1996, most people would have regarded sudden and substantial cuts in agricultural support as politically unrealistic. It was also clear that the CAP budget could not be increased significantly. Any reform aimed at making the CAP more environmentally friendly would have to work within these two constraints. This led to our original objective for the study, of proposing new forms of livestock support policy which benefit the environment, maintain farm incomes and do not increase budgetary expenditure.

Over the 12 months of this study the situation has gradually changed, with attention already beginning to focus on the next GATT round. At the recent OECD seminar on the environmental benefits of sustainable agriculture, held in Helsinki during September 1996, senior officials from agriculture ministries all around the world debated which support measures would go in the GATT "green box" of genuine environmental payments, and which belong in the "blue box" of production-related support, such as arable area payments. Most importantly, there is growing acceptance that "blue box" payments cannot be continued forever and will gradually have to be phased out. Environmental payments will be carefully scrutinised and the EU will be called upon to demonstrate that they do indeed produce tangible environmental benefits.

Thus it now seems much more realistic to envisage a future CAP in which farmers no longer receive support as of right, but where money is carefully targeted on specific environmental or social objectives, perhaps as part of a smaller overall CAP budget. Implicit in this would be a move towards world prices in almost all cases.

In our final recommendations, we have concentrated on our original objective of improving the CAP's environmental impact within the current budget and with a largely neutral impact on farm incomes. However, we have also added a section on how this reform could be taken a step further, towards the "green box" CAP of the future.

The current livestock policies applied in the EU

CAP livestock support comprises three main measures:

- market support - generally raising prices above world levels;
- direct subsidies - usually headage premia;
- production, stocking density and/or premium limits - to limit expenditure on the above measures.

There is strong support and intervention in three livestock sectors: milk and dairy products, beef and veal, and sheepmeat and goatmeat. These three sectors were reformed in the Council agreement on 22 May 1992, and the initial duration of the reforms was from 1993/94 to 1995/96.

There is much less intervention in pigmeat, poultrymeat and eggs, and these were less affected by the 1992 reforms.

The mechanisms required to support market prices depend to some extent on whether the EU is a net exporter (export subsidies required) or a net importer (import tariffs sufficient). Net self-sufficiency for 1992/93 for the principal livestock products is shown in the following table.

Table 2.1: EU self-sufficiency in livestock products for 1992/93

Dairy products	
Fresh milk	102%
Skimmed milk powder	153%
Cheese	107%
Butter	121%
Beef and veal	
Beef	107%
Veal	113%
Total beef and veal	108%
Sheepmeat and goatmeat	
Total sheepmeat and goatmeat	81%
Pigmeat	
Total pigmeat	104%
Poultry products	
Poultrymeat	105%
Eggs	101%

The overall position is that the EU as a whole is a net exporter of all livestock products except sheepmeat and goatmeat, though the position of individual Member States varies considerably.

EU expenditure on livestock support does not equal the benefits received by farmers, as an important part of each of the regimes is a transfer from consumers to farmers, through the higher prices paid for livestock products. However, some indication of the relative support to the different sectors can be gained from the following table, which gives a breakdown of CAP expenditure for 1994.

Table 2.2: Support to different sectors

Sector	Expenditure on market support	Expenditure on direct payments to farmers	Total CAP expenditure
Dairy	4.2 becu	0.0 becu	4.2 becu
Beef and veal	1.9 becu	1.6 becu	3.5 becu
Sheep & goatmeat	0.0 becu	1.3 becu	1.3 becu
Pigmeat	0.4 becu	0.0 becu	0.4 becu
Poultrymeat & eggs	0.2 becu	0.0 becu	0.2 becu
Total	6.7 becu	2.9 becu	9.6 becu

The total CAP expenditure on these products (9.6 billion ecu), represents 30% of the overall CAP budget. All the livestock sectors combined are equivalent to about 75% of the expenditure on arable support.

Details of the CAP livestock support policies by sector are given below, followed by estimates of the overall effects of market support on producer prices. The final section in this chapter presents a brief summary of livestock support, concentrating on the direct support mechanisms (headage payments) which apply to cattle and sheep/goats.

Dairy regime

It is important to note that the beef industry does not operate independently of the dairy sector, which provides a large proportion of calves for finishing. As a result, many developments in beef production, such as the growth in the suckler herd since 1984 (when dairy quotas were introduced) have been a response to policy measures in the dairy sector.

The quantitative link between dairy and beef production is quite important to the overall structure of the cattle sector. As a broad generalisation, a specialist dairy farmer will keep his cows for an average of four lactations and serve half of them with a dairy bull and half with a beef bull; this will result in the following output:

- *one purebred dairy heifer, which will replace the dairy cow and then ultimately end up as cow beef;*
- *one purebred male dairy calf, of little value for beef production and so likely to be reared for veal and slaughtered before it qualifies for the special beef premium. In Portugal these calves may be slaughtered at birth and so qualify for the calf processing aid;*
- *one dairy-beef cross heifer, which will be reared for beef but will not qualify for premium;*
- *one dairy-beef cross steer, which will be reared for beef and receive the beef special premium.*

With suckler herds (not related to dairy production) the breeding cows will qualify for suckler cow premium and half their calves (the males) will qualify for the special beef premium.

The diary sector escaped from the CAP reform process almost unscathed, even though the European Commission had originally put forward proposals for substantial cuts in both support prices and quota levels. It was eventually agreed simply to review both price and quota arrangements on an annual basis, to take the current market situation into account. The butter intervention price has in fact been cut by 3% for each of the last two marketing years, but there has been no reduction in quota. It has however been agreed formally that the milk quota system will remain in place until the year 2000.

At present, the total milk quota for the EU-12 is just over 109 million tonnes. This is roughly 15 million tonnes above the level of domestic consumption. The EU is a major exporter of milk, but with the exception of a small quantity of high-value cheese, all of it must be exported with subsidy. Moreover, well over a third of all butter consumed domestically within the EU benefits from subsidy schemes of one form or another.

Price support

The price of milk is maintained above world levels through the following combination of measures:

- tariffs on the import of dairy products;
- export subsidies;
- intervention buying and storage of butter and skimmed milk powder;
- subsidies for using skimmed milk [powder] for animal feeding and for the production of casein;
- consumption aids for butter.

The price of liquid milk is not supported directly, but this objective is achieved mainly through intervention buying and export refunds for butter and skimmed milk powder. Import tariffs apply to a wider variety of dairy products, such as cheese and cream.

Aids to consumption

Various subsidised consumption schemes for butter have operated at different times, usually targeting food manufacturers or special groups of consumers. Subsidies are also given for school milk, and milk products are often supplied as food aid.

Third country trade

The dairy sector was an important part of the GATT negotiations, and the EU made significant commitments on both market access and export refunds, to be implemented over six years from 1995.

The market access commitments are to:

- reduce import tariffs by 36% (skimmed milk powder by 20%);
- maintain existing tariff concessions;
- create import opportunities ultimately equivalent to 5% of the domestic market.

The commitments on exports are to:

- reduce expenditure on export subsidies by 36%;
- reduce the volume of subsidised exports by 21%.

As with most aspects of the GATT, the choice of base period has created some initial leeway. However, it is only a matter of time before these commitments do begin to bite and, unlike with cereals, there has been no great surge in world prices to come to the rescue. Thus the EU's GATT commitments will be an important element in the forthcoming review of the milk quota regime.

Milk quotas

Milk quotas are generally seen as a restriction on dairy farmers, but they are actually an important part of the milk price support system, designed to benefit farmers. In the early 1980s, over-production of milk was so high that it was causing serious budgetary problems for the EC. Two main options were available: to reduce the milk price, thus bringing down the cost of export refunds and also discouraging production; or to control production. It was felt that a substantial price drop would be unacceptable to dairy farmers, so the supply-control option was chosen instead, mediated through milk quotas. Thus farmers could continue to receive a high price, but for a restricted volume of milk.

Quotas were set for each Member State at their 1981 production plus 1%, with some freedom for each Member State to decide how to translate this into individual farm-level quotas. Milk produced in excess of the quota is subject to a "super-levy" which is currently higher than the price of milk and thus there is no incentive to deliberately produce excess milk. In some Member States the excess is calculated for each individual farm, in others (such as the UK) production is calculated across a whole dairy, allowing under-producers to fully or partially cancel out over-producers before any net levy due is collected from those producers who exceeded their individual quotas.

Rules for the transfer of milk quotas differ between Member States. One of the most liberal regimes is in the UK, where quota can be sold or leased relatively freely.

Currently in the UK, milk quota is trading at about 60-65 p/litre to buy or 12 p/litre to lease. The latter figure represents about half of the farmgate milk price of 24.5 p/litre, indicating that some producers find it profitable to produce marginal extra quantities of milk at only 12.5 p/litre, much closer to the theoretical world price.

Beef and veal regime

The beef sector is subject to the full gamut of policy instruments in the CAP, including automatic market intervention when prices fall below a given level (though these conditions have recently become more restrictive). The 1992 CAP reform replaced several market support arrangements with direct producer premiums.

The regime therefore provides for a system of internal market price support which attempts to keep Community prices at a certain level and direct aid payments used as a means of supplementing farmers' returns per animal and maintaining them at a minimum level.

Price support

The EU market price for beef and veal is maintained above the world price through a combination of:

- intervention buying and private storage aids - to remove supplies from the domestic market and so raise the price;
- export refunds - to bridge the gap between high EU prices and lower world prices and thus encourage traders to export;
- import taxes of various kinds - to prevent low-priced imports from undercutting the domestic market, other than under concessionary arrangements.

Each of the main instruments of price support is described briefly below.

The intervention system

For the 1995/96 marketing year, the intervention price was fixed at 347.50 (green)[2] ecu/100kg. The intervention price is not the price at which beef/veal can be bought into intervention, but is used in conjunction with deadweight market prices to trigger the operation of intervention. The deadweight price is the national average market price weighted for quality.

Two intervention buying-in procedures exist in the Community; only beef from male animals is eligible for purchase:

- normal intervention buying - this will operate if, for a period of two consecutive weeks, the EU average deadweight market price of beef is below 84% of the intervention price, and at the same time the price in a particular Member State is below 80% of the intervention price;
- safety net intervention buying - this is triggered if, for a period of two consecutive weeks, the EU average deadweight market price falls below 78% of the intervention price, and at the same time the price in a Member State is less than 60% of the intervention price.

Limits on the quantities of beef and veal eligible for intervention were implemented in 1993. The annual limits are:

1995: 550,000 tonnes
1996: 400,000 tonnes
1997: 350,000 tonnes

These limits exclude purchase under the safety net procedure.

[2] All support prices (e.g. intervention prices) are quoted in green ecu, all other ecu values are in market ecus.

Private storage aid

This is a device for supporting the market without meat being bought into intervention. When this scheme is in operation a subsidy (storage aid) is paid to the owner (trader) of the meat who agrees to store the beef for a specified period of time under certain conditions. The last Community scheme operated in October 1989.

Trade with third countries

The EU beef market is protected by customs duties and import tariffs, and supported by export refunds on products traded with third countries. The EU is more than self-sufficient in beef and veal, and hence subsidised exports of over 1 million tonnes take place annually. Relatively little import takes place at full tariff rates as there are various concessionary import schemes and bilateral/multilateral beef import agreements (particularly with ACP and Eastern European countries), enabling about 0.5 million tonnes of beef to be imported into the EU annually. Overall, the EU accounts for about 25% of world trade in beef and veal.

Following the agreement concluding the GATT round, subsidised exports of EU beef must fall by 21% from early 1990 levels. Since 1995 the variable levies on meat and veal imports have been replaced with annually declining fixed tariff levels and custom duty charges; however, for several years at least, protection from third-country imports will be higher under the GATT than previously.

i.e. GATT will not result in any immediate lowering of EU beef prices.

Direct aid payments

Premiums operate at the producer level and have a direct and important effect on incomes. Those currently available to beef producers include:

- the special beef premium;
- the suckler cow premium;
- the extensification premium;
- compensatory payments for producers in Less Favoured Areas.

Beef special premium scheme

The special premium for beef producers was first introduced in 1987 and the entire scheme was revised following the reform of the CAP. The special premium is payable on male animals only and payment is restricted to a maximum headage of 90 animals per holding. The premium is payable twice in the life of each animal, at the ages of 10 months and 22 months, although it seems probable that Council will agree to drop the second payment (which applies to a significant proportion of producers only in Ireland and the UK) and increase the first premium payment. The special premium for 1996 is 108.7 ecu per head.

In order to limit total premium claims, payment of the beef premium is subject to Regional Reference Herds: each Member State has a national reference herd (or quota) which is equal to the number of premiums paid over a set reference period. This may be sub-divided into regional sub-quotas or individual producer quotas, at the discretion of the Member State. If, in a given region,

the number of premium requests in a particular year exceeds the Regional Reference Herd ceiling, all premium payments are reduced proportionately.

In practice, no Member State has chosen to operate individual producer quotas and most have simply operated national ceilings, with three exceptions:

- Belgium has two regions for premium ceilings - Flanders; Wallonia;
- Germany has two regions[3] - old Länder; new Länder;
- the UK has three regions - England and Wales; Scotland; Northern Ireland.

The Regional Reference Herd limits could potentially limit total cattle numbers in areas where there is a serious environmental risk from overgrazing, but their current implementation across very large regions (usually whole countries) prevents them operating in this way. Most Member States have chosen to operate national reference herd limits because this allows greatest flexibility and maximises their total premium payments received from the Commission. Even if these limits were applied to smaller administrative regions, such as NUTS III, they would not prevent the localised concentration of livestock in more productive areas and the abandonment of poorer grazings, which is what has tended to happen in many regions.

In addition, beef special premium payments are subject to a maximum stocking density for each holding (see below).

Details of implementation of the Beef Special Premium by EU-12 country along with claim levels are provided in Annex 1.1.

Suckler cow premium

The suckler cow premium was introduced in 1980 as a means of increasing the total returns of beef producers, without increasing those of milk producers.

To qualify for the premium, producers must show that the cattle are pure beef or beef-cross dairy cows or in-calf heifers, producing calves for meat production. Producers with a dairy herd will only be able to apply for premium on any suckler cows held provided that their milk quota does not exceed 120,000kg. The premium is payable at a rate of 144.90 ecu/head from 1995 onwards.

The 120,000kg milk limit is equivalent to 20-25 dairy cows, thus this restriction is quite significant on specialist dairy farms in northern Europe but much less so in the Mediterranean countries where dairy herds tend to be small and thus there is nothing to stop a farmer having both a dairy herd and a separate suckler herd, on which he receives suckler cow premium.

In addition, Member States have the option of paying an additional payment of 30.2 ecu/head from national funds to supplement the above suckler cow premium rate. This option has been taken up in all countries except GB, Denmark and Portugal, at rates of 24-30 ecu/head. Under special rules,

[3] Prior to January 1997 Germany had three regional sub-divisions for Reference Herd ceilings: old Länders; Badden Württenberg; new Länders.

the EU will fund the first 24.2 ecu of this additional payment in Greece, the Irish Republic and Northern Ireland.

Unlike the special beef premium, there is no regional limit on the number of cattle eligible for payment, but each farm has been allocated an individual suckler cow reference quota above which no premiums will be paid. These quota rights can be transferred or temporarily leased between producers, under certain conditions. In some areas, suckler cow premium quota is "ring fenced", it can be transferred between farms inside the area but cannot be transferred outside; this is done in areas where the Member State's authorities consider suckler cow production to be particularly important to the region and perceive a threat of significant quota outflow. Claims are also subject to the application of stocking density limits on each holding (see below).

Implementation details of the Suckler Cow Premium by EU-12 country are provided in Annex 1.2.

Stocking density limits

For both the special beef premium and the suckler cow premium, payment is subject to stocking density limits for each individual holding, introduced to discourage intensive farming. In calculating the stocking density, account is taken of all the animals on the farm for which premiums are requested (male bovine animals, suckler cows and breeding ewes), plus the number of dairy cattle needed to produce the farm's milk quota, where applicable.

The maximum stocking density is fixed in terms of "livestock units" per forage hectare (1 dairy cow = livestock unit) and has been introduced gradually:

- 1993: 3.5 LU/ha
- 1994: 3.0 LU/ha
- 1995: 2.5 LU/ha
- 1996: 2.0 LU/ha

These limits determine how many animals may receive premium payments; farmers are not prohibited from stocking more densely, but the additional stock will not receive premium payments.

Farmers with less than 15 LU are exempt from the stocking density limitations.

The present limit of 2.0 LU/ha is about average for dairy herds and 18-month beef systems in northern Europe, and thus may act to discourage very high stocking rates on these systems, where pollution from manure is a potential problem. However, most extensive beef and sheep systems, which tend to be in areas of greater environmental potential, will be constrained to considerably lower stocking rates by the agricultural potential of the land, and thus will not be affected by these limits. Our statistical review of "agri-ecological zones" (see Chapter 6) found an average stocking rate of 1.10 LU/ha across the EU-12.

Other beef premia

- Deseasonalisation premium - an additional premium is payable on top of the normal beef premium in regions where "the percentage of young male bovine animals slaughtered in the period September to November exceeds 40% of total annual slaughterings"; this premium is fixed at 72.45 ecu/head. Where this payment applies, farmers receive the additional payment for all cattle slaughtered during January to April, provided that those cattle have already qualified for the special beef premium.

  This arrangement was introduced mainly for the benefit of Ireland, where there is traditionally a flood of beef on to the market in autumn, but also applies in Northern Ireland, Germany, Denmark and Portugal.
- Calf processing aid - this takes the form of a grant of 120.75 ecu for each male dairy-breed calf slaughtered before it reaches the age of 10 days (only Portugal had adopted this option prior to 1996, when the UK introduced it in response to the BSE crisis).
- Extensification premium - as an additional incentive, the premiums payable on male bovine animals and suckler cows will be increased by 36.2 ecu per head on holdings where producers can prove that their stocking density throughout the year is less than 1.4 LU per forage hectare.

The stocking rate limit of 1.4 LU/ha is sufficient to have a significant impact on the beef finishing systems of northern and central Europe, but is still considerably higher than most stocking rates found in suckler herds, which tend to occupy more environmentally valuable areas. Only one agri-ecological zone - the Atlantic Lowlands - exceeds 1.4 LU/ha, with an average stocking density of 1.56 LU/ha. In the more sensitive mountain areas, overall stocking densities range from 0.65 LU/ha (Alpine and Mediterranean Mountains) to 0.81 (Atlantic Mountains). Thus the proposed new limits of 1.0 LU/ha and 1.2 LU/ha would only "bite" on the more intensive farms in these areas and might tend to have little effect in the most environmentally sensitive areas, where stocking rates will already be well below these thresholds. But the biggest limitation of the extensification scheme is not the absolute level set, but the failure to take account of local carrying capacity - an issue which is addressed later in this report.

- Compensatory payments in Less Favoured Areas - subject to a maximum stocking density and payment per hectare, these allowances are paid on breeding cattle in designated less favoured areas, which are difficult to farm and consequently experience higher production costs and/or suffer from depopulation.

Sheepmeat and goatmeat regime

Currently, the sheep sector is supported through the use of import tariffs, private storage aid and most importantly, direct producer premiums, the main one being the ewe premium. This is the one livestock sector in which the EU is a net importer, but prices are still maintained above world levels.

The main effect of the CAP reform package was to set up a quota system, whereby the number of ewe premium that producers can claim is restricted to a fixed reference quantity. The idea is to

stabilise the flock size, or at least the total payment of ewe premium, at current levels. These quotas are transferable, under strictly stipulated conditions.

Price support

As the EU is a net importer, export refunds are not used to support the EU price. The tendency of imports to undercut the EU internal market price is restricted through country quotas which limit the volume of tariff-free imports, and tariffs on any imports outside these agreements (see *Trade with third countries*, below). In addition, private storage aids can be used to remove any temporary surplus from the domestic market.

The key price in the sheepmeat sector is the basic price. The average value of the basic price is fixed during the annual EU farm price negotiations, and then adjusted weekly to take into account the normal seasonal variations of the EU sheepmeat market. The level of the basic price takes into account various factors, including the current and forecast sheepmeat situation, production, consumption, and the market situation in the other sectors, particularly beef and veal.

Private storage

Since January 1990 a safety net has been in place which can operate in any Member State to support the market should prices fall below a minimum level. There are three trigger levels which are used to open private storage under different circumstances:

a) a possible opening when the standard quality price[4] in both the EU and a region falls below 90% of the adjusted basic price;
b) a possible opening of a scheme by tender when both market prices fall below 85% of the basic price;
c) the aid will operate by tender if a region's market price falls below 70% of the EU market price for two consecutive weeks.

In 1995, private storage aid schemes operated in Ireland, Northern Ireland, Sweden and Finland.

Trade with third countries

Unlike the other meat sectors, the EU is only 80-85% self-sufficient in sheepmeat and goatmeat and hence needs to import about 0.25 million tonnes a year to meet internal domestic demand.

Voluntary restraint agreements (VRAs) were concluded between the EU and most of the traditional supplying countries, whereby these countries agreed to limit their exports into the EU in return for these exports not being subject to tariffs or customs duties (except for some Eastern European countries). The implementation of the GATT in July 1995 saw the replacement of VRAs with country-specific quotas which operate in much the same way. The largest of the quotas is ascribed to New Zealand, with 225,000 tonnes out of the total 300,000 tonnes allocated. Virtually no sheepmeat is imported into the EU outside these quota schemes, as it would be subject to both import tariffs and custom duties.

[4] The standard Quality Price Quotation was introduced in January 1990. Price reporting in all Member States will ultimately be based upon a standard quality of a fresh or chilled carcase. The precise definition will be the basis of a deadweight carcase classification grid.

Exports of EU sheepmeat to third countries are minimal, and usually total less than 10,000 tonnes. Currently no export refunds are paid.

Direct aid payments

The annual premium is a headage payment for eligible ewes (and breeding goats) and is intended to offset the loss of income of sheepmeat producers resulting from the establishment of the common regime for sheepmeat, which replaced national price support and/or deficiency payments.

The annual ewe premium

Since 1992, the annual ewe premium has been equivalent to the difference between the basic price and the average standard quality price for sheepmeat throughout the EU. The premium therefore varies from year to year, and was about 26 ecu per head in 1995.

For light lambs (i.e. those kept mainly for milk rather than for meat production) the premium is payable at 80% of the full ewe premium for heavy lambs. An annual premium, equivalent to 80% of the full ewe premium, is also paid to goatmeat producers in Greece, Corsica and parts of Italy.

Like the suckler cow premium in the beef sector, the annual ewe premium is subject to individual headage quotas, limiting as from 1993 the number of eligible ewes for which premium can be claimed by each producer. Rights to premiums are transferable and may also be leased. Prior to this, regional "stabilisers" applied, whereby each producer's premium payment would be reduced proportionally if the regional ceiling was exceeded.

As an example, in 1994 the UK non-LFA ewe premium was £16.96 and quota was trading at about £24 to buy and £7 to lease. The difference between the premium payment and the leasing price suggests that the marginal return to a farmer from keeping additional ewes is a net <u>loss</u> of £10/ewe before premium, with the £17 premium then bringing this up to a £7 net profit.

For some years, the full rate of premium was only paid up to 1,000 head per producer in less favoured areas and 500 head elsewhere, with half-rate paid above these limits. However, this restriction has since been dropped.

As each farm's allocation of ewe quota was based on the number of eligible ewes in a reference year, this mechanism never sought to place any environmental restrictions on sheep numbers - which the transferability of quota would make pretty ineffective anyway.

Implementation details of the ewe premium by EU-12 country are provided in Annex 1.3.

Other premiums

- <u>Less favoured area (LFA) supplementary premium payments</u> - producers in LFAs are eligible for a supplementary payment of 5.5 ecu per head in addition to the annual ewe premium, subject to the same headage quotas.
- <u>Compensatory</u> payments to farmers in Less Favoured Areas - these are paid to sheep farmers in LFAs. These allowances are made in addition to any other payments made, but are limited to the first 1.4 LU per hectare, taking account of all grazing livestock on the holding.

Pigmeat regime

Unlike the beef and sheepmeat regimes, the pigmeat regime is a "light regime". In essence this means that the pig market is not generally subject to support measures and instead the European Commission relies on the market being self-regulating. There is limited price support and no direct payments.

Price support

There are four price support mechanisms which can apply to pigmeat:

a) a system of import tariffs applied to non-EU pigmeat products to prevent the undermining of the EU internal market;
b) export refunds, used as a means of removing supplies from the EU market that would otherwise have a depressing effect on prices;
c) an optional internal support buying measure, i.e. an intervention mechanism;
d) aids to private storage. Both of the latter can be introduced to remove temporary surpluses of pigmeat from the EU market.

Two prices determine the operation of the market support systems:

- the basic price - this is agreed annually and in theory is set at a level which offers a desirable level of return to farmers and contributes towards a stable market situation without leading to surpluses. For the 1995/96 marketing year, this was set at 156.98 ecu/100kg.
- the reference price - this is the internal EU market price for pig carcasses, calculated on a weighted average basis of the prices in each Member State.

Intervention buying for pigmeat

The Commission may accept pigmeat offered to it at pre-determined intervention prices, set annually, provided that the products meet certain specified quality criteria. For implementation to occur, the EU reference price must fall below 103% of the basic price and be likely to remain below that level.

However, whilst intervention support buying is technically available, it has not been in operation since 1972 (apart from twice in Belgium following foot and mouth disease outbreak), despite the EU reference price having been well below the basic price over the last few years.

Instead, the main mechanisms used to divert supplies from the internal market have been export refunds, to enable and encourage the export of surplus pig meat products out of the EU, and private storage aid schemes to divert surpluses away from the private market.

Private storage aids

Private storage is the main internal market support measure operating in the EU pigmeat sector. The scheme can be made available when the EU reference price falls below 103% of the basic price and is likely to remain at this level, and may be introduced so that supplies can be temporarily withdrawn from the market when demand is weak. The EU Commission prefers private storage to intervention because the private sector is perceived to be a better judge of when supplies should be released back onto the market without depressing prices and to have a greater interest in maintaining the quality of stored pigmeat.

Under the regulations governing private storage aids, fixed amounts are paid to traders to encourage them to store pigmeat for set periods (usually 4 - 7 months). Under the scheme which operated across the EU in early 1995, nearly 70,000 tonnes were contracted into stores. The aids payable for a three-month period were 278 ecu/tonne for half carcasses, legs and shoulders, and 337 ecu/tonne for fore-ends and loins.

Trade with third countries

External trade is affected by export refunds and import tariffs:

- export refunds - as the EU is a surplus producer of pig-meat products, it has traditionally exported considerable volumes with the assistance of export refunds (e.g. the volume of subsidised exports was 490,000 tonnes in 1991/92 and 650,000 tonnes in 1993/94). Export refunds are provided to enable EU pigmeat products to compete on world markets, with the level of refund depending on prices and supplies in the EU and on world markets, and on the difference in feed grain costs on world and EU markets. From July 1995, due to the GATT agreement the volume of subsidised exports of pigmeat and products is restricted and must fall to 402,000 tonnes by 2000/1 (EU-12).
- import protection - the implementation of the GATT also saw the replacement of the old sluicegate prices and variable import levy system with fixed yearly import tariffs. The import tariffs applicable from July 1995 are considerably higher than the previous levies on pigmeat products, and will be higher for most products even in 2000/1.

Poultrymeat and eggs regime

There are no direct intervention or market support arrangements for either eggs or poultrymeat in the EU and no support payments are available. EU producers are, however, protected from third-country imports through the use of import tariffs and export refunds:

- export refunds - the EU is more than self-sufficient in eggs and poultrymeat and export refunds are necessary to enable Community exports to compete against third countries whose costs of production tend to be lower because of lower feed (e.g. cereal) prices. The GATT agreement requires that subsidised exports of eggs must fall to 83,000 tonnes by 2000/1 (EU-12) and that subsidised exports of poultrymeat should total no more than 291,000 tonnes (EU-12) by 2000/1 (compared to 600,000 tonnes in 1993).

- import protection - the GATT agreement brought to an end the previous system of sluicegate prices and variable levies that had operated for 25 years; the variable levies were replaced by fixed tariffs or customs duties, which will initially be much higher than the levies previously in place.

Estimating the net effect of market support on farm prices

This section looks at overall measures of support, and concentrates particularly on estimating the overall effect of the market support mechanisms described above.

Total producer subsidy equivalents

The Uruguay round of GATT negotiations focused international attention on agricultural protectionism and created a need for an objective aggregate measure of support which could be applied in any country and to any combination of support measures, direct or indirect. The measure which has been most widely used is the *"Producer Subsidy Equivalent"* (PSE) which includes:

- market support (how much more producers get for their output because of export refunds, intervention buying, import tariffs etc, measured as the difference between domestic and world prices);
- direct payments (headage payments, area payments etc.);
- reduction in input costs (or increase in costs where, for example, pig and poultry producers have to pay more for their feed because of arable support policies);
- indirect support (e.g. tax concessions).

The *percentage PSE* measures that percentage of the producers' income which comes from agricultural support policies; the remainder is the genuine return from the market[5]. 3 presents figures for the percentage PSE for each livestock sector, as estimated by the OECD, the principal independent international organisation working in this field.

This shows that it is the grazing livestock which are most heavily subsidised, with about 60% of the farmer's returns coming from the various forms of CAP support, and just 40% from the market.

[5] One perennial question with this kind of calculation is how to measure market support, or more particularly, with what "world price" should the domestic price be compared? If a large country or trading block, such as the EU or USA, suddenly stopped supporting its agriculture, production and exports would fall and the world price would rise. Thus the "first degree" estimate of market support will tend to be an over-estimate or maximum value. However, it is the approach normally used in such calculations, reasonably applicable to relatively small changes in support policies, and is the one which will be employed here.

Table 2.4: Percentage PSE for each livestock sector

Livestock product	Percentage PSE (return to farmers from CAP support)
Milk	63%
Beef and veal	60%
Sheepmeat	59%
Pigmeat	10%
Poultry meat	23%
Eggs	5%
All livestock products	**46%**

The market support component

The PSE figures quoted above include both market support and direct payments, as well as input cost effects. For beef and sheep, in particular, a high proportion of this support comes in the form of headage payments and so the market support element makes up only part of the PSE figure quoted. We have therefore attempted to make our own estimates of domestic and world prices, to calculate the level of market support.

Here we have faced some difficulties in obtaining world prices for a livestock unit (e.g. deadweight or liveweight) or for a particular product (e.g. chilled or frozen, off the bone, back, leg etc.) that is directly comparable in quality and characteristics with a product on the EU market.

The only standard source of import prices for the different livestock is customs statistics, estimating prices by dividing total value of goods imported by the quantity of imports. The problem with this approach is that the CN codes on which the import data are categorised do not always enable a comparison to be made with a EU internal product for which a price exists (beef and veal are taken as a single product in the import statistics and so the average import price of carcasses in this case is not directly comparable with the average EU beef carcass price). Furthermore, the import price is higher than the world price as it includes transport costs and insurance.

However, with these reservations, we have attempted to make the best estimates of price differentials.

Dairy price support

Estimating the time effect of CAP milk price support is far from straightforward, as there is very little international trade in liquid milk. One effect of this is that farmgate milk prices vary substantially between EU Member States with different marketing structures, despite the common support systems. Another effect is that intervention buying and export refunds deal just with the derived products of butter and skimmed milk powder, and international trade focuses on these two products plus cheese. Finally, the international dairy market, particularly for skimmed milk powder, is heavily dominated by subsidised exports and food aid, so the differential between EU and world prices may significantly overestimate the true effects of CAP support.

As a starting point, we have used the OECD's PSE figure for milk of 65%, i.e. only 35% of the farmer's returns really come from market. As there is no direct support in the form of headage or area payments, this PSE should reflect the effects of market support. Our own calculations, applying technical coefficients to the world prices for butter and skimmed milk powder, produced a very similar figure of 60%. However, a number of experts in the Commission and at Wye College have suggested that this figure is rather high, partly because of the depressing effects of EU subsidised exports on world prices, and have suggested that the EU price might need to drop by as little as 25-30% to remove the need for export subsidies.

In our calculations we have used the OECD figure of 63%, whilst recognising that this is at the top end of the range. In reality, until the EU does end its subsidised exports, nobody can really predict how the world market will respond.

Beef price support

There are two ways of obtaining the difference between the internal EU beef liveweight price and that on world markets:

- by taking the average of the liveweight Special Export Refund for male beef and the export refund for cow beef (the export refund generally represents quite closely the difference between the EU market and the world market situation). For April 1996, this would be equal to (47.7 + 35.5)/2 = 41.5 ecu per 100kg liveweight.;
- by taking the difference between the EU reference price for liveweight beef and the average US price for liveweight beef in the same month. This calculation gives rise to a figure which is usually similar to that of the export refund calculated above: 1,522 - 1,059 = 463 ecu/tonne = 46.3 ecu per 100kg liveweight.

For April 1996, market price support received by beef farmers in the EU can therefore be said to be about 440 ecu per tonne, equivalent to 33% of the current market price of 1,344 ecu per tonne.

Sheepmeat price support

There are no export refunds applied to sheepmeat, so this figure is not available. Nor are import tariffs particularly useful, as most sheepmeat is imported levy-free under the various Voluntary Restraint Agreements.

Therefore the best way of measuring the level of market price support received by farmers in the EU is to calculate the difference between the liveweight price in the EU and that on the world market. We have not been able to obtain a reliable price for the world's largest exporter, New Zealand (which would anyway need to be adjusted for the substantial transport costs), but on the basis of the US sheep liveweight price, we estimate that the level of market support is about 30%.

Pork price support

As with beef, a logical way of obtaining the level of market price support received by EU pig producers is through the export refund, which gives a good indication of the difference between the EU and world price for a particular pig product.

The April 1996 export refund for pig carcass is 103 ecu per tonne, which is equivalent to 9% of the EU pig carcass reference price of 1,130 ecu per tonne at the same time. This is very similar to the OECD PSE figure of 10% for 1994 (as there is no direct payment for pig producers in the EU, the PSE should be a reflection of the effect of market price support).

(One would actually expect the gross market support figure to be higher than the PSE, as the PSE calculations take account of the additional feed costs caused by CAP support to arable products. However, the PSE is a good estimate of the net market support, which is what is required here.)

Price support for poultry meat and eggs

CAP support for these products is almost entirely directed through the market, so the PSE figures can be taken as reasonable estimates of price support.

Table 2.5: Summary table of estimated price support

Livestock product	Percentage of farmgate price due to CAP price support
Milk	25-63%
Beef and veal	33%
Sheepmeat	30%
Pigmeat	10%
Poultry meat	23%
Eggs	5%

In practice, price support is applied to only certain end products, e.g. skimmed milk powder or particular parts of a carcass, but the effect "works through" to other products in the production chain. For our calculations, we have assumed that the percentages of market support given above apply to all relevant types of livestock and at each point in the production chain. This assumption is reasonably sound for milk and slaughter stock but becomes progressively less reliable as you move back towards the youngstock from which these are eventually derived.

Summary of current livestock support

The absolute effects of price support depend on the market price, which can vary considerably with country, region, type of stock and time of year. Direct support and certain other measures are also subject to a certain degree of national interpretation, particularly when a proportion of the cost has to be met by the Member State. Thus a detailed statement of livestock support would have to consider each country and livestock system individually.

What we present here is an overall summary of EU livestock support policies, which will be amplified for each of our case study regions. The breakdown of aggregate support is shown in 6.

Table 2.7: Aggregate support for different livestock products

Livestock product	Direct support	Market support	Unsupported returns from the market
Milk	0%	25-63%	37-75%[6]
Beef and veal	40%	20%	40%
Sheepmeat	41%	18%	41%
Pigmeat	0%	10%	90%
Poultry meat	0%	23%	77%
Eggs	0%	5%	95%
All livestock products	**46%**		**54%**

Note that, for beef and sheepmeat, market support as a proportion of total support is smaller than market support as a proportion of total sale price (quoted above) because direct support makes up a significant proportion of total producer returns.

8 summarises the direct support measures applicable to beef, sheep and goat producers in 1996.

[6] Opinions differ on the effects of CAP support on the milk market; see section 2.6.3.

Table 2.9: Summary of direct support measures

	Beef				Sheep & Goats
	Finishing beef cattle Special Premium Scheme	Suckler Cow Premium	LFA Compensatory Payments	Extensification Premium	Annual Ewe Premium
Eligibility	- male animals - claims subject to stocking density limits (1.4 LU/ha)	- pure beef or beef-cross cows - dairy herds: only if milk quota < 120,000kg - claims subject to stocking density limits	- hill livestock in designated less favoured areas	- male bovine animals and suckler cows - stocking density less than 1.4 LU/forage ha	
Value	- 108.7 ecu/head - payment twice in animal's life (10 and 22 months)	- 144.9 ecu/head	- member states determine payment levels - minimum 20.3 ecu/LU - maximum 150 ecu/LU	- 36.2 ecu/head	- 26 ecu/head - light lambs and goatmeat 80% of full ewe premium
Limits	- max. headage 90 animals per holding - Regional Reference Herd Limits	- individual reference quotas	- limited to first 1.4 LU/ha		- individual headage quotas
Additional payments	- Deseasonalisation premium (72,5 ecu/head)	- member states option of paying an additional 30.2 ecu/head from national funds			- producers in LFAs eligible for supplementary payment of 5.5 ecu/head - LFA Compensatory Payments (as for beef)

Agri-environmental schemes under Regulation 2078/92

In this chapter, and in the study as a whole, we have concentrated on the mainstream measures of price support and headage payments, as these make up the large majority of CAP expenditure on livestock support. They have an even more substantial effect on farmers once the full effects of price support are considered. However, the 1992 CAP reform did introduce Regulation 2078/92, under which Member States have implemented a number of agri-environmental schemes, many of which are applicable to livestock production.

This section provides a brief overview of CAP agri-environmental legislation and its implementation in different Member States. We have not attempted to review this in-depth, as that would be a deviation from the main focus of this study, and a number of other reviews already exist, such as Whitby (1996) *The European Environment and CAP Reform: Policies and Prospects for Conservation.*

However, in our search for new policy alternatives we have attempted to bridge the gap between mainstream CAP support and specific agri-environmental schemes. Measures such as those implemented under Regulation 2078/92 have a role in our final policy recommendations.

Background to the "agri-environmental" regulation 2078/92

EC Regulation 2078/92 obliged Member States to provide aid for "environmentally-friendly" farming, partially funded by the CAP budget. In some cases this caused Member States to implement such schemes for the first time, in others it allowed them to receive EU funding for schemes which were already in place. This regulation is summarised below and an account of its implementation in a selection of Member States is provided in Annex 2.

1. Subject to positive effects on the environment and the countryside, the scheme may include aid for farmers who undertake:

   (a) to reduce substantially their use of fertilizers and/or plant protection products, or to keep the reductions already made, or to introduce or continue with organic farming methods;

   (b) to change, by means other than those referred to in (a), to more extensive forms of crop, including forage, production or to maintain extensive production methods introduced in the past, or to convert arable land into extensive grassland;

   (c) to reduce the proportion of sheep and cattle per forage area;

   (d) to use other farming practices compatible with the requirements of protection of the environment and natural resources, as well as maintenance of the countryside and the landscape, or to rear animals of local breeds in danger of extinction;

   (e) to ensure the upkeep of abandoned farmland or woodlands;

(f) to set-aside farmland for at least 20 years with a view to its use for purposes connected with the environment, in particular for the establishment of biotope reserves or natural parks or for the protection of hydrological systems;

(g) to manage land for public access and leisure activities.

2. In addition, the scheme may include measures to improve the training of farmers with regard to farming or forestry practices compatible with the environment.

There is also provision for aid under Article 4 of the regulation for the cultivation and propagation of "useful plants adapted to local conditions and threatened by genetic erosion". Article 6 allows for courses, training and demonstration projects which are for new schemes and not for those already in existence in Member States prior to 1992.

Comments

This is a very wide-ranging regulation, encompassing clearly environmental objectives alongside preservation of rare breeds and enhanced public access. It might also be observed that the focus is perhaps more on actions (e.g. reducing the use of fertiliser, decreasing stocking rates) than on their effects on the environment (e.g. species diversity).

It is also possible to make a division into two kinds of measures:

- payments for "doing things", like options (d) to (g), where farmers are paid incentives to undertake additional activities which maintain or enhance the countryside;
- payments for "not doing things", like option (a), which has generated debate because it appears that incentives are being offered to farmers to reduce pollution, in breach of the "Polluter Pays Principle".

Implementation in different Member States

Member States had to respond to this regulation by introducing multi-annual, multi-zonal programmes, with at least five years' duration, to reflect the diversity of environmental priorities in their country. Schemes submitted for eligibility under Article 2 do not have to be new but must fulfil certain rules; there is also a maximum payment per hectare which is eligible for EU reimbursement.

Countries creating environmental schemes for first time, e.g. Ireland, Spain and Portugal (except for its already established rare breeds project), tend to have created imaginative but not very finely-tuned schemes, compared with those who had already built up some experience through established agri-environmental schemes, such as the UK and the Netherlands.

Most Member States have established national programmes, incorporating a number of smaller schemes which target specific environmentally sensitive areas. The schemes tend to reflect regional units (i.e. established administrative boundaries) rather than coherent geographical areas. Few of the

schemes are truly zonal in approach, rather they consist of national regulatory frameworks which are taken up at the regional or local level, with some targeting of areas of high environmental priority.

Several Member States had introduced "Organic Farming Conversion" schemes prior to 1992, and several others have implemented such schemes since. Under regulation 2078/92 incentives are now paid to all organic farmers, both existing and new, in Germany, Denmark, Spain and the Netherlands. In the UK this aid is restricted to just those farmers who are converting from conventional to organic production.

Option (d), relating to the preservation of rare breeds, has been applied to the modest schemes which were already in place in Portugal and Germany.

Option (e), on the upkeep of abandoned farmland and woodland, now allows for the previously rejected French scheme of support for the maintenance of grazed lands in mediterranean areas. This is a rather sensitive issue, because some see it as a means of introducing more stock and thus increasing production.

Option (g), managing land for public access and leisure, has been taken up by the UK and a few other Member States.

Significance for this study:

- *Farmers and environmental bodies have frequently complained that mainstream CAP policies encourage them towards intensification, whilst the agri-environmental schemes ask them to move in the opposite direction; this issue is explored further in our case studies.*
- *This legislation also means that there a certain amount of agri-environmental measures have been developed in every Member State; we look at how a revised form of livestock support could integrate these measures more closely with basic support payments.*

The economic links between policy and the environment

This study is all about the links between livestock policy and the environment, which will be explored through a variety of means: mathematical modelling, literature review and case studies. Essentially these are *economic* links, as it is the economic incentives of the CAP to which the farmer responds by changing his livestock system, which in turn has implications for the environment.

This chapter takes a first theoretical look at these linkages, particularly:

- the links between livestock support policy and livestock systems;
- the links between livestock systems and the environment;
- the effect of different objectives on optimal production;
- the variation of optimal production with agri-environmental conditions.

The next chapter uses mathematical modelling to look in detail at the economic relationships in one important system - lowland dairying - whilst the essentially scientific links between livestock systems and the environment are reviewed in Chapter 5 with emphasis on floral species diversity and bird population in lowland grassland. Lowland dairying is the only system which we model in detail, but many of the general relationships brought out in that chapter apply also to beef and sheep production, which are covered in four out of the six case studies reported in Chapter 8.

The links between livestock support policy and livestock systems

A cornerstone of economic analysis is the supply curve, showing how farmers produce more of a commodity as the price increases. Chapter 2 showed how the CAP support substantially increases the price of livestock products, increasing the price of beef and sheepmeat to 50% above world prices and that of milk to perhaps twice the world price, depending on assumptions used. CAP support has also placed a "price" on the intermediate products, the individual cattle and sheep used to produce this meat, through the medium of headage payments. For beef cattle and sheep this additional "price" is approximately as large as the world price for the beef and sheepmeat produced, and in fact some farmers will produce livestock for which there is practically no market, simply in order to receive the headage payments[7].

It has sometimes been claimed that if price or headage support were reduced, farmers would be forced to produce more livestock in order to stay in business (this response occurs in several of the case studies). This may apply in some cases, in the short term, but it has been demonstrated time and again that increasing the price leads to more production, and *vice versa*. Good examples within the livestock sector would include the rapid increase in sheep numbers which took place when the UK switched from Variable Premium (which rewarded only meat output) to Ewe Premium (which rewarded the number of ewes); a similar increase occurred in Spain when it joined the Community and began to receive Ewe Premium. Similar examples exist in the arable sector, such as the rapid adoption of oilseed rape once the EC began to support the price through a crushing

[7] For example, the very light lamb carcasses produced on the remote Shetland Islands off the north coast of Scotland, which incur high transport costs to attract a low market price. However, the overall system is still profitable, due to the headage payments received on the ewes.

subsidy; this was actually done with the deliberate objective of increasing production and obtaining self-sufficiency.

Examples of the opposite effect are more difficult to find in the EU, because it has rarely decreased the price of a commodity without giving support in some other form. However, throughout Eastern Europe and the CIS it is possible to observe the dramatic decreases in production which occur when the ratio of output prices to input prices falls substantially (though compounded by massive structural change).

What are the practical actions which farmers can take to increase their livestock numbers and output, in pursuit of higher prices? The main responses include:

1) Increasing the stocking rate to fit more animals on a given area. This tends to decrease output per animal (as each animal manages to eat less grass) but increases overall output per hectare, as well as the total number of animals on which headage payments may be claimed. The drop in performance per animal can be reduced through increasing the total feed supply, through:

   - pasture "improvement" such as drainage, fencing and re-seeding;
   - increased use of fertiliser;
   - supplementary feeding.

2) Increasing the total area of grazing land, through:

   - buying or renting more land - this may not affect the total amount of grassland in a region, but will cause structural change as less efficient farms sell out and will increase the proportion of land under intensive management. It will also tend to increase both the sale price and the rental value of land;
   - bringing previously un-farmed land into use;
   - converting arable land to pasture - or resisting a movement in the opposite direction.

(This last point is very important, as it hints at the links between arable and livestock support policy. Where both options are agriculturally possible, the relative levels of support for arable crops and livestock products will cause some land to "swing" back and forth between the two uses. Even where particular pasture land is unsuitable for arable cropping, arable support may reduce the total amount of grassland, increase rental values, and so encourage more intensive use of the grassland. Thus in many areas, even the arable regimes of the CAP have a real effect on livestock farming, with significant environmental implications).

3) More intensive management to increase production per animal, including:

   - use of higher-yielding breeds;
   - increased use of veterinary medicines and prophylactics;
   - indoor lambing, three-times-a-day milking, and other practices applicable to particular livestock systems.

The links between livestock systems and the environment

The effect of grazing livestock systems on the environment is mediated through several different variables or management practices, including:

- *Re-seeding* - replacing a species-rich sward with a near-monoculture, thus directly reducing the diversity of plant species and indirectly reducing the diversity of plants, insects, birds and mammals which depend on the sward.
- *Herbicides* - used to support the near-monoculture with the effects described above, plus the possibility of toxic side-effects on some faunal species.
- *Fertilisers* - including artificial fertilisers, lime and animal manures, which tend to favour the growth of a few species (including particularly sown grasses) at the expense of others, and may also directly suppress plant species which are intolerant of high nutrient concentrations.
- *Drainage* - carried out to create more favourable conditions for agriculturally-desirable grasses at the expense of other plant species and perhaps species-rich wetland areas. Also often associated with the other intensification measures listed above.
- *Seasonal stocking rate* - the intensity of stocking at particular times of the year has complex effects on wildlife: different plant and animal communities will thrive at different sward heights, with the environmental optimum depending on which species are desired; direct detrimental effects of high stocking rates may include poaching, soil erosion and compaction, trampling of ground nest sites, and reduced diversity of floral and faunal species.
- *Housing* - winter housing may have a number of indirect effects on the environment: it will usually permit higher stocking rates; may be associated with earlier lambing or calving, thus changing the seasonal distribution of stocking rates; and will create manure or slurry for disposal, thus increasing the fertiliser input to selected areas. The direct effects will stem from the removal of stock from grassland during the winter period.
- *Supplementary feeding* - affects the environment indirectly, by permitting higher stocking rates and by bringing additional nutrients to the pasture, particularly through local enrichment by manure around the feeding areas.
- *Cutting regime* - whether and when the grass is cut, and whether hay or silage is made. Silage is usually cut earlier than hay, with a greater potential for the destruction of flowering plants and ground nest sites before the process of reproduction has been completed. It also tends to be associated with generally more intensive grassland management (see all of the above) and brings the risk of pollution from silage effluent (see below).
- *Breeds* - agriculturally-improved breeds of livestock tend to be larger and heavier, leading to increased poaching, and may also graze more selectively. They also tend to be associated with generally more intensive farming, particularly supplementary feeding and the winter housing required by less hardy breeds.
- *Pollution* - accidental or point-source pollution, as opposed to the general effects of fertilisers and herbicides, may result from spillage of silage effluent or slurry, careless spraying of slurry or pesticides close to water courses, and spillage of sheep dip and other agri-chemicals. These sorts of incidents can have a dramatic effect on the biodiversity of the area affected, as well as posing a potential hazard to drinking water. Regions with high livestock densities may also suffer from more generalised pollution of surface and ground water, resulting from nitrate run-off and leaching.

- *Resource use* - intensive livestock systems generally use significant quantities of fertilisers, fuel and agrochemicals, all derived from limited natural resources. They also tend to use more energy, thus contributing to the greenhouse effect.
- *Features* - wildlife opportunities are created by features such as ponds, streams, hedgerows, copses and drystone walls, which together contribute to landscape diversity and interest. Field enlargement and the use of barbed wire, electric fences and water tanks tend to lead to the neglect or deliberate removal of these features. The trees and shrubs in wooded pastures may be lost by deliberate clearance (in pasture "improvement" or conversion to arable) or through neglect and overstocking which prevents natural regeneration.
- *Landscape* - the combined effects of many of the above factors can lead to noticeable change in the overall appearance of the landscape.

For intensive livestock, the direct environmental effects tend to be confined to resource use and pollution, including air and noise pollution, with indirect effects through the arable systems which produce the feed, and through the crop and livestock systems which receive the manure. Additional problems can arise from the use of feed additives, particularly copper, which are detrimental to certain species where the manure is spread. Outdoor pig and free-range poultry production vary widely in intensity but can potentially combine most of the grazing-related factors discussed above with a high potential for pollution.

Those are the negative features which can result from the intensification of livestock production, but grazing livestock can also bring many environmental benefits, including:

- *Maintenance of a grassland landscape* - through resisting the encroachment of heather or scrub, which would give rise to a very different environment.
- *Control of sward height* - which is critical to many flowering plants and ground-nesting birds.
- *Preservation of features* - such as hedges, ponds and barns which were often created as part of livestock farming.
- *Support for other wildlife* - through grain spillages and dung-pats, haystacks and manure heaps.
- *Support for rural employment* - which may be engaged in countryside maintenance during periods of the year when the livestock require less attention.

Many of Europe's most-valued semi-natural habitats have been created as a result of livestock systems, and the loss of a traditional livestock system through abandonment can be just as environmentally damaging as its intensification. For biodiversity, the mosaic of different land uses is very important, and thus the balance of grassland, arable, woodland, scrub and features is as important as the management of the grassland itself.

The adoption of the environment-affecting management practices listed above depends on a complex combination of technology, policy and price (which is heavily influenced by policy). Some of these practices have come about almost entirely through technological development, for example, the replacement of hedges by barbed wire and electric fences, or the substitution of silage for hay. Policy alone may be sufficient to cause some changes, such as increased stocking rates in upland areas or greater use of supplementary feeding, without any change in technology. But the most common situation is where the two work together: technological advance creates the possibility, such as agri-chemicals, or new livestock breeds and plant varieties, and policy

encourages their uptake - and hence the development of the next round of technology. Wider socio-economic changes, such as increasing wage rates, have also played their part, and it is perhaps the inability of many traditional livestock systems to meet modern expectations for standard of living which is their greatest threat.

What is important for this study is to recognise that the present systems of livestock production in the EU have not been created by CAP policy alone, and hence a reversal or removal of CAP mechanisms will not always be sufficient to re-create traditional systems. Where a particular technology brings considerable agricultural or economic benefits, such as silage production or cheap and flexible fencing, it may take a substantial policy incentive for farmers to re-introduce or retain desired practices. The following chapter will demonstrate how one particular livestock system -lowland dairying - would tend to result in intensive land use even in the absence of any CAP support.

The effect of different objectives on optimal production

All policies should be judged against their stated objectives, and here it is worthwhile analysing the different objectives of agricultural and environmental policy.

Agricultural objectives

- Production of quality food[8] at affordable prices
- Farm incomes
- Rural employment

The latter is actually a social objective, which can potentially be addressed through means other than agriculture, but it is an important component of agricultural policy, particularly for the LFAs.

Environmental objectives

- Habitat and species diversity
- Landscape interest and diversity
- Low pollution
- Public access

The relative importance attached to these different objectives varies from region to region, partly in response to the current level of problem (Is there much pollution? Is access currently restricted?) and partly in response to the demand (Are there a lot of people who want access to the countryside? Are there rare species or habitats which should be preserved?).

The following graph indicates how the achievement of each of these different potential objectives varies with intensity of farming, based on the literature reviews and discussions carried out during the conduct of this study. It is purely indicative, with the vertical axis representing the percentage of some potential maximum achieved by each variable (note that the complete absence of pollution

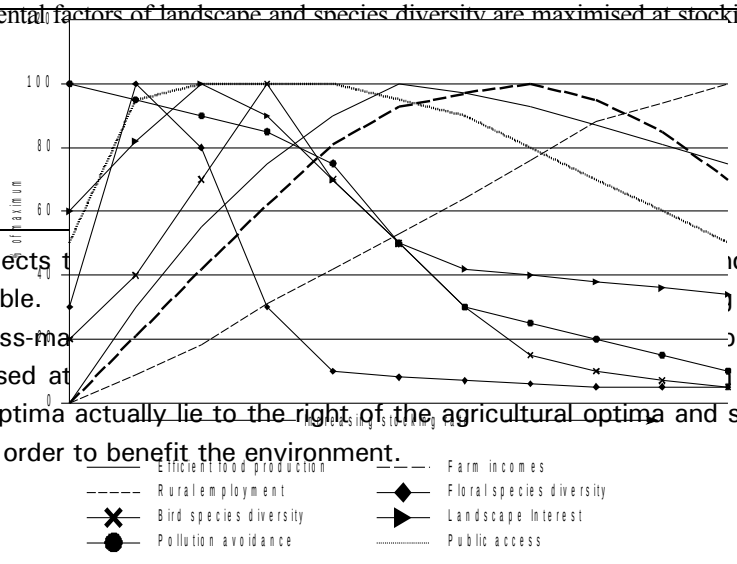
[8] The various "food scares" of recent years, and more gastronomic concerns, have led many people to question whether the food produced by intensive systems is in fact of high quality. This is a whole complex issue in itself, involving the different approaches to food hygiene in "intensive" and "extensive" systems and is thus not covered in this report.

scores 100%), and the horizontal axis reflecting stocking rate, which in practice is closely correlated with fertiliser use, re-seeding, supplementary feeding and other forms of intensification and is the main variable affected by CAP support. These particular numbers might apply to a lowland livestock system in Northern Europe, passing from extensive sheep or beef, through more intensive beef and sheep systems to intensive dairying, but it is the general shape of the curves, rather than the numbers, which is important. If this exercise was repeated for hill or Mediterranean systems, the actual stocking rates would be many times lower but the same trends would usually emerge: that most environmental measures are maximised at stocking rates lower than those which are optimal for output, incomes or employment.

The assumed relationships are:

- *Production of quality food at affordable prices* - increases with intensity until uneconomically high levels of resources are being applied and the efficiency of production tails off.
- *Farm incomes* - under current CAP mechanisms, farm incomes continue to increase beyond the point of most efficient food production (indicating one of the fundamental inefficiencies of the CAP), but do eventually fall off[9].
- *Rural employment* - will tend to increase continuously with stocking rate.
- *Floral species diversity* - peaks at a low level of stocking rate (implying little or no use of fertiliser) and then falls off sharply.
- *Bird species diversity* - peaks at a somewhat higher stocking rate, as some birds benefit from lower patches of grass within the sward, and others feed off the grass, dung pats etc.
- *Landscape interest* - is assumed to be greatest when the landscape is farmed (i.e. it decreases at zero stocking rate) and to fall off somewhat as farming becomes more intensive (often implying the loss of features, as well as a reduction in the plants which contribute to the overall landscape). However, this is not so well correlated to stocking rate.
- *Pollution avoidance* - is possible up to reasonably high stocking densities (with the slight fall in the line indicating the increased risk of spillages of manure and silage effluent), then falls off quite sharply once nitrate leaching and run-off begin to occur.
- *Public access* - is theoretically possible at any stocking rate, but we have assumed that it will tail off at the two extremes, as scrub encroachment makes access physically difficult at zero stocking rate, and as fencing and intensive management practices discourage access at the other extreme.

The key environmental factors of landscape and species diversity are maximised at stocking rates of 0.5 to 1.5 (but



[9] This graph reflects t d, where agriculture is basically profitable.) abandonment is that agriculture is loss-ma oroduction of food are actually maximised at these cases the main environmental optima actually lie to the right of the agricultural optima and so production needs to be *intensified* in order to benefit the environment.

Figure 3.2: Different objectives against stocking rate

pollution avoidance (probably maximised by total abandonment of the land) and rural employment (which increases all the way up to feedlot or indoor production systems).

So how should the policy-maker balance all these different legitimate objectives? The answer will always be a political one, but the following graph suggests one theoretical approach, based on assigning different weights to the different policy objectives. We have combined the percentage scores from the above graph into two groups:

- *People-centred* - the average of the scores for food production, farm incomes, rural employment and public access.
- *Wildlife-centred* - the average of the scores for floral species diversity, bird species diversity, landscape interest and pollution avoidance.

The three lines on the following graph are the result of giving different weights to these two components:

- *Equal weight* = 50% of "people-centred" score plus 50% of "wildlife-centred" score.
- *People-weighted* = 66% of "people-centred" score plus 33% of "wildlife-centred" score.
- *Wildlife-weighted* = 33% of "people-centred" score plus 66% of "wildlife-centred" score.

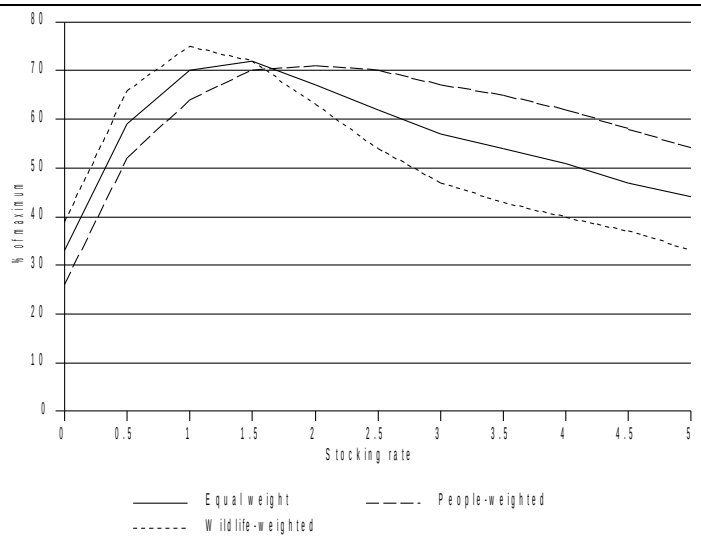


Figure 3.3: Effects of different weightings on optimal production

This shows that, when preference is given to wildlife and environmental issues, the optimum stocking rate is around 1.0, and when preference is given to social issues, the optimum stocking rate is around 2.0.

Obviously, these are rather arbitrary figures, used to illustrate a point. We had hoped to identify some more meaningful values as part of the dairy systems modelling exercise, but this is currently next to impossible. Perhaps the development of environmental valuation techniques will allow this exercise to be repeated in a few years' time, with some genuine values included.

However, this simple exercise does illustrate the following points:

- The "optimal" point of production, taking account of all externalities, varies considerably according to the relative emphasis given to different policy objectives.
- Where social objectives are paramount (e.g. areas of low incomes and depopulation), then society's overall interests may be best served by a policy which is less than optimal for the environment.
- On the other hand, where policy has so far emphasised the social and productive aspects of agriculture (as is generally the case with the CAP), giving due weight to the environmental issues would advocate a lower level of intensity than presently found.

One way of viewing the changes now taking place within CAP politics is as a shift in weighting away from exclusive emphasis on the social and productive aspects, to give a weight to the environment which more accurately expresses the wishes of society as a whole.

The variation of optimal production with agri-environmental conditions

Even if we had the real numbers necessary to create the above graphs, numbers which reflected both the detailed environmental effects of increasing stocking rate and the value placed by society on environmental goods, the graphs would still only reflect one particular situation, as the underlying relationships vary with agricultural and environmental conditions.

Chapter 4 explores the effects of policy and agricultural conditions on optimal production from a dairy system (though the general relationships would hold for any grazing livestock system on lowland improved grassland in Northern/Central Europe). Two points which emerge are:

- The more favourable the agricultural conditions of soil and climate, the more intensively the farmer should produce in order to maximise his profit.
- The more favourable the agricultural conditions, the greater the cost to the farmer (in profit foregone) of reducing his intensity of production to some environmentally-defined point.

(Both of these points apply at any level of price support, though lowering price support would both decrease the stocking rate at which profit is maximised, and reduce the cost to the farmer of deliberately reducing his intensity of production.)

Chapter 7 reviews the literature to examine the effects of livestock systems on the environment, paying particular attention to stocking rate, fertiliser use and cutting regime, and their effects of species diversity. An important point which emerges here is that:

- Many of the grasslands which are currently farmed quite intensively have so much inherent or residual fertility that, for many years to come, they would not generate much floral species diversity, even if all fertiliser applications were stopped and cutting and grazing regimes were optimised for the environment.

The following graph takes just two of the factors discussed above - farm incomes and floral species diversity - to illustrate the effects of fertility on them (note that it is actually the higher levels of fertiliser required for high stocking rates which have most effect on the flora, rather than the stocking rate itself). Under "high fertility" the "production" of floral species diversity is reduced

and moved to the left, reflecting the residual and inherent fertility in the soil. Under "low fertility" the farm income curve is reduced and moved to the left, reflecting the lower profitability of farming in these conditions:

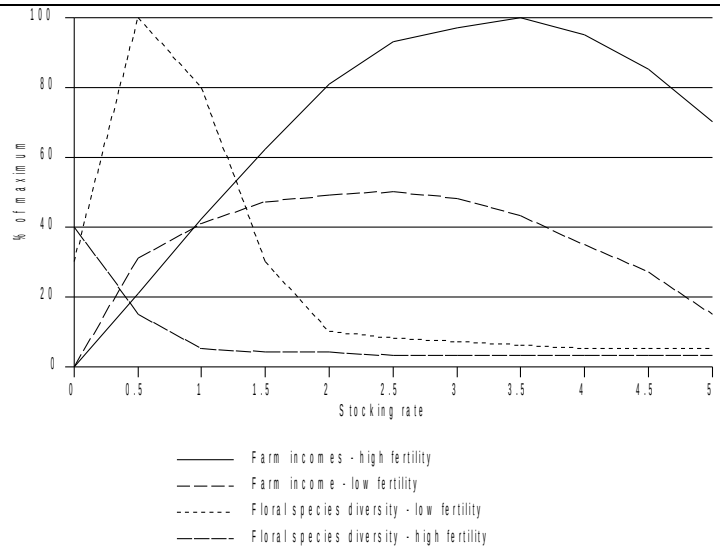


Figure 3.4: Effect of fertility on outputs

Finally, the following graph shows the effect of combining these two factors with equal weights: 50% to farm incomes and 50% to floral species diversity:

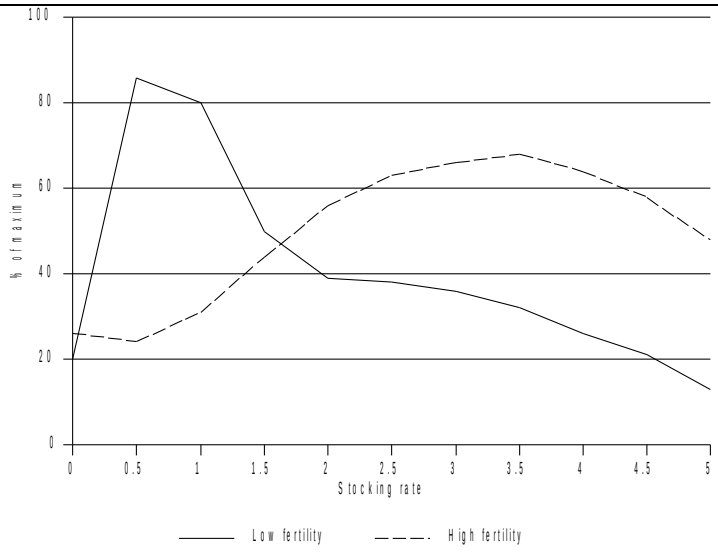


Figure 3.5: Effect of fertility on overall optimal production

This shows that, where soil fertility is low, society's overall objectives are best served by extensive production (a stocking rate of 0.5), sacrificing a lot of agricultural production in order to produce the "environmental good" of floral species diversity. Where fertility is high, the optimum solution is intensive production (with these figures, a rather extreme stocking rate of 3.5) to take advantage of the substantial agricultural potential of the land, at the expense of floral species diversity.

If we had taken account of some of the other factors, such as bird species diversity or landscape interest, which peak nearer the centre of the graph and are less affected by fertility, then the results would be less extreme and the "low fertility" and "high fertility" optima would be closer together. However, the same point would hold: as the agricultural potential of the land increases, then society's overall objectives are better served by rather more intensive production and *vice versa.*

There is a significant political implication from this, relevant to the current "polarisation" of agriculture whereby agricultural production has become concentrated on the better ground at the expense of the environment, whilst the high environmental-value farming systems have survived in the less fertile areas. This outcome cannot be entirely attributed to the deficiencies of the CAP in failing to take account of externalities, such as environmental damage, or failing to reflect all the interests of society, but is actually relatively rational.

A comprehensive and efficient multi-objective rural policy, which reflected all of society's requirements for food production, income generation, environment and landscape, would avoid many of the excesses and inefficiencies of the current CAP, but would still result in a division of land into some areas of extensive farming with a strong emphasis on nature conservation, and other areas where emphasis is placed on efficient agricultural production through fairly intensive systems.

In simple terms, those areas currently used for extensive farming systems tend to have quite a high nature-conservation value, and in many cases increasing the production of environmental goods would be relatively efficient, leading to quite a small income loss or additional management costs in order to produce some quite valuable environmental goods. On the other hand, attempting to generate a wildlife-rich countryside through de-intensification in areas of high agricultural potential could prove very expensive in terms of income forgone, and not actually produce much of great value.

There are, of course, some exceptions to this general conclusion:

Low fertility areas

- In very remote areas, where depopulation is a major factor and the basic social infrastructure is disappearing, it might prove quite expensive to preserve traditional farming systems. Policy makers need to assess the costs and benefits of trying to produce traditional environmental goods in these areas, compared to developing alternative wildlife-based systems or embracing the concept of wilderness.

High fertility areas

- Within large areas of predominantly high agricultural potential, such as the Atlantic Lowlands, there are many pockets of lower fertility, where the nature conservation potential is high and the agricultural potential relatively low. These should be targeted and managed for nature conservation, through farming or other means.
- Where there are species of particular importance (local, national or international rarity) amongst fertile agricultural land, the environmental benefits of preserving them may easily outweigh the agricultural production foregone.
- Both of the above examples have to be taken within a wider ecological context, which may require the preservation of corridors of extensively managed or un-farmed land in order to allow the preservation of the islands of high wildlife interest and to support "common species" which are nevertheless, valued by people who spend time in the countryside.
- Avoidance of pollution (which should be taken for granted under the Polluter Pays Principle) and preservation of particular features: even within an intensively farmed landscape there will be natural and man-made features which are relatively cheap to maintain but are of high environmental or landscape value.
- Finally, the human user of the countryside appreciates diversity - patches of hedgerow, woodland or hay meadow to break up vast expanses of intensive agricultural land - and accessibility - a small patch of interesting woodland close enough to walk the dog every evening may be valued far more than a similar area so far away that it can only be visited on an annual holiday.

Each of these exceptions does in fact fit within the overall model: they are all examples where there is an unusually high value or cost attributed to certain environmental goods.

Many of these special cases are already recognised in existing legislation, as ESAs, protected sites etc. This analysis suggests that such targeted legislation is along the right lines, and the objective of a combined agricultural-environmental policy should not be to turn all of the EU into one huge ESA, but to continue targeting resources based on the agricultural and environmental potential of each area.

The implications for intensive areas are particularly interesting: here the approach should not be one of general targeted approach to create landscape diversity and wildlife opportunities alongside intensive farming systems. This is a genuine challenge which requires careful though and effort to develop appropriate mechanisms, rather than broad-brush approaches such as "extensification". An economically-optimum solution to these issues will require a complex approach ranging from support for conservation headlands, hedges and farm woodlands, to pesticide regulation procedures which concentrate on the specific effects of individual components, rather than aiming for global reductions. It is only fair to say that considerable research and development is already being carried out along these lines.

These conclusions strongly support the approach taken later in this study, that of "zoning", or dividing the EU into areas of different agricultural and environmental potential, defining the overall policy objectives for each zone, and developing slightly different policy measures to be applied in each zone.

The economic effects of CAP dairy policy

The principal instrument of CAP dairy policy is market support which raises prices considerably above world levels. Current EU prices approach three times the world price, though this differential is somewhat artificial, as in the absence of CAP support EU production would fall and world prices almost certainly rise.

This substantial price support encouraged high levels of production in the EU, and milk quotas were introduced to curb the growing surpluses and their budgetary cost. Without price support production would be considerably lower and the EU would probably be a net importer, buying butter and cheese from countries like New Zealand. In this situation there would be no need for quotas as there would be no surplus to control nor budgetary expenditure to limit. Thus the primary policy mechanism is price support, with milk quotas playing a secondary supporting role.

Price support has acted to increase production through a number of ways, each of which has environmental impacts:

- there are more dairy farms than there otherwise would be, and thus more point sources of pollution from slurry and silage effluent;
- there are more dairy cows, and thus more manure, and so more nitrogen potentially available to leach into water courses or enter the atmosphere;
- there is more land used for grazing and forage production for dairy cows;
- there is a greater intensity of production both of the forage area, particularly through applications of nitrogen fertiliser, and of the cows, particularly through higher concentrate feeding.

To gauge the net environmental impact of this, these effects must be compared with what would otherwise be taking place. In much of the atlantic lowlands[10], home to 49% of the EU's dairy cows, the alternative land uses would usually be beef and sheep production, generally associated with lower intensity, lower nitrogen use, lower concentrate feeding, lower stocking rates, less time housed (particularly in the case of sheep) and hence less slurry to dispose of, more use of permanent rather than rotational grass, more hay and less silage. There are of course exception, with some beef finishing units being every bit as intensive as dairy farms, and in some cases the alternative to dairy farming would be arable cropping, with a very different impact on the environment. However, the norm is for dairy farms to be significantly more intensive (see, for example, the free pollution advisory scheme run in the UK, which targeted dairy farms as being by far the most common source of water pollution).

This intensity is to some extent encouraged by CAP support, which is must greater for dairy than for beef or sheep, but also by the capital-intensive nature of dairy farming which encourages

[10] This section refers to the eight agri-ecological zones developed in Chapter 6. Of most significance to dairy production are the "Atlantic Lowlands" and "Continental Lowlands" zones, defined as all the land in northern (i.e. non-Mediterranean) Europe which is not designated as Mountain LFA or, in the case of the UK and Ireland, LFA. The "Atlantic Mountains" zone comprises basically the mountains and moors of the British Isles, plus some small areas in north-west Spain.

farmers to make as much profit as possible from each cow. However, the environmental effects of this grazing intensity are less clear cut. On land good enough for dairying it is likely that moderate amounts of fertiliser would be used even under beef and sheep production, and as species diversity tails off quite rapidly once nitrogen starts being applied it is unlikely that pastures would be much more diverse in the absence of the CAP, whether as beef or sheep grazing or as less intensively managed dairy pastures. The number and diversity of birds would tend to increase under extensive beef, sheep or dairy production, as a result of more varied sward heights, less trampling and perhaps more hay meadows. The risk of groundwater nitrate pollution varies considerably with location. In the traditional dairy pastures of Ireland and the north and west UK, with permanent grass and heavy soils, relatively little nitrogen escapes being taken up by the grass or locked up in the soil, when fertiliser is correctly applied, and that which is leached is diluted by high rainfall so that nitrate levels in drinking water are not a problem. However, on lighter soils nitrate leaching can be a serious problem, particularly on the intensively stocked farms of Denmark and the Netherlands. This is clearly an area in which policy needs to be regionally targeted - a fact which has been recognised in the Nitrate Vulnerable Zones directive but not yet in CAP stocking rate limits.

The situation in the atlantic mountains, with 8% of dairy cows, is roughly similar, except that the high rainfall and low overall stocking density mean that nitrate leaching is rarely an issue, and the generally lower intensity on fundamentally less productive ground means that there may be more bird interest on dairy pastures and a possibility of significant species diversity under the beef and sheep grazing which would probably occur in the absence of CAP-supported dairying.

In the continental lowlands, with 29% of the EU's dairy cows, and in the drier areas and lighter soils of the atlantic lowlands, the alternative land use would often be crop production. There the dairy systems often rely heavily on forage maize, which can be a major source of nitrate pollution.

The remaining five zones account for only 13% of the dairy cows on 39% of the EU's agricultural area. The environmental effects of dairying may relate less to the dairy production itself than to its role within a farming system (e.g. transhumance, integrated crop and livestock production) and in maintaining a rural population. These effects will be investigated in more detail in the individual case studies.

A model of intensive, grass-based dairying

This system probably accounts for three-quarters of all dairy cows in the EU (including almost all of those in the atlantic lowlands and mountains, perhaps half of those in the continental lowlands and some in other zones) and an even higher proportion of milk production. The effects of dairy policy on this system are therefore of over-riding importance.

Based on the discussion above, and the literature review of the following chapter, a number of different production points can be identified, roughly in order of decreasing intensity and increasing environmental value (see also the graphs in Chapter 3 which illustrate how different environmental objectives dictate different optimal production points):

Point 1 - unconstrained dairy production;

Point 2 - fertiliser use and stocking rate limited so as to avoid nitrate pollution;
Point 3 - fertiliser reduced to very low levels so as to encourage species diversity.

Depending on circumstances, Point 1 may already be at or below Point 2, i.e. nitrate leaching is not currently a problem. In many cases, the benefits of Point 3 may be difficult or even impossible to achieve, as the residual soil fertility is too high for many floral species to thrive, even in the absence of any fertiliser. To create a species-rich sward it would be necessary to take repeated cuts of hay or silage for many years, without either fertiliser or grazing livestock to replenish soil nutrients.

Whilst these three points are in order of decreasing intensity, it does not follow that any decrease in intensity will necessarily bring environmental benefits. For example, a well-managed farm might be applying 400kg N/ha on a soil and in climatic conditions which led to no significant nitrate leaching, run-off or other pollution problems; a 25% reduction in fertiliser use (with a commensurate reduction in stocking rate) would bring no appreciable environmental benefits (apart form a *pro rata* reduction in gaseous nitrogen emissions) because it would still be managed too intensively to be of much value for birds or flora.

Mainstream CAP policy mechanisms, such as price support, headage payments and stocking rate limits can be used to influence the general intensity of production as discussed above. In addition, further environmental objectives can be defined which would require more direct policy measures, for example:

- preservation, maintenance and recreation of features such as ponds, hedges and woodlands;
- late cutting dates for hay or silage to favour ground-nesting birds;
- maintenance of patches of un-farmed land (e.g. nettle and weeds around dung heaps) for wildlife value.

These are in addition to the avoidance of pollution by slurry or silage effluent, which should be a normal part of good agricultural practice.

Quantitative results

The results of a simple spreadsheet model are presented below. This represents a feeding system based on grass, grass silage and concentrate with two different levels of cow performance: 5,000 l/year from one tonne of concentrate; and 6,000 l/year from two tonnes of concentrate. A range of fertiliser levels is modelled, from 0-550kg N/ha, in 50kg steps; a basic application of P and K is assumed in all cases but nitrogen use is the main variable determining grassland intensity. Under each level of cow performance, stocking rate remains proportional to grass production at all nitrogen level, though for the "high" performance cow the stocking rate is 15% higher at each point as more of the cow's energy requirements are being met from concentrate.

Prices and costs are based on current (1996) costs for the UK, taking account of those factors which could be changed in the medium term (say within five years). Some of the costs, such as rent, labour, and interest on capital invested in the herd, are largely notional as not all farmers would actually pay all these costs (e.g. the owner-occupier who relies on family labour). However, the approach used here places all farms on an equal footing and is an appropriate basis for

planning, as it indicates how returns to the farm would change under different scenarios: the owner-occupier *could* choose to rent out his land or (more probably) use it for another enterprise; the farmer who owns all his cows *could* chose to sell up his herd and invest the proceeds in the bank.

One effect of this costing approach is that farms which appear to be making a loss may actually continue to operate for years, simply because the farmer is prepared to apply his own resources of land, labour and capital for lower returns than the prevailing market rate. This would be typical on low-income farms. Because the costs relate specifically to the UK, and relative prices would differ somewhat in other countries, the detailed figures have been left in pounds sterling, with key results converted to ecu (at the rate of £1 = 1.25 ecu).

Further technical details of the model are given in Box 1 and a fuller explanation of the costing basis is given in Box 2.

Box 1: Technical description of the spreadsheet dairy model

The model is based on that of Goss (1988), which is in turn derived from a wide range of published literature, using generally accepted standards wherever these exist.

The "metabolisable energy" (ME) system is used to balance the cow's requirements for energy for maintenance, growth, pregnancy and lactation, with the supply of energy from forage and concentrate.

Forage production is estimated with an equation derived from the four-year "GM20" trials conducted at 21 sites all around the UK (Morrison *et al*, 1980). Land was classified into one of five "grass growth site classes", based on soil type, rainfall, latitude and altitude, and the equation predicts the dry matter production of perennial ryegrass under monthly cutting or grazing at different nitrogen levels. The results presented here are for the middle site class (3), at intervals of 50kg N/ha from 0 to 550kg/ha.

It is assumed that 80% of the dry matter produced is utilised, with half of this grazed and half of it conserved as silage (the 20% losses are due to factors such as trampling, wastage during silage making, and the patches of rank, uneaten grass around dung pats). An average ME value of 11.5 MJ/kg DM has been calculated, taking account of seasonal variations in digestibility and the effects of ensiling.

Two levels of cow performance are modelled, based around typical UK values of 5,500 litre milk from 1,500kg concentrate. As a cow is fed more concentrate, three things occur: she give more milk, puts on more weight (or loses less), and eats less forage. This model assumes that for each extra kilogram of concentrate fed (fresh weight) the cow will yield an extra litre of milk; this is in line with the calculations of energy partition, dry matter intake and concentrate-forage substitution in Goss (1988) and with the results commonly observed in feeding trials (e.g. see the review of Thomas, 1988).

Using this assumption, the two levels of performance modelled are 5,000 litre of milk from 1 tonne of concentrate, and 6,000 litres from two tonnes of concentrate. The low milk yield, low concentrate cow will eat 15% more forage than the high concentrate one.

In the model, the stocking rate is derived from the nitrogen and concentrate levels, to bring the overall system into energy balance. Thus, a system with the higher level of concentrate feeding and milk yield per cow can support a 15% higher stocking rate at any given rate of nitrogen application.

The only other technical assumption is that a constant base application of P and K fertiliser is made in all cases, irrespective of the amount of N applied, as the return of P and K from manure should maintain a balance of these

nutrients as the level of N is increased.

Box 2: Costing basis used in the spreadsheet dairy model

a) Variable costs

All costs are calculated for the UK, in 1996. Some costs will vary between Member States, particularly the fixed costs such as labour and rent, but the main variables - the prices of milk, concentrate and fertiliser - are reasonably consistent across the EU as a result of the CAP and of multinational marketing.

Basic costs have been taken from the *John Nix Farm Management Pocketbook*, 26th edition (1996), and we have also estimated what the prices of milk and cattle would be in the absence of CAP price support, using the figures derived in Chapter 2 and summarised in section 2.7 (though cattle purchases and sales so nearly balance each other that the estimated effects of CAP support here are negligible). These figures are presented below, together with miscellaneous cow costs (straw, dairy sundries, AI, etc), the base forage variable costs (seed, sprays and P&K fertiliser), and the cost per kilogram of nitrogen fertiliser.

Calculating per cow costs & returns with and without CAP price support			
Variable costs & returns			
	Current price	Support %	Non-CAP price
Quota rental (pence per litre)	12		
Milk value (pence per litre)	24.5	50%	12.25
Concentrate (per tonne)	£138	0%	£138
Feed costs per cow			
Value of calves (per cow)	£110	33%	£74
Value of culls (per cow)	£107	33%	£72
Cost of replacements (per cow)	£214	33%	£143
Miscellaneous variable costs	£95	0	£95
Non-feed variable costs per cow			
Calculating forage costs			
Variable costs			
Seed (£/ha)			
Sprays (£/ha)			
Base fertiliser - 0:24:24 (£/t; £/ha)	£122.5	200	kg/ha
Non-nitrogen forage costs per ha			
Nitrogen fertiliser - 34.5% (£/t; p/kgN)	£125	34.5%	N

Box 2: Costing basis used in the spreadsheet dairy model

b) Fixed costs

Fixed costs are more problematic, as they relate to the whole farm rather than just the dairy enterprise, and may vary considerably from farm to farm, depending on whether it is owned or rented, on whether the labour is hired or family, and on whether own machinery or contractors are used. However, we wanted to model the medium-term effects of policy, when farmers would have a chance to adjust some of these factors (and our pilot case study actually highlighted labour as one of the first things which the farmers would change, even though this is regarded as a "fixed" cost). Our approach has been to attribute fixed costs to each component of the dairy system, so as to be able to estimate the full costs associated with each system modelled.

The factors which we have estimated are:

- Labour cost per cow £208/year
  (based on labour requirements for a typical 80-cow herd and an average wage rate for a hired dairy herdsman)
- Interest cost per cow £48/year
  (based on a real interest rate of 5% and a replacement heifer value of £950)

- Base forage production costs £15.80/ha/yr
  (based on contractors' charges for an annual base application of P and K fertiliser, and rotovating and re-seeding once every ten years)
- Nitrogen fertiliser application costs £6.80/ha/application
  (based on contractors' charges)
- Silage production costs £5.70/t
  (based on contractors' charges for cutting, carting and existing)
- Rental cost £130/ha/year
  (average value for lowland farms but **excluding** dairy facilities such as milking parlour and cubicle buildings; most of the scenarios investigated with the model would involve a reduction in cow numbers and it is quite unlikely that the farmer could find an alternative use for these facilities or negotiate a rent reduction, i.e. these costs are genuinely "fixed" in the medium term).

The use of contractors' charges for all forage operations takes account of labour, machinery and fuel, and thus removes the need to estimate these separately. Nix quotes two different contracting rates, and we have used the lower rate, appropriate to a farmer who does a certain amount of contracting for his neighbours, as this will be quite close to the full cost for a farmer who uses his own labour and machinery.

The final cost included is that of milk quota, with a rental price of 12 pence/litre. In the UK a dairy farmer is not strictly limited by his milk quota but could choose to rent more, or alternatively to rent out quota and produce less milk or even no milk at all. Thus, the marginal price which he receives for his milk should be regarded as the farmgate price **less** the quota rental value (though not all farmers will actually think in these terms). This is an area which does vary considerably between Member States, as the rules on quota transfer are interpreted quite differently in different countries.

Box 3: overall structure of the spreadsheet dairy model

The model can be run with any of three different costing bases affecting the value of milk:

- CAP-supported prices, no quota rental, i.e. farmgate milk price 24.5p/l
- CAP-supported prices, quota rental permitted, therefore the marginal value of milk is the farmgate price less the cost of quota rental 12.5p/l
- No CAP support, quota not relevant, reduced farmgate price (using middle estimate of world price).....12.25p/l

An example of the model output is shown on the following page for CAP-supported prices and no quota rental.

Each column of the table represents a different level of nitrogen fertiliser use, and the upper results block represents the "low milk yield" approach (5,000 litre/cow from 1 tonne of concentrates) whilst the lower results block represents the "high milk yield" approach (6,000 litres/cow from 2 tonnes of concentrate).

Within each results block the first section presents the stocking rate and milk yield per hectare; these are calculated solely from the technical assumptions and do not vary with the costing basis.

The second section presents the revenue from milk sales, the net costs which vary in proportion to the number of cows, and the costs which vary in proportion to the number of forage hectares.

The final section in each results block presents the net margin, expressed per hectare, per cow and per litre.

The optimal production point can be found by selecting the level of nitrogen use and milk yield which gives the highest value for the chosen measure of net margin (see box 4). This margin can then be compared with that which would result from any particular environmental target for nitrogen use or stocking rate, to see how much it would cost the farmer if he were to charge his system to meet this environmental target.

Box 3 (continued)

Calculation of margins - net margin basis												
N (kg/ha)	0	50	100	150	200	250	300	350	400	450	500	550
Low milk yield												
Stocking rate	0.5	0.8	1.1	1.4	1.7	2.0	2.1	2.3	2.4	2.5	2.5	2.5
Milk yield/ha	2,658	4,180	5,719	7,206	8,574	9,764	10,740	11,486	12,006	12,320	12,456	12,446
Milk sales	£651	£1,024	£1,401	£1,766	£2,101	£2,392	£2,631	£2,814	£2,941	£3,018	£3,052	£3,049
Cow variable costs	£258	£405	£555	£699	£832	£947	£1,042	£1,114	£1,164	£1,195	£1,208	£1,207
Forage costs	£190	£217	£245	£272	£300	£326	£353	£379	£405	£430	£456	£480
Net margin/ha	£204	£401	£602	£794	£969	£1,119	£1,237	£1,321	£1,372	£1,393	£1,388	£1,362
Net margin/cow	£383	£480	£526	£551	£565	£573	£576	£575	£571	£565	£557	£547
Net margin/l	7.7	9.6	10.5	11.0	11.3	11.5	11.5	11.5	11.4	11.3	11.1	10.9
High milk yield												
Stocking rate	0.6	1.0	1.3	1.7	2.0	2.3	2.5	2.7	2.8	2.8	2.9	2.9
Milk yield/ha	3,681	5,788	7,920	9,980	11,873	13,522	14,873	15,906	16,626	17,061	17,249	17,236
Milk sales	£902	£1,418	£1,940	£2,445	£2,909	£3,313	£3,644	£3,897	£4,073	£4,180	£4,226	£4,223
Cow costs	£382	£601	£822	£1,035	£1,232	£1,403	£1,543	£1,650	£1,725	£1,770	£1,790	£1,788
Forage costs	£190	£217	£245	£272	£300	£326	£353	£379	£405	£430	£456	£480
Net margin/ha	£330	£600	£874	£1,137	£1,378	£1,584	£1,748	£1,868	£1,944	£1,979	£1,981	£1,954
Net margin/cow	£538	£622	£662	£684	£696	£703	£705	£704	£701	£696	£689	£6808
Net margin/l	9.0	10.4	11.0	11.4	11.6	11.7	11.8	11.7	11.7	11.6	11.5	11.3

Box 4: Margin per hectare, margin per cow or margin per litre?

A farmer's overall profit will be greatest when he maximises returns to his most limiting resource. In arable production the limiting resource is usually land, so the farmer will try to maximise his margin per hectare. However, for dairy production the situation is more variable, depending on individual farm circumstances and on national interpretation of milk quota policy.

On a well-equipped specialist dairy farm the objective will usually be to use the whole farm area as efficiently as possible for dairy cows, maximising margin per hectare. This assumes that the farm has sufficient physical facilities (cow cubicles, milking parlour, etc), and labour to manage the requisite number of cows, and has sufficient milk quota. Such a situation often occurs on the small specialist family dairy farms of the Netherlands, for example.

On a mixed farm, the maximum size of the dairy herd will usually be limited by physical resources and/or labour, and the objective will be to maximise margin per cow. The split of land between the dairy unit and other enterprises can be varied in pursuit of this goal (and the farmer should consider in his calculations the "opportunity cost" of the land, i.e. what return he would get by using it for one of the other enterprises on his farm). Again, this scenario assumes that the farm has sufficient quota to sell all the milk produced. This situation commonly occurs in the UK, where even so-called "specialist dairy farms" usually have some other enterprise (such as beef or cereals) and so have an alternative use for their land.

Until 1984, these two approaches were the alternatives for dairy farmers, and research or advisory material would often quote results per hectare and per cow. However, milk quotas changed all that. Most farmers were allocated a milk quota several percent lower than their previous level of production and thus became limited by the number of litre which they could sell, rather than by their land area or the number of cows which they could keep. Many chose to expand or start-up other enterprises to make use of their slack resources, and the objective for their dairy units became to maximise margin per litre of milk quota.

Over the last twelve years the situation has developed and diverged. Despite a number of subsequent quota cuts, some farmers will have reduced their fixed resources in line with their milk quotas so that they are again limited by land area or cow numbers. Others will have bought or rented quota so that it is no longer a limiting constraint for them, though this depends considerably on the local quota transfer regulations. In the UK and the Netherlands quota is quite freely tradable, whilst in France and Italy it is tradeable but with some restrictions and additional transfer costs. In some Member States quota transfer is practically prohibited or is "ring fenced" in certain vulnerable areas, such as mountain regions.

Basic model results

The situation which currently prevails in many countries and for many farmers is one of CAP-supported prices and no rental of quota. In these conditions, the optimal production points are as follows:

- Margin per hectare is maximised with the higher level of concentrated feeding and milk yield, and at a very high fertiliser input of 500kg N/ha, supporting a stocking rate of 2.9 cows/ha (= 2.9 LU/ha). This would be typical of many specialist dairy farms in the Netherlands.

- Margin per cow is maximised again at the higher yield level, but with a lower fertiliser usage of 300kg N/ha and a slightly lower stocking rate of 2.5 LU/ha. This would apply to many farms in the UK.

- Margin per litre is also maximised at the higher level of concentrate feeding and milk yield, and with fertiliser use of 300kg N/ha, supporting a stocking rate of 2.5 LU/ha. This would apply to many mixed farms which are unable to obtain additional milk quota.

One point which emerges immediately is that a fixed milk quota tends to encourage rather less intensive production. However, milk quotas are only part of the CAP dairy policy, and the following table sets out the interacting effects of price support and milk quotas.

Pricing: Quota rental:	CAP supported No	CAP supported Yes	World price N/A
Maximising margin per hectare (assumes milk quota not limiting)			
Milk yield	High (6,000 l/cow)	High (6,000 l/cow)	High (6,000 l/cow)
Fertiliser	500kg N/ha	300kg N/ha	300kg N/ha
Stocking rate	2.9 LU/ha	2.5 LU/ha	2.5 LU/ha
Net margin	£1,981/ha (2,477 ecu)	- £37/ha (-46 ecu)	- £38/ha (-48 ecu)
Gross margin	£2,950/ha (3,688 ecu)	£801/ha (1,001 ecu)	£762/ha (952 ecu)
Maximising margin per cow (assumes milk quota not limiting)			
Milk yield	High (6,000 l/cow)	High (6,000 l/cow)	High (6,000 l/cow)
Fertiliser	300kg N/ha	300kg N/ha	300kg N/ha
Stocking rate	2.5 LU/ha	2.5 LU/ha	2.5 LU/ha
Net margin	£705/cow (881 ecu)	- £15/cow (19 ecu)	- £15/cow (-19 ecu)
Gross margin	£1,043/cow (1,304 ecu)	£323/cow (404 ecu)	£307/cow (384 ecu)
Maximising margin per litre (assumes production is limited by milk quota)			
Milk yield	High (6,000 l/cow)	High (6,000 l/cow)	High (6,000 l/cow)
Fertiliser	300kg N/ha	300kg N/ha	300kg N/ha
Stocking rate	2.5 LU/ha	2.5 LU/ha	2.5 LU/ha
Net margin	11.8p/l (0.148 ecu)	- 0.2p/l (-0.003 ecu)	-0.3p/l (-0.004 ecu)
Gross margin	17.4p/l (0.218 ecu)	5.4p/l (0.068 ecu)	5.1p/l (0.064 ecu)

Many interesting results emerge from this table. The first is that at current world prices all dairy farmers would have negative net margins: they would be losing money in the long term. Under these pricing conditions the optimal production points shown are those which would give the smallest loss, rather than the greatest profit. In these conditions the gross margins are still positive, so a farmer could continue producing in the short term, but he could only sustain this if he was able and willing to continue applying his own resources of land, labour and capital to generate returns much below the market rate.

This seems to imply that dairy farming would be untenable in the EU without the CAP, but the situation may not be quite so extreme, as a number of adjustments would occur:

- Firstly, the end of EU subsidised exports of milk products would lead to a rise in world prices, which would rise even further if EU production dropped sufficiently to turn it into a net importer. Thus the estimate used here - that EU prices would halve in the absence of CAP support - may exaggerate the long-term effects.
- Secondly, the cost of factors of production - particularly rents - would tend to fall in response to the lower profitability of dairying.
- Thirdly, this model reflects the average situation, and there would be some farmers who were more efficient or on better land who would continue to produce milk profitably, and of course there would be other less efficient farmers who would go out of business.

The apparent negative margins when quota can be rented are because we have set the rental value of quota against every litre of milk, though in practice most dairy farmers own the majority or all of the milk quota. According to the model, the farmer would actually be better off if he gave up dairy farming and rented out his quota. However, most farmer do not choose to do this but instead carry on and make a positive margin on the other resources used for dairy production.

Interestingly, our assumed value for the world price of milk (12.3 p/l) is almost identical to the net value of milk for the farmer who has to rent in quota (12.5 p/l). This implies that those farmers who can rent in quota and still produce milk profitably, could also produce profitably at world prices without any quota regime[11]. A study of those farmers who do regularly rent in large volumes of quota could give some valuable indications of the shape which the EU dairy industry might take if it did eventually move to world prices.

The production point shown here (high milk yield, 300kg N/ha) is the best of the options modelled but is probably not a good indicator of what would actually happen, as it does imply a negative net margin. The greatly reduced returns to dairying would probably reduce the level of rents and some other input costs (e.g. herdsmen's wages), and most farmers would have to choose between abandoning dairying altogether or seeking a system based on much lower levels of variable inputs, such as grass-clover leys with no nitrogen fertiliser and much reduced or zero concentrate feeding, as well as looking for all possible means to reduce their expenditure on labour, machinery and other overheads. The long-term effects would probably be quite beneficial for the environment, though at a social cost of lower rural employment. The experience of New Zealand might be another good model for some of the changes which would take place.

The second point to emerge is that, in the absence of milk quotas, CAP price support leads to significant intensification relative to the world price situation. Concentrate feeding, milk production and stocking rates all increase, whether maximising margin per hectare or per cow, with a two-thirds increase in fertiliser use and a 20% increase in stocking rate. None of these effects are beneficial to

[11] Though this may only reflect the short-term situation, where a farmers has slack resources of land, labour, buildings or machinery, and rents in sufficient quota to bring the operation up to full capacity. In the longer term, where the farmer had to take account of all of his fixed costs, quota rental at these prices might appear a less attractive option.

the environment, though the question of how detrimental they are will be examined in the next chapter.

The third point is that milk quotas have to some extent counteracted the intensifying effect of price support, reducing the optimal production level to the lower milk yield with 300kg N/ha and a stocking rate of 2.5 LU/ha. This effect is the same, whether the farmer is able to rent quota and continue pursing the goals of maximum margin per hectare or per cow, or whether he has to maximise his margin per litre under a fixed milk quota.

As most dairy farmers are currently constrained by quotas one way or the other, these results suggest the optimal production point under current policy is not very different to that under world milk pricing. However, this ignores the fact that withdrawing several billion ecu per year from the EU dairy industry would have profound structural effects, which would in turn affect production systems, and that farmers would actively seek new low-cost systems of production which are not included in this model.

The fourth and final main point, of considerable relevance to agri-environmental policy, is that the optimal level of nitrogen use is largely insensitive to different levels of output pricing. Only the most extreme scenario of maximising margin per hectare, with CAP price support and without the limitations of milk quotas, moves optimal nitrogen usage away from the level of 300kg N/ha.

This is a result of the shape of the response curve of grass to nitrogen: production increases in an almost linear fashion as more and more nitrogen is applied, until the uptake and use of the nitrogen are limited by soil moisture, temperature or sunlight, and the response then levels off rapidly[12]. Thus, the optimum level of nitrogen to use is practically independent of input or output prices, within normal limits. Doubling the price of nitrogen fertiliser in the model had no effect on the optimal application if seeking to maximise margin per hectare, and only reduced the optimum by 50kg N/ha for those farmers seeking to maximise margin per cow or per litre. This means that a nitrogen tax would be a very ineffective and inefficient means of encouraging farmers to use less fertiliser.

The full table of model results presented in Box 3 shows that the financial variable most sensitive to stocking rate is, not surprisingly, margin per hectare. If the farmer is primarily concerned with margin per cow or margin per litre, and can vary the amount of land used by the dairy herd, then he can make quite substantial changes in his intensity of production without much effect on his overall profitability. One implication of this is that the limitation of a fixed milk quota should make a dairy farmer much more prepared to consider entering environmental schemes which would require him to reduce his intensity of production.

Effects of CAP support on uptake of environmental management schemes

What effect does current CAP support have on dairy farmers' willingness to adapt their farming systems to be more "environmentally friendly"? In this section we look at the costs to the farmer, in profit foregone, of reducing his intensity of production to each of two possible target points:

[12] This is also the point at which significant nitrate leaching may start to occur.

- The stocking rate of 1.4 LU/ha used in the Extensification Premium scheme.
- Complete cessation of all nitrogen fertiliser use to encourage floral species diversity.

All we do here is look at the potential costs to the farmer in terms of profit foregone; the political question of what combination of carrot, stick or compensation to use is another issue.

All the examples concentrate on the financial variable of net margin per hectare.

Reducing stocking rate to 1.4 LU/ha

Under CAP price support

- Reduction of stocking rate from 2.9 to 1.4 LU/ha
- Reduction of fertiliser use from 500 to 110kg N/ha
- Reduction of net margin from £1,981 to £939/ha
- **Net cost to the farmer of £1,042/ha (1,300 ecu)**
- Reduction in milk output per hectare to 46% of current level

Under world pricing

- Reduction of stocking rate from 2.5 to 1.4 LU/ha
- Reduction of fertiliser use from 300 to 110kg N/ha
- Reduction of net margin from -£38 to -£70/ha
- **Net cost to the farmer of £32/ha (40 ecu)**
- Reduction in milk output per hectare to 53% of current level

Ceasing all use of nitrogen fertiliser

Under CAP price support

- Reduction of stocking rate from 2.9 to 0.6 LU/ha
- Reduction of fertiliser use from 500 to 0kg N/ha
- Reduction of net margin from £1,981 to £330/ha
- **Net cost to the farmer of £1,651/ha (2,060 ecu)**
- Reduction in milk output per hectare to 21% of current level

Under world pricing

- Reduction of stocking rate from 2.5 to 0.6 LU/ha
- Reduction of fertiliser use from 300 to 0kg N/ha
- Reduction of net margin from -£38 to -£112/ha
- **Net cost to the farmer of £80/ha (100 ecu)**
- Reduction in milk output per hectare to 25% of current level

Summary

- CAP price support has a very dramatic effect on the cost to a farmer of de-intensifying his dairy system, adding over 1,000 ecu/ha to the cost of meeting the Extensification Premium stocking rate, and almost 2,000 ecu/ha to the cost of cutting out nitrogen fertiliser. The reason is quite simple: the higher the price of milk, the greater the farmer's loss if he produces less of it.
- Environmental restrictions like these would have a very dramatic effect on EU milk output, with the stocking rate restriction reducing milk output per hectare to about half its current level, and the fertiliser restriction reducing output to about a quarter of its current level. (If the milk price were not supported by the CAP, then output would already be lower and so the drop in production would be rather less dramatic).

Effects of land quality on uptake of environmental schemes

Here we look at how the quality of land affects the profit foregone if a farmer decides to de-intensify his system. The data used to model grass production considered five "grass growth site classes", where Site Class 1 represented the best soils and the highest summer rainfall, and Site Class 5 represented the poorest soils, lowest summer rainfall, or higher latitude or altitude. All the results presented so far have been for the middle point, Site Class 3, but here we look at the two extremes.

As with the example above, the two possible targets considered are a stocking rate of 1.4 LU/ha, and the complete cessation of all nitrogen fertiliser. Again, the financial results are expressed as net margin per hectare.

Reducing stocking rate to 1.4 LU/ha

Site Class 1 (best dairy land)

- Reduction of stocking rate from 2.9 to 1.4 LU/ha
- Reduction of fertiliser use from 500 to 70kg N/ha
- Reduction of net margin from £2,376 to £959/ha
- **Net cost to the farmer of £1,420/ha (1,775 ecu)**
- Reduction in milk output per hectare to 42% of current level

Site Class 5 (poorest dairy land)

- Reduction of stocking rate from 2.2 to 1.4 LU/ha
- Reduction of fertiliser use from 450 to 145kg N/ha
- Reduction of net margin from £1,696 to £917/ha
- **Net cost to the farmer of £779/ha (970 ecu)**
- Reduction in milk output per hectare to 56% of current level

Ceasing all use of nitrogen fertiliser

Site Class 1 (best dairy land)

- Reduction of stocking rate from 2.9 to 0.9 LU/ha
- Reduction of fertiliser use from 500 to 0kg N/ha
- Reduction of net margin from £2,376 to £568/ha

- **Net cost to the farmer of £1,808/ha (2,260 ecu)**
- Reduction in milk output per hectare to 27% of current level

Site Class 5 (poorest dairy land)

- Reduction of stocking rate from 2.5 to 0.4 LU/ha
- Reduction of fertiliser use from 300 to 0kg N/ha
- Reduction of net margin from £1,696 to £158/ha
- **Net cost to the farmer of £1,538/ha (1,920 ecu)**
- Reduction in milk output per hectare to 16% of current level

Summary

- The higher the agricultural productivity of the land, the greater the loss to the farmer if he de-intensifies production. This effect is most noticeable when reducing stocking rate to a defined target (with the income loss on the better land more than twice the loss on the poorer land), but the same effect can also be observed when cutting out nitrogen fertiliser[13].
- As discussed above, environmental restrictions like these would have a very dramatic effect on EU milk output.

CAP, cows and conservation - some preliminary conclusions

The situation in dairying is very different from that in beef or sheep production, in that CAP policies do not currently have a very large environmental effect.

The technical and economic relationships in a dairy system are such that, under almost any pricing regime which makes it worthwhile to produce milk at all, the farmer has a strong incentive to apply reasonably high levels of fertiliser (e.g. 300+ kg N/ha), easily high enough to wipe out practically all floral diversity. Any policy which tried to reverse this by prohibiting nitrogen use would have a massive cost to the farmer (or to the taxpayer if compensation or incentive payments were made) and in many cases a rather limited chance of success due to the inherent high fertility and stored nutrients in many dairy pastures. Moreover, if applied on a large scale, such a policy would result in a severe milk shortage across the EU as milk production per hectare dropped to a quarter of its current level. Thus, the pursuit of floral diversity in lowland dairy pastures is not technically, economically or politically realistic as a general policy objective. This goal can be pursued in a more targeted way, concentrating on pastures where fertility is low and there is still a floral diversity worth conserving or which could be easily recreated, for example in mountain pastures and in pockets throughout the lowlands.

[13] Also, as discussed in Chapters 3 and 5, cutting out nitrogen fertiliser on the less productive land is much more likely to bring real benefits in terms of increased floral species diversity. Cutting out fertiliser on inherently fertile land may bring very little environmental benefit but would certainly cost the farmer a lot.

We recommend that the environmental objective of floral diversity in dairy pastures should be pursued through carefully targeted management agreements, specifically developed for individual sites or small regions, and not through mainstream dairy policy.

A reduction in stocking rates to the 1.4 LU/ha currently used for the Extensification Premium scheme would not be as expensive to dairy farmers as ceasing the use of nitrate fertiliser, but would still incur a very significant cost, accentuated by CAP price support. Before any attempt was made to promote such extensification in dairy systems, it would be essential to clarify exactly what environmental goods were being pursued, and to consider whether the large cost was justified.

In terms of avoiding nitrate pollution, the potential on lowland dairy pastures is much greater, with the majority of dairy farmers already operating below or close to the critical limits for fertiliser application and stocking rate. The problems which do exist are associated with light soils and with areas of particularly intensive dairying, found on occasional farms throughout the EU but especially concentrated in Denmark and the Netherlands. Here CAP price support does play a role, both in encouraging the current level of intensity and in increasing the cost to the farmer of de-intensifying. A lower marginal incentive to produce (e.g. a lower price for milk) would be sufficient on its own to achieve these objectives in some areas, and would reduce the cost to other farmers of complying with nitrogen or stocking rate limits. Thus, a change in CAP dairy support would provide a better base from which to pursue these environmental goals but would still need to be supplemented by various forms of specific environmental policy, such as:

- nitrate vulnerable zones or similar measures, targeted at specific water catchment areas and adapted to the local soil type and climatic conditions;
- management agreements to protect particular flora or ground-nesting birds of pastureland, incorporating stocking rate limits and restrictions on the timing of hay and silage cuts and on the use of certain pesticides. These should be developed for individual regions, taking account of the species to be promoted, their flowering/nesting dates and typical cutting dates for the area;
- preservation of hedgerows, ponds and other features which contribute to the landscape and environment, and can co-exist alongside reasonably intensive dairy production.

Application to other grazing livestock

We have not been able to develop similar models for beef or sheep, but would expect the same basic conclusions to apply:

- CAP support encourages farmers to produce more intensively than they otherwise would;
- CAP support increases the cost to a farmer (in terms of income foregone) of deliberately de-intensifying his system;
- the cost of de-intensification is greater on more productive land.

The main difference with beef and sheep systems is the presence of headage payments, representing a much more significant incentive than price support. This means that it can be worthwhile for a farmer to increase his stocking rate even to the point where total livestock output suffers, just to maximise

his headage receipts. This does not occur in dairying, where the farmer must increase his output of milk in order to take better advantage of CAP price support.

The presence of quotas and other ceilings for headage payments will tend to function in a similar way as milk quotas: depending on the individual circumstances of the farm, they may go quite some way to offset the incentive provided by the headage payments. The case of tradeable sheep quota is very similar to that of milk quota, in that the quota rental price can be deducted from the level of premium to give the net value of the ewe premium.

Literature review of the effects of livestock systems on the conservation of grassland flora and bird population

The aim of this chapter is to provide an overview of the general effects of grazing livestock systems on key environmental variables, based on key literature sources, particularly reviews and discussion papers. Most of the research work has concentrated on temperate lowland grasslands and moorlands, and so the emphasis in this chapter is on lowland intensive livestock systems.

The most frequently measured indicators of the ecological health of a grassland community are floral species diversity and bird populations. "Species diversity" means simply the total number of different species present in a given area, however, the relative abundance of particular species is also of major importance to the characteristics a floristic community. Therefore some measures of diversity take account of the importance and abundance of various species in a more comprehensive "diversity index".

The major management variables which affect the nature conservation value of pastures are:

- fertiliser use - quantity and timing;
- stocking rate - both overall and seasonal stocking density;
- cutting regime - particularly the timing of the first cut of hay or silage.

Objectives of this review

The main objectives in undertaking this overview were to address the following questions for neutral grasslands in the Atlantic and Continental lowlands, site of most of the EU's improved pastures and intensive grazing livestock systems[14]:

- At what fertiliser levels, stocking rates and mowing dates does species diversity change significantly?
- At what fertiliser levels, stocking rates and mowing dates do bird populations change significantly?
- What is the potential for reversibility?

General relationships

The general effects of fertilisers and stocking rates are shown in the following figures (6, 7 and 8).

[14] Chapter 4 divides the EU into a number of agro-ecological zones, including "Atlantic lowlands" and "continental lowlands". These two zones account for 69% of all temporary grass and 78% of all dairy cows: two important indicators of intensive grazing systems.

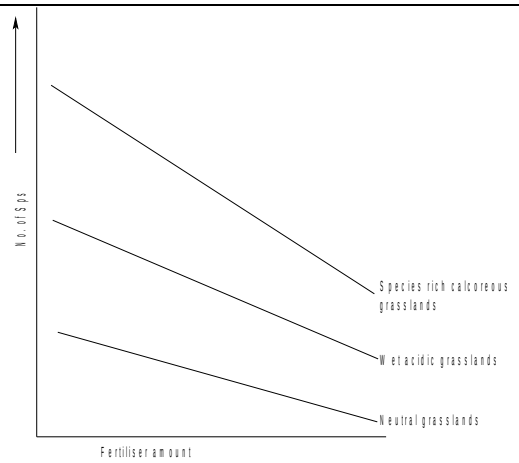


Figure 5.9: Relationship between fertiliser & species diversity on different soils

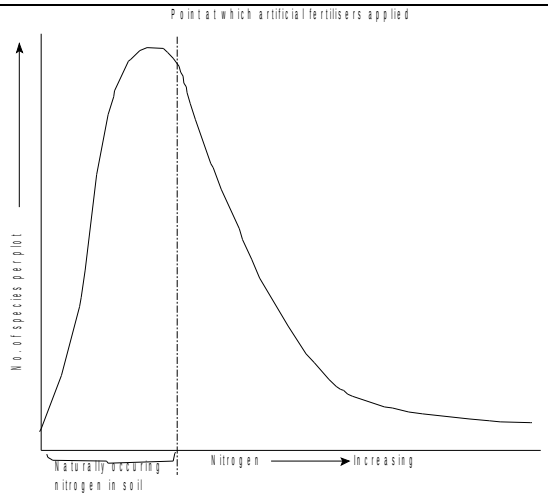


Figure 5.10: General relationship between fertiliser & species diversity

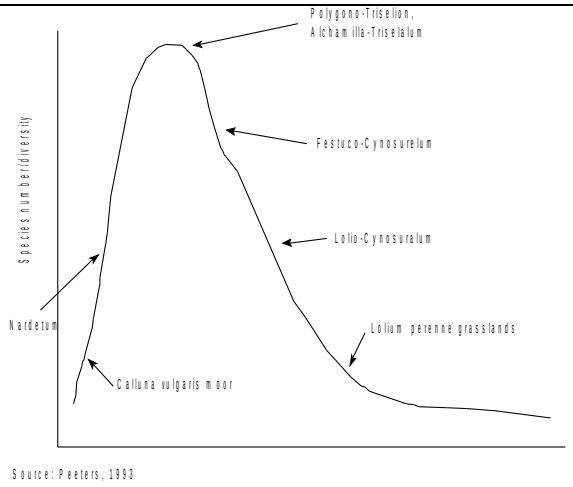


Figure 5.11: Species number and diversity in relation to soil fertility or the productivity of the community

All other things being equal, the lower the soil fertility, the greater the species diversity of the grass sward. However at the extreme end of the fertility spectrum, where nutrients are very low, species diversity is severely reduced. Plants respond to the total amount of nutrients available to them, whether supplied from artificial fertilisers, animal manures, or from the soil, and thus a soil which has a high inherent or residual fertility may already be at or beyond the point of optimum fertility (from the species diversity point of view) even without any applications of fertiliser or manure.

The general effect of fertiliser applications and mowing dates are summed up in 12:

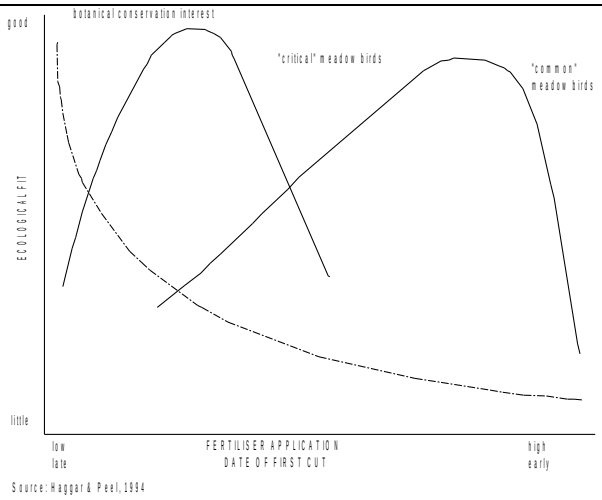


Figure 5.13: Simplified relationships between the intensity of agricultural practices and the ecological fit for botanical and meadow bird conservation interest (after Dijkstra, 1991)

Botanical conservation interest (i.e. species diversity) declines rapidly with increasing amounts of fertiliser applications and early mowing dates. The higher level of available nutrients allow the more vigorous species to flourish at the expense of less vigorous species. This applies particularly to tall grasses, which can soon come to dominate the sward, leading to shading and physical smothering of low-growing forbs and mosses. However, in wet meadows, adverse physical conditions such as flooding or ice cover can kill and inhibit taller grasses, thus allowing the low-growing species to take advantage of the nutrient availability (Mountford, Lakhani and Kirkham 1993) and increase in abundance. Fertilisers also act as muscicides in meadows (Mountford, Lakhani and Kirkham (1993), further affecting the ecology.

Early mowing removes plants before they have had an opportunity to flower and set seed.

The ability of a grassland to recover its nature conservation interest when management practices are changed depends on several factors, particularly the duration, intensity and nature of grassland "improvement", which affects both the residual fertility and the potentially viable seed bank in the soil from which new plants will germinate. Also important to species re-establishment is the proximity of other seed sources, which depends on the degree of fragmentation of semi-natural grassland areas.

On areas of improved grassland where applications of fertiliser and herbicides have ceased, a switch from cutting to grazing encourages the growth of a more diverse sward structure (see Treweek, Watt and Hambler, in press, who used stocking rates equivalent to 8 sheep per hectare). Winter and spring grazing has a beneficial effect on sward diversity, by opening up the sward structure and reducing the accumulation of organic matter, both of which help to allow dicotyledons to germinate (Watt, Treweek and Woolmer 1996).

Treweek *et al.* (in press) managed to achieve average sheep liveweight gains and increase sward species diversity, on mixed-species swards, by applying no fertilizer and using winter or spring grazing to maintain a relatively tall sward height, which also increased invertebrate numbers. They also found that a nearby source of propagules was essential in order to restore semi-natural community types.

The process of reversing the effects of agricultural management is not quick, with natural regeneration and succession from arable land to ancient grasslands taking about a century (Bioscan 1995). The nature of modern arable soils differs from those in past centuries due to the increased input of artificial fertilisers. It is crucial to establish the right soil conditions and nutrient status in order to re-create a semi-natural grassland community. Intensive methods may be required to reduce nutrient levels and enable a species-rich sward to establish. These can include deep ploughing, removal of top soil, and repeated cropping without fertilisers, though all of these have their drawbacks. Removal of topsoil erases the seed bank and hence potential plants for recolonisation; repeated cropping is costly in time and machinery with the obvious loss of income in tonnage per hectare. Once a species-rich sward has been established, it can be maintained and enhanced by a combination of mowing and grazing (Bioscan 1995). A detailed account of grassland restoration is given in Parker (1995).

Summary of relevant papers

This section briefly describes the various papers reviewed, from which the "general relationships" above were drawn.

Effects of stocking rate on species diversity

Grazing can affect species within a plant community in several ways: indirect effects due to grazing of competitors, affecting the local environment for seed germination and seedling emergence, plant survival and growth; direct effects on plant survival and size by grazing of the plant itself (Silvertown, Watt, Smith and Treweek 1992). The physical action of the animals resulting in poaching also alters the local environment creating open areas of bare soil allowing colonisation and the effect of manuring by animals creates areas of localised soil enrichment (often resulting in burning and scorching of species) (Crofts and Jefferson 1994). It has been found that conditions of heavy grazing which permit the establishment of seedlings have a detrimental effect later on in the life cycle of minor dicots (Silvertown *et al.* 1992).

Paper 1

Management options to conserve a Cirsio-Molinietum and integrate its use into productive livestock systems. (Tallowin and Smith 1996).

Pasture type

- A *Cirsio-Molinietum* fen meadow, acidic wet

Previous management
- Neglected with invasion of *Molinia caerulea*, *Betula* and *Salix* sps.

Treatments
- Reintroduction of grazing for three years with 2-300kg Hereford x Friesian steers at three timings: early (May and June); late (July - September) or a combination (May - September).
- No fertiliser applications.

Results
- All grazing treatments reduced the *Molinia* and allowed other species to flourish, leading to a 17% increase in the number of fen-type species, with grazing in May and June least successful in improving species diversity.
- Grazing opened up the canopy structure with areas of bare soil leading to disturbance of the soil and germination of the soil seed bank.
- The low nutrient availability suppressed a few of the relatively competitive species.

Paper 2

The effects of grazing management on the vegetation of mesotrophic (meadow) grassland in Northern England. (Smith and Rushton 1994).

Pasture type
- Herb-rich hay meadows on limestone in the Yorkshire Dales (CG9 in NVC).

Previous management
- Spread with organic manure April-May from farm-yard middens, grazed until mid-May, hay crop cut July or August. Aftermath grazed by cattle until November-December, removed to yards.

Treatments
- Four different treatments:
  - No grazing.
  - Spring grazing (no grazing from after haycut to January 1st followed with grazing 100 Kendal Rough Fell ewes with supplementary feeding away from plots; between April and early May 30 ewes and lambs confined to treatment plots).
  - Autumn grazing (no grazing from January 1st to hay-cut in July or August, grazed with 10 beef cows and 10 calves September to late October, replaced with 50 hogs late October to late December).
  - Normal grazing (a combination of spring and autumn.
- Treatments carried out for four years.

Results

- The greatest reduction in species richness occurred in the ungrazed plots as a result of individual species growth strategies (groups of similar or analogous genetic characteristics which occur widely among species and cause them to exhibit similarities in ecology) in established grassland communities. For example, as a result of cessation in grazing, those few species with a more vigorous upright growth form dominated and outshaded those prostrate and shade intolerant species (Grimes 1979).

Attempts to recreate "old meadows" by changing management of "improved meadows" will tend to be more successful in a diverse landscape which provides propagules of different species to colonise the "opportunist niche" of the meadow.

Paper 3

Response of an old pasture to applied nitrogen under steady-state continuous grazing. (Tallowin, Kirkham, Brookman and Patefield 1990).

Pasture type

- Previously old unimproved mixed-species pasture in Devon.

Treatments

- N rates = 0, 100, 200, 400 or 800kg/ha/yr.
- P and K replaced.
- Response examined under 4-weekly cutting or continuous grazing with young beef cattle.

Results

- Primarily looked at dry matter (DM) production and utilized metabolizable energy (UME), both of which increased with increasing applications of N up to the 400kg/ha/yr.
- Looked at the response of agriculturally productive grasses within the sward, and found that *Lolium perenne* increased at the expense of other species, especially the other grasses and *Trifolium repens*, particularly at the rate of 400kg/ha/yr. Where no N was applied the percentage composition of other species and *Trifolium repens* increased at the expense of the grasses.

N	Other species		Lolium perenne		Poa trivialis		Holcus lanatus		Agrostis stolonifera		Trifolium repens	
	1984	1987	1984	1987	1984	1987	1984	1987	1984	1987	1984	1987
0	8	27	30	16	28	21	16	11	12	8	2	12
200	10	14	25	36	27	20	22	18	10	9	1	1
400	7	12	25	42	30	18	19	12	13	12	2	1

Effects of stocking rate on bird populations

Paper 4

Farming and birds. (O'Connor and Shrubb 1986).

Pasture type

- Unknown but probably semi-improved grasslands.

Previous management

- Unknown.

Results

- Higher stocking rates led to increased loss of nests through trampling, with snipe suffering 80% loss of nests at 4.8 cows per ha.

	% nests lost to trampling at stocking of 2.4 cows/ha	% nests lost to trampling at stocking rate of 4.8 cows/ha
Lapwing	40	60
Snipe	60	80
Redshank	72	93

Effects of fertiliser on species diversity

Paper 5

Experimental assessment of the effects of nitrogen addition under hay-cutting and aftermath grazing on the vegetation of meadows on a Somerset peat moor. (Mountford, Lakhani and Kirkham 1993).

Pasture type

- Lowland, wet, neutral.

Previous management

- Hay meadow, with aftermath grazing.
- Unfertilised.

Treatments

- 0, 25, 50, 100, 200kg N/ha/yr.
- P and K replaced.

Results

- An annual application of 25kg N/ha stimulated the spread of agriculturally productive grasses within 2 years and 50kg N/ha/yr significantly reduced species richness in 3 years. *Lolium perenne* and *Holcus lanatus* benefitted from N applications and came to dominate the swards at the expense of most other species.
- Few forb species increased cover with increasing N applications e.g. *Rumex acetosa*. All *Carex*, *Juncus* and moss species declined with increasing N, as did short-lived species and low growing wet-land species, probably due to shading by tall grasses. Legumes were suppressed by increasing amounts N but common in plots receiving 25kg N/ha/yr where P and K were replaced.

Paper 6

Restoration of species-rich grassland after a period of fertilizer application. (Bakker 1987)

Pasture types

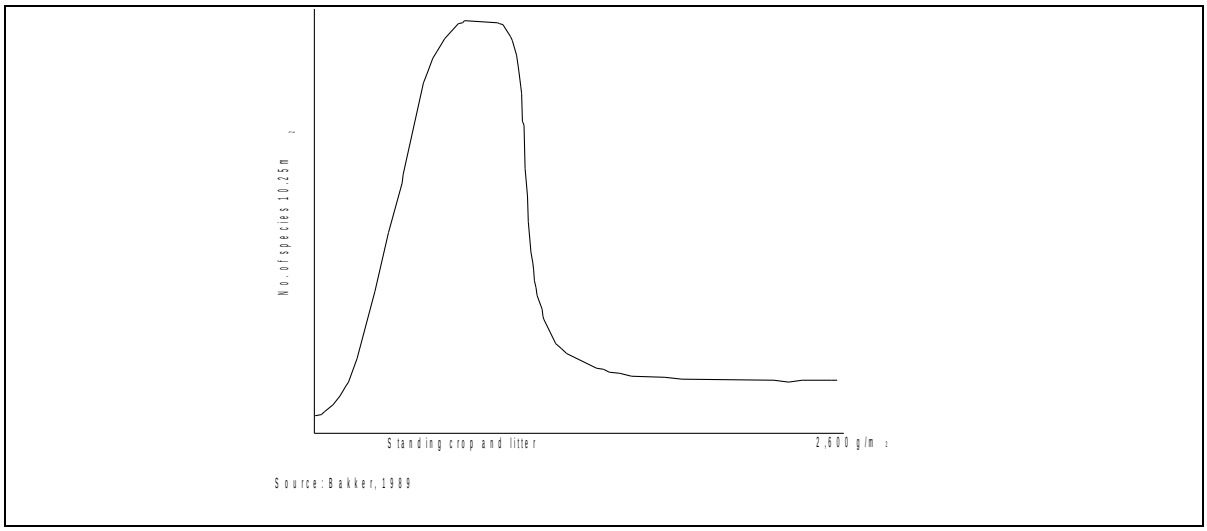
- Numerous improved Dutch grasslands, with varying water tables.

Treatments

- Cessation of fertilizer applications over time.
- Looked at different species typically found in nutrient-rich soils, nutrient-poor soils and intermediate soils.

Results

- A complex paper with many graphs, but Bakker concludes that with cessation of fertilizer applications the nutrient status of the soil declines, the rate of which is speeded up when a hay crop is taken.
- The canopy is also opened up, leading to more opportunities for species adapted to nutrient poor soil conditions to become established. There is a slow overall increase in species diversity (due to changes in the structure of the canopy) but a rapid increase in the number of species, especially those tolerant of low nutrients.
- This process can take up to 15 years to reach an equilibrium in the vegetational succession process.



Effects of fertiliser on bird populations

No relevant papers were found on this subject.

Effects of mowing dates on species diversity

It is generally accepted that regular mowing enhances species diversity (see, e.g. Parker, 1995).

Peeters *et al*. (1993) have shown that increasing mowing and taking silage cuts, combined with dressing of slurry and NPK, severely reduces species diversity as well as altering species composition. A combination of one cut for hay and late season grazing produced the highest species diversity in a *nardetum* grassland in Belgium.

Effects of mowing dates on bird populations

Paper 7

Hatching dates of waders and mowing dates in intensively exploited grassland areas in different years. (Kruk *et al*. 1996).

Pasture type

- Netherlands, intensively farmed grasslands on the peat soils, cut for silage (between April and June) and grazed late in the season.

Treatments

- Observations on clutch survival (those not incubated = early in season and those with birds sitting = late in season)i.e. either successful, predated, destroyed by mowing activities or deserted.

Results

- With each of the three meadow bird species studied, it was found that delaying mowing dates for up to two weeks allowed nearly all clutches to hatch and provided more than the required percentage for recruitment into the population. Lapwings tend to favour short grazed grass whereas the Redshank and Black-tailed Godwit favour tall grass for nesting and are therefore more vulnerable to mowing. Figure 10 summarises the finding of the research for all years of the study.
- It is proposed that fine-tuning mowing dates to hatching can be achieved by using Temperature sums. The researchers found that if mowing is postponed on fields rich in meadow birds (estimated at 40% of grassland area on an average farm in the Netherlands) then the total costs of mowing 1-2 weeks later would be low. The actual delay required depended on the particular season, with postponement from the 19th to the 28th of May for an early spring, and from the 5th to the 12th of June for a late spring. After June 1st the quality of silage rapidly decreases, but it was found in the study area that a need to delay mowing beyond this date happened only once in eight years.

Table 5.11: Percentage of nests hatched before mowing

Meadow bird	% required to maintain current population levels	Current mowing date	Mowing delayed by 1 week	Mowing delayed by 2 weeks
Redshank	40	42	80	92
Blacktailed Godwit	64	70	85	95
Lapwing	65	74	82	83

Source: Kruk, Noordervliet and ter Keurs, 1996

Other papers

Review paper: Role of farmyard manure, (FYM) in Simpson and Jefferson (1996).

- Annual high rates of FYM (> 30 t/ha) cause scorching and bare patches. In general terms, as rates and frequency of application of FYM increase beyond a certain point (which varies according to back-ground fertility), there is a decrease in richness and abundance of forbs and an increase in competitive grasses, resulting in overall reduction in species richness and diversity. (Simpson and Jefferson, 1996).
- Current guideline for well rotted FYM (stored 12 months or more) of 20 t/ha every 3-5 years represents good practice for nature conservation (Crofts and Jefferson 1994). Heavier clay soils require less frequent dressings than light sandy soils when maintaining hay yields. The nutrient status of FYM is variable depending on storage conditions, source, handling and weather conditions.

Some key statistics on hay meadows

- In 1984 there were 200,000ha of unimproved, lowland semi-natural grassland in England and Wales, representing 4% of total agricultural grassland and 5% of grass over 5 years old, excluding rough grazings. Of this unimproved lowland grassland, neutral hay meadows now cover less than 10,000 in England (Fuller 1987).
- Semi-natural lowland grassland of high conservation value in England accounts for less than 3% (<100,000ha remaining) of all permanent grassland (Jefferson and Robertson 1996a). with lowland defined as at or below altitudes of 350m or less in England (Jefferson and Robertson 1996b). Losses between the 1980s and 1990s were 2-10% per annum. Once lost, semi-natural grasslands cannot be recreated, at least over a timescale of less than a few hundred years (Jefferson and Robertson 1996a). See table below.

Table 5.12: Lowland grassland communities and their distribution in England

Note: Community codes refer to the NVC codes in volume 3 of the NVC (Rodwell 1992).

A.	**Grasslands of high botanical interest**
1.	**Neutral grasslands**
MG2	*Filipendula ulmaria* - *Arrhenatherum elatius*: Northern tall herb grassland A sub-montane community restricted to the Carboniferous limestone in Northern England especially in Pennine areas of Derbyshire and North Yorkshire.
MG3	*Anthroxanthum odoratum* - *Geranium sylvaticum*: Northern hay meadow Valley grasslands and river banks of northern England; often used as hay meadows. Major concentrations in the Pennine Dales of Swaledale, Wharfedale (N Yorks) and Teesdale (Durham).
MG4	*Alopercurus pratensis* - *Sanguisorba officinalis*: Flood meadow Seasonally flooded land in lowland river flood plains. Widely scattered but concentrations in N Yorkshire/Humberside (along the rivers Derwent, Ouse and Wharfe) and Oxfordshire (Thames Valley and tributaries).
MG5	*Cynosurus cristatus* - *Centaurea nigra*: Lowland hay meadow and pasture Widely scattered throughout the English lowlands. The community covers a wide range of soil types and the sub-communities reflect this. The *Galium verum* sub-community shows affinities with some CG grasslands and the *Danthonia* sub-community with acid grasslands. Major concentration in Worcestershire.
MG8	*Cynosurus cristatus* - *Caltha palustris*: Flood pasture Widespread but rather local distribution throughout lowland England. Characteristic of periodically inundated land. Sometimes managed in the past as water meadows.

MG11	*Festuca rubra - Agrostis stolonifera - Potentilla anserina*: Inundation grassland Scattered localities in lowland England characteristic of areas frequently inundated with fresh or brackish water. Only one sub-community (*Lolium perenne* sub-community) is found inland and it has often been improved.
MG13	*Agrostis stolonifera - Alopercurus geniculatus*: Inundation grassland, silver meadows Scattered localities in lowland areas usually in river flood plains. In eastern England it forms mosaics with swamp communities in extensive stands on washlands, but elsewhere it is fragmentary alongside watercourses and on the edges of ponds. This community has special value in providing feeding areas for wildfowl.
2.	**Calcareous grassland**
CG1	*Festuca ovina - Carlina vulgaris*: Warm temperature limestone grassland Distribution limited to scattered sites on harder limestones principally around and near to southern and western coasts of England.
CG2	*Festuca ovina - Avenula pratensis*: Species-rich chalk grassland Species-rich grassland widely distributed over southern lowland calcareous formations, with regional differences showing up as sub-communities.
CG3	*Bromus erectus* Distribution follows that of the species and so this community is especially frequent over the Chalk, Jurassic limestone (Oolite) and Magnesian Limestone (Permian).
CG4	*Brachypodium pinnatum* Frequent on the Cretaceous chalk and Jurassic limestone.
CG5	*Bromus erectus - Brachypodium pinnatum* Distribution s centred on the Jurassic limestone in Central and Eastern England.
CG6	*Avenula pubescens* Occurs in scattered localities over a variety of lowland limestone areas but is nowhere extensive, being a product of little or no grazing of grasslands over moist, mesotrophic calcareous soils on flat or gently-sloping sites. Most of these areas have been converted to arable.
CG7	*Festuca ovina - Hieracium pilosella - Thymus praecox* Scattered localities in Wiltshire, the Yorkshire Wolds, the Carboniferous Limestone of Derbyshire and the Mendips, with its greatest concentration and extent in Breckland.
CG8	*Sesleria albicans - Scabiosa columbaria*: Magnesian limestone grassland Distribution is confined to the Magnesian limestone in County Durham.
CG9	*Selseria albicans - Galium sterneri*: Carboniferous limestone grassland Distribution is confined to the Carboniferous limestone of Northern England, with the sub-communities marking regional differences.
3.	**Acid grasslands**
U1	*Festuca ovina - Agrostis capillaris - Rumex acetosella* The very diverse and open swards occur widely on light soils in the drier areas of lowland England.
U2	*Deschampsia flexuosa* The swards are of local distribution on wetter but free-draining, base-poor soils in lowland England.
U3	*Agrostis curtisii* A community based on the abundance of *Agrostis curtisii* and therefore confined to central southern and south west England.
U4	*Festuca ovina - Agrostis capillaris -Galium saxatile* Principally a community of upland (sub-montane) areas of North and Western England associated with a range of acidic soils on lime-poor subtrates. Examples do, however, occur in lowland situations (<350m) on the

	"upland fringes" and in Dorset and Wealden districts.
B.	**Grassland communities of lower botanical interest**
MG1	*Arrhenatherum elatius* An unmanaged coarse grassland occurring throughout the English lowlands on road verges and railway embankments and in neglected agricultural and industrial habitats.
MG6	*Lolium perenne - Cynosurus cristatus*: improved permanent grassland The major permanent pasture type in lowland England, often bought about by the action of fertilisers, herbicides and drainage on many other MG, CG or U types or by agricultural rundown of MG7. May also be used for silage or hay-making.
MG7	*Lolium perenne*: re-seeded grassland The major and ubiquitous sown grassland type in England.
MG9	*Holcus lanatus - Deschampsia cespitosa*: damp pasture This is highly characteristic of permanently moist soils throughout the English lowlands. Often results from invasion of *Deschampsia caespitosa* into MG6 and 7 where drainage has deteriorated.
MG10	*Holcus lanatus - Juncus effusus*: rush pasture This is ubiquitous throughout the English lowlands, commonly developing by invasion of *Juncus* into MG6 and MG7 where drainage becomes impeded.

Conclusions: the effects of livestock systems on the environment

This section draws conclusions from the above material, concentrating on two particular issues:

- the nature of the response - whether changing a particular variable gives rise to continuous environmental improvement, or a sudden change at one point, or deteriorates either side of some optimum;
- the agricultural implications - how far from normal agricultural practice would a farmer have to go to get significant environmental benefits?

Stocking rate

Neither undergrazing nor overgrazing are good for the environmental status of grasslands. Both lead to a reduction in the flowering plants and other species which are generally associated with and desired in traditional pastures, and neither extreme is ideal for ground-nesting birds.

Thus a balance is required, suggesting the concept of an "optimum stocking rate". However, in practice this is hard to define as it depends on both the nature of the soil and the pasture, and on the birds and plant species which considered most desirable. Moreover, the optimum stocking rate requires adjustment from year-to-year, as weather conditions affect the growth rate of grasses and thus the grazing pressure required in order to maintain a particular sward height. In fact, it is the sward height and its variation which directly affect both floral species diversity and bird life, and an ideal management prescription would be expressed in these terms; it is the need for practical policy measures which can be easily monitored and clearly conveyed to farmers, which dictates the emphasis on stocking rates in most agri-environmental schemes.

Despite these limitations, progress has been made in establishing target stocking rates for different pasture types. The *"Lowland Grassland Handbook"* proposes the following targets[15]:

[15] Approximate conversion of "grazing weeks per year" to livestock units, assuming a grazing season of 26 weeks/year.

- Acidic, wet or marshy grasslands.....0.60 LU/ha
- Calcareous grasslands.....0.75 LU/ha
- Neutral grasslands.....1.25 LU/ha

If the grassland type can be more closely defined, and more specific environmental objectives specified, then it is possible to give more accurate management guidelines, as in the UK's "Countryside Stewardship Scheme" which targets six different pasture types and gives guidelines for stocking rate, grazing period, target sward height and fertiliser regime for each of them. These stocking rate range from 0.1 to 0.75 LU/ha.

Three things stand out from these target stocking rates:

- they vary considerably between pasture types, making EU-wide or even nationwide stocking rate limits seem very crude instruments;
- they are all lower than the 1.4 LU/ha set for the Extensification Premium, and in most cases quite significantly lower;
- they are all lower than the agricultural (i.e. profit-maximising) optimum stocking rates determined by surveys or experiments and advocated by agricultural extension services. In other words, farmers will usually face an economic cost in reducing their stocking rates to levels which are better for nature conservation.

Trampling of birds' nests

As well as their effect on the sward height, livestock have a rather more direct effect on birds' nests: they tread on them. The effect is probabilistic and exponential, with any increase in stocking rate increasing the risk of nets being destroyed. Thus there is no absolute safe level of stocking density, but it would be theoretically possible to determine target stocking rates below which a high enough proportion of nests would survive to allow maintenance of a stable bird population.

So far, most discussions of the environmental effects of grazing livestock systems have used livestock units, whereby several sheep are regarded as equivalent to one cow. This relationship does not hold for nest trampling, where it is more the total number of legs which counts. It would be possible to investigate how much more likely a nest is to survive being kicked or trodden on by a sheep than a cow, and to look at which species walk about the field more, but in the absence of such esoteric research, it is probably best to express targets in terms of total animals per hectare, irrespective of size or species.

If a farmer was being encouraged to change his management in order to promote the populations of ground-nesting birds, each reduction in stock numbers would bring benefit to the birds but would generally cost the farmer more in income forgone. A shift from sheep to a smaller number of cattle might bring the same conservation benefit, with relatively little impact on farm income.

Cutting date

The key variable here is the timing of the first cut of hay or silage. If this comes too early it will destroy birds' nests before they have hatched, and flowering plants before they have set seed. Unlike the continuous nature of response to stocking rate and fertiliser, this is a much more discreet effect: on a given date the chicks have either left the nest or they haven't, a plant has either set seed or it has hasn't. The curves shown in research papers reflect the variation in dates between individual nests or plants of the same species (spread over just a few days) and between different species (spread over a few weeks).

Thus in any given year there will be an earliest cutting date for a particular pasture, by which most of the target species should have reproduced. Delaying cutting beyond this point will bring little or no additional benefit, and may even inhibit the germination of the seeds just produced.

The significance of cutting date to the farmer is that agricultural grasses behaves just the same as other flowering plants: at a certain point in the spring the plant diverts nutrients away from leaf growth towards seed production, the seed stalks elongate and stiffen, and after setting seed the plants begin to senesce. This all results in a fairly dramatic drop in digestibility around the flowering period, with the total amount of "utilisable metabolisable energy" (UME - the best measure of total feeding value extracted from an area of grassland) declining even though the dry matter yield goes up. The lower feeding value leads to a reduction in animal performance, unless the lower quality hay or silage is supplemented by more concentrate feed. Research and survey work shows that cutting date has an important impact on the profitability of livestock enterprises, with it being particularly critical to produce high-quality silage for dairy and intensive beef cattle.

Because the agricultural grasses are responding to the same "biological clock" of day length and temperature as other plants, their flowering periods are linked. Some control can be exercised through the choice of grass varieties and the timing of fertiliser applications, but there will always be a trade-off between the agricultural and the environmental optimum cutting dates. Silage is usually cut well before most plants flower and so a deliberate attempt to encourage species diversity would require a significant change of management from silage to hay, as well as postponing the hay mowing dates. The widespread switch from hay to silage has occurred for good agricultural reasons, including the higher feeding value of silage, reduced dependence on the weather, and increased scope for mechanisation. Reversing this trend would imply a significant cost to farmers.

For ground-nesting birds, the conflict is not so extreme, with one of the papers finding that a well-calculated delay of just 1-2 weeks could significantly favour bird populations without too great an effect on the quality of forage.

Fertiliser applications

Most experimental work has concentrated on the amounts of nitrogen added to the soil, partly because the effects of nitrogen are more immediate and dramatic than of any other major nutrient, and partly because farmers tend to work by first deciding their applications of nitrogen (the most expensive and critical nutrient) and then applying P and K in proportion, usually through a compound fertiliser. Thus the nitrogen application rate is a good proxy for total macro-nutrients applied.

As with stocking rates, there is a theoretical optimum level of nitrogen supply, below which species diversity will be reduced. However, on any intensive lowland pasture the inherent or residual level of fertility will be at or well beyond this point, and so any amount of fertiliser will tend to reduce species diversity. The experiments reviewed found a significant reduction in the range and abundance of environmentally desirable species at just 25kgN/ha, with additional nitrogen further reducing species diversity.

Most significantly, the effects of fertiliser application are cumulative. Only a proportion of the added nutrients are harvested by animals or machine, and a significant proportion accumulates in the soil organic matter, building up fertility over decades and centuries[16]. Work on re-creating species-rich swards has shown that it can take decades of careful management to remove this stored fertility, requiring the cessation of all artificial fertiliser use and the removal of nutrients from the pasture as hay or silage. Needless to say, such an approach is not the most profitable way to manage an intensive livestock enterprise.

In practice, most of the lowland pastures of northern Europe are by now so far removed from the low-nutrient status required for environmentally-desirable species to compete, that it would be very difficult to ever return them to this state. It would certainly require many years and would prove very expensive in terms of income forgone, and any compromise approach, such as a partial reduction in fertiliser use would have little or no measurable environmental benefit.

Agricultural research has shown that grass gives very significant economic returns to nitrogen fertiliser, up to an optimum which varies with soil, rainfall and latitude, but is usually in the range of 300-450kg N/ha - massively above the optimum levels for species diversity. These research findings have been backed up by surveys, which show a strong correlation between fertiliser use and farm profitability.

We found no direct research on the effects of fertiliser levels on birds, and it seems that this effect is generally mediated through sward height, affecting ground-nesting birds. Thus the target fertiliser rate, in terms of bird populations, would be that amount of fertiliser required to achieve

[16] A good example of this is provided by the "Ploughing-up campaign" of the Second World War, in which British farmers were encouraged to plough-up traditional grazing areas, like Romney Marsh, and use them to produce much-needed cereals. The accumulated effects of hundreds of years of dunging by livestock had build up sufficient fertility to produce several years of reasonable cereal crops with minimal fertiliser use. This stored fertility resulted from long-term grazing management on naturally fertile soils, and not from the use of artificial fertilisers; where fertilisers have been used, the stored fertility will be that much higher.

the desired sward heights under the chosen grazing regime. However, because livestock effect ground-nesting birds in two ways - through influencing the sward height and through nest trampling - the optimum arrangement to favour bird populations would probably be a low or zero level of fertiliser use, reducing grass production and thus decreasing the number of livestock needed to maintain the target sward height. In this way the level of trampling would be lower than with a higher fertiliser level and higher stocking rate, but the income forgone by the farmer would be greater.

And finally, one interesting exception to the general trends, just to show that you cannot be simplistic about the effects of agriculture on the environment: grazing geese. These birds thrive on the short, rich pastures found on intensive dairy farms, and the birds get just as much benefit from additional fertiliser as the cows do.

Note on mountain and extensive livestock systems

The above review has concentrated on lowland pastures in northern Europe, with the literature covering both the "improved" pastures and the remaining islands of "unimproved" pasture. Amongst the extensive sheep, goat and beef systems of the Mediterranean and mountain zones, the same general relationships apply but with the following important differences:

- Fertiliser use is normally low or zero, due in part to the practical difficulties of applying it, but mainly due to the low economic returns from poor soils and unfavourable climatic conditions.
- The history of fertiliser non-use, combined with low inherent fertility, means that the pastures tend to be much more species-rich; in other words, there is still something worth preserving.
- Stocking rates are generally much lower, but as grass production is also lower, reduced stocking rates are needed to maintain similar sward heights and so serious overgrazing can still occur at apparently low stocking rates.
- The poorer social infrastructure and lower profitability of farming mean that abandonment and undergrazing often occur, something practically unheard of in the intensive lowlands. Thus encouraging a farmer to move towards a environmental target stocking rate may mean an *increase* in stock, whereas in the lowlands it will almost invariable require a decrease.
- These lower stocking rates mean that trampling risk to birds' nests is much lower, even under normal agricultural practice.
- Much less of the total area is conserved as hay or silage, and where grass is cut, it is more likely to be as a relatively late hay cut, allowing more opportunity for plants to flower and birds to hatch their eggs.

So overall, these semi-natural pastures tend to be of much greater nature conservation interest, and the objective is usually maintaining and fine-tuning the farming systems which brought them about. This is in sharp contrast to the conflict between the agricultural and the environmental optima for stocking rate, fertiliser use and cutting policy which occurs on intensive lowland pasture. And somewhere between these two extremes lie the hill and moorland pastures which have remained semi-natural for generations but have sufficient agricultural potential to be "improved" and lose much of their nature conservation value if agricultural policy makes this economic for farmers.

Some recommendations for environmental management of grasslands

The literature reviewed above suggests that, to maintain and encourage meadow bird populations, stocking rates should be kept to below 2.4 cows per ha, with mowing taking place approximately three weeks after nesting.

However, the recommended stocking rates vary according to the desired sward height and the type of pasture. The more animals the shorter and more even the sward. Cattle and larger animals are useful in breaking up a rank course sward, especially if put to graze in the winter and early spring. Goats, being browsers, will effectively control scrub encroachment.

The following recommendations are given in the *"Lowland Grassland Handbook"*:

Table 5.13: A guide to stocking rates for lowland grassland

No. of grazing weeks per year	Calcareous grassland		Neutral grassland		Acidic grassland		Wet/marshy grassland	
	S	C	S	C	S	C	S	C
2	60.0	15.0	100.0	25.0	50	12.0		12.0
4	30.0	8.0	50.0	12.5	25	6.0		6.0
6	20.0	5.0	33.0	8.0	16	4.0		4.0
8	15.0	4.0	25.0	6.0	12	3.0		3.0
10	12.0	3.0	20.0	5.0	10	2.5		2.5
12	10.0	2.5	17.0	4.0	8	2.0		2.0
14	8.5	2.0	14.0	3.5	7	1.5		2.0
16	7.5	2.0	12.5	3.0	6	1.5		1.5
20	6	1.5	10.0	2.5	5	1.0		1.0
24	5	1.0	8.0	2.0	4	1.0		
36	3.5	1.0	5.5	1.5	3	0.5		
52	2.5	0.5	4.0	0.5	2	1.0		0.4
Grazing pressure (animal weeks/ha/yr)	120 or	30	200 or	50	100 or	25		25

Countryside Stewardship guidelines are as follows:

Table 5.14: Countryside Stewardship: stocking rates

Habitat type	Lu/ha	Duration of grazing	Optimum sward height	N application
Hay meadows	light 0.1	Aftermath	20-50mm in winter	20 t/ha FYM
Grazing pastures	Light 0.6	1 Mar - 30 June April - Dec	20-50mm 20-50mm	None None
Upland grazing pastures (rough)	0.25			None
Culm grassland	0.25	Part of grazing season	150mm by end of summer	None
Chalk or limestone grassland	0.75	Min. 10 weeks in a year	75mm end of summer	None
Upland limestone grassland	0.75	Min. 10 weeks in a year	75mm end of summer	None
Plus	0.1 (sheep)	8 weeks between May and August		None

Source: MAFF, June 1996

Low rates of N application (25kg/ha/yr) will have a significant effect on species diversity of a semi-natural grassland community. Ideally there should be no fertiliser applications made.

Well-rotted farmyard manure (i.e. stored for a minimum of 4 months) can generally be used on semi-natural grasslands without damage to the nature conservation value of the site, provided they are mown for hay and are on neutral soils, (Crofts and Jefferson, 1994).

Development of agri-environmental zones

This chapter develops a number of agri-environmental zones for use in analysis and in developing new policy options. Some reference has already been made to these zones on previous chapters.

The rationale for zoning

The effects of livestock policy on the environment depend on the particular livestock system and on the environment in question, and thus vary from place to place. We have therefore attempted to divide the EU into a number of "agri-environmental zones": areas of broadly similar environmental conditions, where a similar set of livestock systems can potentially be employed. This has been done partly as an analytical tool, to ensure that our consideration of livestock policies is representative of the whole EU, and to get an impression of the relative significance of the different systems by area and by livestock numbers.

If the effects of livestock policy do indeed vary between different places, then there must be a case for differentiating policies between different zones. There are also important differences in policy objectives between areas (e.g. avoiding rural depopulation, preventing forest fires) which can be reflected in zonal policies. This approach is already applied within the CAP to some extent, for example in LFAs and in regional headage limits, as well as in specifically regional policies such as Objective 1 and 5b regions, but it is an area which will be investigated and developed further in this report.

If zones are to be used as part of livestock policy, then the zones must be defined in some administratively-meaningful way, either in terms of existing administrative boundaries (such as regions or districts using the NUTS system), in terms of other recognised zones (such as LFAs or Objective 5b areas), or by objective criteria which could be used to designate zones based on available statistics such as land use and livestock numbers.

Any attempt at zoning will inevitably involve trade-offs:

- the trade-off between the fine detail which would reflect subtle differences between habitats, livestock systems and local policy objectives, and the availability of data and resources to this project. There is also a danger that creating to many small zones would make it impossible to "see the wood for the trees" in what is supposed to be a strategic study;
- the trade-off between natural boundaries which reflect differences in environmental features and livestock systems, and administrative boundaries which form a current basis for statistics collection and a potential basis for zonal policies.

We have considered a number of possible methods of zoning, in the search for the trade-off which best meets the objectives of this study. The maps, data sources and zoning systems which we considered included the following:

- ITE land classification maps;
- Council of the European map of the natural vegetation;
- CORINE land cover plot;
- Dobris assessment landscape map;

- IEEP low intensity farming system maps;
- Eurofarm statistics for NUTS regions;
- FADN (RICA) statistics for NUTS regions;
- LFA and Mountainous Areas maps;
- Objective 1 and 5b maps.

Proposed agri-ecological zones

After much deliberation, we decided that it was best to work with recognised existing boundaries and classifications, rather than to create yet another set of maps. We have proposed a hierarchical approach to zoning, as set out below.

Primary division

Here we have adopted the regions of the EU Habitats Directive, which have already been determined by Member States, taking account of their own geography and existing administrative boundaries. These regions are:

- Atlantic;
- Continental;
- Mediterranean;
- Alpine;
- Boreal;
- Macronesian.

We have concentrated on just the first four regions (see map). The Macronesian region is very small (just the Azores and Canary Isles) and is a minor part of the overall picture of livestock in the EU environment. The Boreal region (which occurs in the new Member States of Sweden and Finland) is potentially quite an important zone, but so far its livestock systems have been little affected by the CAP and relevant Eurostat data are not yet available.

INSERT MAP HERE

Secondary division

We have further divided the principal habitat zones into mountainous areas and non-mountainous areas along the already-recognised boundaries of the Mountain LFA. For the British Isles, where MLFA does not occur, we have used the basic LFA boundaries, as the northern latitude creates mountainous habitats at quite low altitudes.

This mountain/lowland sub-division is not relevant to the Alpine region (which actually includes the Pyrenees and Apennines, as well as the Alps themselves).

Thus the seven basic agri-ecological zones employed in this study are:

- Atlantic lowlands;
- Atlantic mountains;
- Continental lowlands;
- Continental mountains;
- Mediterranean lowlands;
- Mediterranean mountains;
- Alpine.

These zones are analysed and described in the next section, and the final section of this chapter presents key statistical data on each zone. For the practical purpose of identifying objectives and developing policies, zones cannot be determined on agri-ecological conditions alone. Within each zone, important differences exist between and within Member States, reflecting the social structure and the past history of farming, rural development and agricultural support. These aspects have been brought out in our descriptions below, under *"Variation within zones"*.

Further sub-division

For the analytical purposes of this report, we have limited our scope to these seven zones. However, further subdivision of the zones would be possible in a number of ways in order to enhance the effectiveness of policies in meeting their environmental and social objectives, and to reduce the incidence of major "winners and losers" when agricultural support changed from the current pan-EU approach to a zonal basis.

A number of possible bases for further sub-division are outlined below, together with their main advantages and drawbacks.

By Member State

Despite the fact that we now have a "common" agricultural policy, important differences do occur across Member State boundaries and a certain degree of freedom does exist for Member States to determine the way in which policies are implemented on their territory, as well as to vary the rate for certain payments and top-ups. Thus we would propose that the practical implementation of a zonal policy should respect Member State boundaries.

One of the ideas discussed later in this report, under policy options, is that of budget neutrality within zones, perhaps achieved through the use of regional stabilisers. If zonal boundaries coincided with Member State boundaries, then this approach would maintain the level of national CAP receipts unchanged, perhaps increasing its political acceptability within Council. Such an approach is already implicit in the use of regional reference herds for Beef Special Premium.

By regions within Member States

A number of existing CAP policies, such as BSP or arable area payments, already require or allow Member States to subdivide their territory into regions for policy purposes, and this is usually done along those existing administrative boundaries which best reflect important agricultural differences.

This approach could be developed further to give a pragmatic set of agri-ecological zones. For example, the UK might be split as follows:

- English Lowlands.....Non-LFA in England
- English Mountains.....LFA in the lake District and Peak District
- English Moors.....LFA on Dartmoor, Exmoor and Bodmin Moor
- Scottish Lowlands.....Non-LFA in Scotland
- Scottish Uplands.....LFA outside the NUTS II "Highlands and Islands" region
- Scottish Highlands.....LFA in the mainland of the "Highlands and Islands" region
- Scottish Islands.....LFA in the islands of the "Highlands and Islands" region
- Welsh Lowlands.....Non-LFA in Wales
- Welsh Mountains.....LFA in Wales
- Northern Ireland Lowlands.....Non-LFA in Northern Ireland
- Northern Ireland Uplands.....LFA in Northern Ireland

This would give eleven separate zones but would be relatively simple to administer, as all of the subdivisions employed already exist. Minor complications might occur with the division of LFA into "Disadvantaged Areas" and "Severely Disadvantaged Areas", or over the fact that some farms may encompass both LFA and non-LFA land. However, these problems already exist and have to be addressed by policy makers and administrators.

By habitat

Division into mountainous and non-mountainous areas is quite convenient, as the boundaries are relatively obvious and the somewhat arbitrary decision of at what altitude a "mountain" begins has already been tackled in the definition of mountain LFAs. Mountains can then be split up into distinct ranges: terms like Alps, Pyrenees, Grampians or Cairngorms readily indicate distinct "islands" of mountain habitat within the "sea" of lowland Europe.

However, this approach is rather less useful for discriminating between different habitats within the lowlands, where sub-division along administrative boundaries may be rather arbitrary and ineffective. For example, the "Mediterranean Lowlands" zone might be further divided into categories depending on the dominant agri-ecosystem, for example:

- Wood pastures (Dehesa and Montado);
- Steppelands;
- Permanent crops;
- Irrigated land;
- etc.

Considerable work could be required in identifying and defining these sub-zones, and then in developing appropriate objectives and policies for them. A good starting point would be to take existing areas or landscape types which have already been identified under ESA or similar agri-environmental schemes. In many countries, ESA legislation has already identified a number of "islands" of high conservation value within the mass of more common habitats and farming systems.

The level of definition to use in zoning will always be a trade-off between the administrative practicality of identifying the zones and implementing the policies, and the greater efficiency which such sub-division should bring. The Member States themselves should be intimately involved in proposing and identifying the zones, finding the trade-off which is most appropriate to their particular circumstances. This is fully in line with the accepted principle of "subsidiarity", and further emphasises the need for taking account of Member State boundaries when defining operational policy zones.

Description and analysis of proposed zones

Each of the seven proposed agri-ecological zones is discussed below, together with an example of how the "Mediterranean Lowlands" zone might be further sub-divided (two of the many possible sub-zones are described: "wood pastures" and "steppelands".

Atlantic lowlands

- *Livestock systems:* Intensive dairy, beef and sheep finishing, characterised by fertilised ryegrass swards, interspersed by pockets of less-intensive production in particular habitats: chalk downland, limestone pavements, lowland heaths, river valleys, marshes, etc.
- *Arable competition:* Major; whilst livestock tend to be concentrated in the wetter areas, on heavier soils and on steeper slopes, and cropping concentrated in drier areas and on lighter soils, there are many intermediate areas which have moved between livestock and crop production in response to policies and prices.
- *Habitats:* Generally intensive pastures with a limited number of grass species, with species diversity concentrated in the pockets of less-intensive grassland and around the natural features such as hedgerows, ponds and woodlands.
- *Landscapes:*
  - (Open field: Arable)
  - Former open field: Arable, dairy
  - Polder: Arable, dairy
  - Bocage: Dairy, beef, sheep
  - Kampen: Dairy, pigs, arable
- *Variations within zone:* Whilst soil type, rainfall and farming systems vary considerably, the over-riding factor of heavily-fertilised sown grassland is fairly consistent. Intensity tends to vary between countries, according to historical farming patterns, farm structures and population density. The variation becomes much more important in the pockets which are less-intensively farmed, where very different habitats can emerge.
- *Environmental objectives and problems:* Environmental efforts have tended to concentrate on preserving or encouraging the re-creation of features (for landscape as well as wildlife interest), and on the maintenance, improvement and expansion of the pockets of special interest. Avoidance of pollution is an important objective, particularly applicable to dairy and intensive livestock systems.
- *Social objectives and problems:* These tend to be the wealthiest areas of the EU, with a predominantly urban population, below-average unemployment, and little risk of rural depopulation - though circumstances do vary between the different Member States. A major rural objective is access to the countryside so that its landscape and wildlife interest can be enjoyed.
- *Agricultural objectives and problems:* These are among the most productive areas of the EU, for both crops and livestock. As such they contribute significantly to surpluses, but are also a major source of food supplies, having to meet the consumers' requirements for plentiful, varied, affordable, safe and high-quality foodstuffs.

- *Locations:* UK, Ireland, western France, northern Germany, Belgium, Netherlands, Denmark, Spain (northern coast).
- *Designations:* In some countries this zone can be identified as all the non-LFA land. In the UK, many of the pockets of particular interest have been identified or designated as ESAs, SSSIs or target habitats for the Countryside Stewardship Scheme. A similar situation exists to a greater or lesser extent in other Member States.
- *Environmental effects of CAP policies:*
  - Many years of CAP price support and headage payments, often supported by grants for agricultural improvements such as drainage, have encouraged intensification and the loss of the more valuable habitats. Measures such as extensification premia and environmental management schemes have sought to address this directly.
  - Milk quotas have in some cases encouraged a reduction in intensity of grassland use, either through reduced levels of inputs to the dairy land, or through a switch to cattle or sheep. However, such a change is rarely accompanied by complete reversion to the pre-intensification flora and fauna.
  - Arable support has played an important role in this zone and contributed to the loss of traditional grasslands, but this trend is now constrained by set-aside and arable base areas.

Atlantic mountains

- *Livestock systems:* Sheep and cattle breeding, interspersed by pockets of cropping, often for forage, and meadows for hay and silage.
- *Arable competition:* Now generally limited but these areas historically included pockets of arable production (e.g. oats, potatoes) on the better land.
- *Habitats:* Acid grassland, heather moorland, peat bogs, sub-Alpine pastures, hay meadows and pockets of agriculturally improved land, semi-natural forest and commercial plantations.
- *Landscapes:* Highlands.
- *Variations within zone:* Widely ranging fertility and carrying capacity, from a few livestock units per hectare to several hectares per livestock unit, making headage limits rather ineffective instruments. This zone could be divided across Europe into three sub-zones:
  - Higher northern mountains
  - Central mountains and northern uplands
  - Southern mountains and uplands
- *Environmental objectives and problems:* Localised over-grazing (and occasionally under-grazing) causing loss of species diversity. Pasture improvement and afforestation. Abandonment in Cantabria.
- *Social objectives and problems:* The most common problem is rural unemployment and depopulation, though the reverse problem occurs in certain accessible tourist spots, where visitor pressure can cause erosion and disruption to wildlife.

- *Agricultural objectives and problems:* To date, agricultural policy has tended to be used as a means to achieve the social objective of maintaining the rural population, but these uplands do have an important agricultural role as the breeding ground for large numbers of sheep and cattle - though they also contribute to the surpluses of these products, particularly after the increase in sheep numbers which was stimulated by the Ewe Premium Scheme.
- *Locations:* UK, Ireland, Spain (Cantabrian mountains).
- *Designations:* Whole areas tend to be designated as LFA on agricultural grounds whilst some are designated as Objective 5b or Objective 1, more on socio-economic grounds.
- *Environmental effects of CAP policies:*
  - Livestock headage payments have encouraged overgrazing in some cases, often linked to low labour-intensity "ranching" where emphasis is on the number of animals kept, not the meat output (enhancing the already-existing tendency to reduce the input of expensive labour).
  - Stocking rate limits and regional headage limits have proved blunt instruments for controlling overgrazing, due to the considerable local variability in land carrying capacity, and the limited effect of regional limits on individual farmers' decisions.
  - Grants for afforestation have often encouraged tree planting with little sympathy for the local environment.

Continental lowlands

- *Livestock systems:* Intensive dairy, beef and sheep finishing, characterised by fertilised ryegrass swards, interspersed by pockets of less-intensive production in particular habitats: lowland heaths, river valleys, etc.
- *Arable competition:* Major; whilst livestock tend to be concentrated in the wetter areas, on heavier soils and on steeper slopes, and cropping concentrated in drier areas and on lighter soils, there are many intermediate areas which have moved between livestock and crop production in response to policies and prices.
- *Habitats:* Generally intensive pastures with a limited number of grass species, with species diversity concentrated in the pockets of less-intensive grassland and around the natural features such as hedgerows, ponds and woodlands.

- *Landscapes:*
  - (Open field: Arable)
  - Former open field: Arable, dairy
  - Polder: Arable, dairy
  - Bocage: Dairy, beef, sheep
  - Kampen: Dairy, pigs, arable
- *Variations within zone:* Whilst soil type, rainfall and farming systems vary considerably, the over-riding factor of heavily-fertilised sown grassland is fairly consistent. Intensity tends to vary between countries, according to historical farming patterns, farm structures and population density. The variation becomes much more important on the pockets which are less-intensively farmed, where very different habitats can emerge.
- *Environmental objectives and problems:* Environmental efforts have tended to concentrate on preserving or encouraging the re-creation of features, for landscape as well as wildlife interest, and on the maintenance, improvement and expansion of the pockets of special interest. Avoidance of pollution is an important objective, particularly applicable to dairy and intensive livestock systems.
- *Social objectives and problems:* These tend to be the wealthiest areas of the EU, with a predominantly urban population, below-average unemployment and little risk of rural depopulation - though circumstances do vary between the different Member States. A major rural objective is access to the countryside so that its landscape and wildlife interest can be enjoyed.
- *Agricultural objectives and problems:* These are among the most productive areas of the EU, for both crops and livestock. As such they contribute significantly to surpluses but are also a major source of food supplies, having to meet the consumers' requirements for plentiful, varied, affordable, safe and high-quality foodstuffs.
- *Locations:* eastern France, Germany, northern Italy, eastern Austria.
- *Designations:* In some countries this zone can be identified as all the non-LFA land.
- *Environmental effects of CAP policies:*
  - Many years of CAP price support and headage payments, often supported by grants for agricultural improvements such as drainage, have encouraged intensification and the loss of the more valuable habitats. Measures such as extensification premia and environmental management schemes have sought to address this directly.
  - Milk quotas have in some cases encouraged a reduction in intensity of grassland use, either through reduced levels of inputs to the dairy land, or through a switch to cattle or sheep. However, such a change is rarely accompanied by complete reversion to the pre-intensification flora and fauna.
  - Arable support has played an important role in this zone and contributed to the loss of traditional grasslands, but this trend is now constrained by set-aside and arable base areas.

Continental mountains

- *Livestock systems:* Intensive and extensive dairy and finishing of beef and pork is in general of minor importance. In some regions sheep farming (traditionally transhumance systems) is still important, but more and more are transferring to stationary systems.
- *Arable competition:* In general low. In the last fifty years entire landscapes previously characterised by subsistence agriculture with cropping have been changed to grassland.
- *Habitats:* Intensive and extensive grasslands with farming systems predominantely traditional grazing and/or indoor-keeping of livestock. Ecologically rich and unique habitats due to differences in soils, climate and history. There is a sensitive equilibrium between the intensity/the withdrawal of agriculture and the ecological value of habitats, the most important threat is the progress of afforestation, the degree of woodlands already amounts to 90%.
- *Landscapes:* Valleys, basins, plateau's, highlands, open grasslands, extended/scattered forests.
- *Variations within zone:* There are no common features in terms of climate, soils, geology, history or forms of agriculture, consist of very diverse areas which can change entirely within short distances.
- *Environmental objectives and problems:* Loss of habitats and historic landscapes. It is assumed that in these zones abandonment and/or natural succession will not occur because it will not be tolerated. Afforestation is likely.
- *Social objectives and problems:* Because agriculture seems to have no future there is little incentive for young people to farm. Those who are interested in agriculture tend to run their farms with the help of their parents. In Germany and Austria jobs in industry, commerce or administration are better paid so although living in the countryside may be desirable, employment opportunities dictate living in urban areas.
- *Agricultural objectives and problems:* The overall question will be: What kind of agricultural production systems can be maintained/should be developed and which are suitable models for enterprises if only few farmers remain in a certain area?
- *Locations:* Austria, Belgium, France, Germany.
- *Designations:* Are mainly considered as LFAs.
- *Environmental effects of CAP-policies:* Depending on the severity of environmental conditions (climate, soils, relief etc) the productivity for all agricultural products can be very low. That means that agriculture can never be competitive and will rely on transfer payments. Headage payments and market support are not sufficient means to encourage farmers to stay on their holdings. Because of economic uncertainty afforestation of vast landscapes in the next decades is the main threat for many regions.

Mediterranean mountains

- *Livestock systems:* Breeding and milking of sheep and goats on dry grasslands, scrub and forests.
- *Arable competition:* Limited, although durum wheat production is maintained by very high arable area payments in some areas.
- *Habitats:* Mediterranean grasslands, woodlands and scrub of many different types, typically in a varied mosaic which gives rise to the characteristic landscape types.
- *Landscapes:*
  - Mediterranean open land: Olives, sheep, goats
  - Cultura promiscua: Olives, vines, sheep, goats
- *Variations within zone:* This is quite a diverse zone, with considerable variation in the amount of tree and scrub cover and in the vegetation types.
- *Environmental objectives and problems:* Preventing widespread abandonment and scrub/forest encroachment, leading to the loss of open habitats and increased risk of forest fires. Also overgrazing in some areas, particularly by goats.
- *Social objectives and problems:* Serious problems of rural depopulation and farm abandonment in many areas, often leading to an increased risk of forest fires. Income and employment opportunities tend to be low.
- *Agricultural objectives and problems:* There is a substantial area in this zone and it makes a significant contribution to the production of sheep and goatmeat. Agricultural production and processing often suffer from structural weaknesses, for example in complying with EU hygiene regulations.
- *Locations:* Italy, Greece, Spain, Portugal, southern France.
- *Designations:* Often designated as mountain LFA but the LFA boundaries also encompass other zones.
- *Environmental effects of CAP policies:*
  - As in the previous zone, headage payments may contribute to the localised problems of overgrazing.
  - Generally livestock support has not proved sufficient incentive to maintain people in these areas and thus to preserve traditional livestock systems and habitats.

Mediterranean lowlands

This is an extremely diverse zone, with major differences between areas (e.g. irrigated and non-irrigated (dryland) areas, productive river valleys and arid steppes, etc) and in farming systems (arable, permanent crop and livestock systems all range from the highly extensive to the highly intensive). Consequently, we have focused on two of the many possible subdivisions of this zone: steppelands and wooded pastures (the latter is also the subject of a case study in Chapter 6). These two sub-zones are of particular interest for their livestock production and valuable ecosystems.

Steppelands

- *Livestock systems:* Typically production of sheep for meat and milk, also integrated with extensive crop production systems. Sheep are shepherded on a variety of pastures, fallows and stubbles, roadside verges, etc, during the day and usually are folded at night; in some cases, they may be kept indoors for significant periods, fed on preserved and fresh forages (crop residues). In certain areas, sheep and arable have disappeared, to be replaced by extensive cattle grazing.
- *Arable competition:* Significant on the better land, whilst the thinner soils, drier areas and steeper slopes tend to be under permanent grassland or scrub. Grazed fallows used to be an important part of the arable rotation, to retain moisture and re-build fertility, until the 1970s when the use of artificial fertilisers became widespread. In some areas, a proportion of the land has been converted to irrigated crop production (cereals, maize, sugar beet, sunflower, alfalfa and forage maize). Stubbles and residues from these crops may also be exploited by sheep and cattle.
- *Habitats:* Varying proportions of semi-natural grassland and other stepic vegetation, grazed fallows and extensive arable cultivation. The mosaic supports important communities of steppeland birds and valuable flora.
- *Landscapes:*
  - Mediterranean open land: Arable, sheep, goats, vines, olives
- *Variations within zone:* There is considerable variation with this sub-zone, related to factors such as rainfall, altitude, soils and historical use. Vegetation varies from poor scrubland to a mixture of fallows and quite intensive pastures and arable land.
- *Environmental objectives and problems:*
  - Increased stocking densities and fencing are damaging to bird communities.
  - Rationalisation of land use towards either arable or grazing, involving loss of mosaic.
  - Arable intensification and consequent loss of fallow element.
  - Removal of field boundaries.
  - Conversion to irrigated arable production.
- *Social objectives and problems:* Incomes are generally low and there is a shortage of rural employment. Substantial rural depopulation has already taken place and the remaining sparse rural population is almost totally dependent on agriculture.
- *Agricultural objectives and problems:* Whilst much lower yielding than the northern and central lowlands, these areas produce significant quantities of cereals, oilseeds, sheepmeat and some specialist cheeses (e.g. 1.5-2 t/ha cereals, 1-2 sheep/ha on farms of 5-600 ha). Traditionally, wool was an important output from these systems but the price dropped considerably when Spain and Portugal joined the Community and it is now regarded as a by-product.
- *Locations:* Spain, Portugal, Italy, Greece, southern France.
- *Designations:* Mostly within, but not delineated by, LFAs.

- *Environmental effects of CAP policies:* Headage payments and market support have encouraged increases in livestock numbers and specialisation in sheep production (or cattle in some cases). Arable market support has promoted intensification and consequent loss of fallows and local pastures. Aids for farm investments have promoted fencing at the expense of shepherding. Structural Funds have financed damaging irrigation schemes. The present system of arable payments and base areas may have halted a tendency to abandon cultivation on poorer land.

Wood pastures

- *Livestock systems:* Extensive production of cattle, sheep, goats and pigs in the Spanish *dehesas* and Portuguese *montados*, comprising widely-spaced trees, dry grasslands and scrub, interspersed with patches of cultivation on long rotations. Pig production used to be very important in the denser forests where acorns were an important source of forage, until decimated by African Swine Fever; however, pig populations are now increasing again.
- *Arable competition:* Up until the early 1980s much more of the wood pastures were cultivated as part of long term rotations. Nowadays, cultivation is carried out mainly to prevent scrub invasion and to maintain grassland pastures.
- *Habitats:* Mosaic of species-rich grasslands, open woodlands of holm oak and cork oak, scrub.
- *Landscapes:* Dehesa/Montado.
- *Variations within zone:* This zone comprises a mosaic of different habitats, with the proportions of each habitat, as well as the tree species, varying from place to place.
- *Environmental objectives and problems:* Preservation of a traditional, low-intensity system which contains a variety of habitats and thus supports a rich variety of species. Need to reduce current stocking levels which prevent tree regeneration and increase pressure on wildlife. There is a widespread lack of regeneration and ultimate loss of tree cover where land is cultivated or grazed repeatedly: in the traditional rotation, cultivation would be used periodically to control scrub, and at intervals stock would be excluded from an area of land for 6-15 years to allow tree regeneration; this is rare now that fewer shepherds are employed. In the past, some wood pastures were lost through conversion to arable, with the use of mechanisation, fertilisers and sometimes irrigation, but the tendency now is towards extensively "ranched" livestock with minimal labour input. There is also a problem of the loss of traditional features, such as drystone walls and dewponds.
- *Social objectives and problems:* High unemployment in areas which are very rural and dependent on agriculture. Much of the land is in big estates with absentee landlords. In Extremadura and Andalusia there is an employment subsidy for agricultural labour of all sorts, including shepherds.

- *Agricultural objectives and problems:* Traditionally, wool was an important output from these systems but the price dropped considerably when Spain and Portugal joined the Community and it is now regarded as a by-product. The main output now is relatively low yields of beef, sheepmeat (from 1-2 sheep/ha) and pork, mostly from regional breeds.
- *Locations:* Spain, Portugal and very small pockets in Italy.
- *Designations:* Mostly within, but not delineated by, LFAs.
- *Environmental effects of CAP policies:*
  - Headage payments for sheep and beef cattle have encouraged increased stocking densities.
  - Aids for farm investments have promoted fencing at the expense of shepherding.
  - Structural Funds have financed damaging irrigation schemes.
  - The present system of arable payments and base areas may have halted a tendency to abandon cultivation on poorer land.

Alpine

- *Livestock systems:* Extensive cattle, sheep and goat production, often transhumant and involving dairying, with pockets of hay meadows and cropping, often for forage production or for local consumption.
- *Arable competition:* Limited.
- *Habitats:* Species-rich grasslands and hay meadows.
- *Landscapes:* Montagne.
- *Variations within zone:* The nature of the grasslands, and hence of the species supported, varies with altitude and with latitude. There is also considerable variation in the livestock systems which have developed over many years. There are two main sub-zones:
  - Alpine (above the tree line)
  - Sub-Alpine (below the tree line)
- *Environmental objectives and problems:* The objective is clearly maintenance of these unspoiled habitats, which support a wide variety of wildlife, including many endangered species. Probably the greatest threat comes from cessation of grazing and land abandonment, leading to the loss of the traditional short sward which supports the existing plant and insect communities. However, where access is good, overgrazing may occur. Tourism and skiing can also damage habitats.
- *Social objectives and problems:* Maintenance of income, employment and population in remote, less economically-developed areas.
- *Agricultural objectives and problems:* The output from these systems includes sheep and cattle for finishing in the lowlands, and a range of high-value, traditional local cheeses.
- *Locations:* France (Alps, Pyrenees), Spain (Pyrenees), Italy (Alps, Apennines), Austria (Alps), Germany (Alps), Sweden, Finland.
- *Designations:* Almost all of these areas are designated as mountain LFAs.
- *Environmental effects of CAP policies:*

- Headage payments have in some cases contributed to overgrazing, as in the northern intermediate mountains, uplands and moors, but this is not such a major problem.
- Support to milk prices (including the indirect effects of quotas in maintaining price levels) has played an important role in keeping dairying in certain of these regions (Val d'Aosta), although beef cattle have tended to replace dairy cattle in some others (Spanish Pyrenees).

Statistical data

The following table present key data on the seven regions which we have identified. It is from 1993, the latest Eurostat ("Eurofarm") data available. We have had to use a certain amount of estimation to arrive at data for our selected zones, as most data are available either for MLFA, LFA and non-LFA at national level, or at NUTS II (region) level for all land types combined. The sub-division which we required - into MLFA, LFA and non-LFA at regional level - is not generally available. In some cases LFA boundaries nearly coincided with regional boundaries, and so we have used the regional data, but in others we had to allocate data from the national LFA and MLFA totals according to the total areas of LFA and MLFA land in individual regions. We could achieve the desired level of precision in many cases but for France, Italy and Spain, which have significant areas of mountain in more than one main habitat type, the results are a little more approximate.

INSERT AGRI ENVIRONMENTAL ZONES 1

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Developing an alternative system of livestock support

This chapter traces the development of our ideas as the study progressed, and explains why we ended up with the system which we are now recommending to the Commission. The reader who is just interested in understanding what our proposals are may turn straight to the final section, 7.5, where the full system is explained and illustrated.

Refining the objective

The objective set out for this study in Chapter 1 was:

> *"To propose new forms of livestock support policy which benefit the environment, maintain farm incomes and do not increase budgetary expenditure"*

The analysis of Chapters 3, 4 and 5 highlighted the following problems with the current forms of CAP livestock support:

- price support & headage payments encourage intensification;
- they also increase the cost to the farmer of adopting any environmental management system which would reduce livestock numbers or output, thus causing the current contradiction between mainstream CAP livestock support and its agri-environmental schemes.

In this chapter we begin to develop ideas for alternative systems of livestock support, which will meet our overall objective and overcome these problems of current support systems. Building on these general aims, we can more closely define our objective as:

- to redistribute current support in a more production-neutral and environmentally-beneficial manner;
- to proposed further levels of environmental measures which could be applied on top of this basic support, without any fundamental contradictions.

Options under debate

Many suggestions have been made, by different bodies, for the better integration of environmental concerns into livestock support policies. These can be categorised under three general headings:

- Environmental management "add-ons" to existing support systems - e.g. 2078 measures such as the Environmentally Sensitive Areas Scheme, or the Countryside Stewardship Scheme in the UK.
- Variations to the existing support systems - e.g. the Extensification Premium, ewe and suckler cow premium quotas, and the HLCA limits on number of sheep and total payment per hectare).
- Radical changes in the livestock support system.

Each of these approaches has its advantages and disadvantages:

Environmental management add-ons

Advantages

- Have a clear and specific objective of producing environmental benefits.
- Can employ detailed, region-specific measures adapted to the local circumstances and conservation requirements, particularly if individual farm plans are involved.
- May be whole-farm schemes which take account of interactions between different parts of the farming system.

Disadvantages

- Are complex schemes which require a lot of work to develop and administer, and might thus be impractical for the whole EU.
- May tend to be seen by farmers as "environmental schemes" rather than "farming" and thus be off-putting to quite a proportion of farmers.
- Start from a basis of the existing CAP measures which generally encourage intensification and higher production, thus presenting a significant conflict with the way in which farmers currently operate and requiring large payments to induce farmers to enter the schemes.

Variations to existing schemes

These may be either constraints (e.g. the maximum stocking density limits for BSP and SCP) or incentives (e.g. the Extensification Premium supplement to BSP and SCP).

Several of the options which are being put forward at the moment, such as compensatory coefficients or reciprocal coefficients, fit into this category.

Advantages

- Adaptations of existing schemes, which can evolve over time in response to experience.
- Relatively simple to apply across the whole EU.

Disadvantages

- The current "broad brush" approach whereby, for example, the stocking rate for the extensification premium is the same across the whole EU, is generally too unspecific to bring much environmental benefit.
- A danger that repeated modification of the main schemes to meet different environmental objectives would end up with a complex and unwieldy system.
- The whole concept of price support and headage payments stimulates an increase in livestock numbers, up to the limits set, and thus has a distortionary effect on farming systems.
- Most of the current limitations on stocking rate or total livestock numbers only cap the payments and do not actually prohibit the farmer from keeping additional animals without premium.

Radical changes in support

A potentially unlimited range of options could be considered. The ideas which we have considered or seen discussed include:

- Abandonment of price support, probably associated with a range of specific environmental management payments (similar to the "environmental management add-ons" discussed above but starting from a very different base) - e.g. Entec beef report.
- A switch from headage payments [and price support] to area payments - e.g. Entec beef report; ideas developed in this study.
- Replacement of all existing support by direct payments to the farmer, unrelated to his production, either in the form of an annual payments or a lump sum entitlement to support -e.g. Stefan Tangerman's idea of an "agricultural support bond" (or the "compensatory cheque" offered in our case study interviews).
- Replacement of existing support by direct income payments to farmers, related to their needs and level of income - e.g. the income aids regulation which already exists within the CAP but is rarely implemented.
- Movement away from agricultural support to broader rural support, which may include agriculture when that is an appropriate means of meeting desired objectives - e.g. the structural funds and the oft-expressed intention of shifting FEOGA support away from guarantee towards guidance.
- Partial replacement or supplementation of existing support by agricultural employment subsidies…
-

…we could go on to find or develop many more ideas, but they tend to be variations on the following themes:

- Whether or not price support continues.
- How "decoupled" the support is from production: generally headage payments are less decoupled than area payments, which are less decoupled than income or lump sum payments.
- The basis of support: whether it is primarily targeted as agricultural support, environmental support, income support or rural development aid.
- Whether support is seen as being open-ended or for a limited period of time.

Issues

It is difficult to discuss the advantages and disadvantages of these without working up the ideas in some detail, but the following issues frequently apply:

- How would it affect the CAP budget and consumer prices? (There is generally much more discussion about the former than the latter).
- How would it be viewed by our WTO partners and how would it affect the EU's future negotiating position?
- What would be the practicalities, administration costs and scope for fraud?
- How would it re-distribute support between producers and between Member States? (There are always winners and losers, and generally the objections by the potential losers are louder than the support by the potential winners).

- How visible would be the transfers to farmers and how would these be perceived by the non-farming community? (People are rather more used to the idea of paying farmers to produce than to "do nothing", e.g. set-aside; if farmers are to receive income support, what about their non-farming neighbours, who might have even lower incomes?)
- Should intensive producers (who currently receive the greatest support) continue to receive high levels of support or compensation (thus appearing to "reward" those who may have contributed most to environmental damage), or should some of this support be re-distributed to less intensive producers?

and, of course:

- How effectively would it meet the diverse environmental objectives and constraints in different parts of the EU?

Many of these are political questions, concerning the allocation of resources between the interests of different sectors of society, and as such have to be addressed through the political process. What we have tried to do below is to analyse and clarify the likely effects of some selected policy options. We believe that some fairly radical changes are required in order to achieve forms of support sufficiently decoupled from production to escape the drawbacks of the current policy instruments.

Our proposals

This approach, together with the objective of preserving farm support, leads to the question of how to continue giving approximately the current level of support to each farmer without strongly influencing his production. Support cannot be paid per kilogram of output or per head (as these are strongly production-increasing), so we need to look at alternatives: paying support per farmer, per farm, or per hectare.

Paying support per farmer

We decided not to try and develop the "per farmer" option, as this is basically income support, which has been admissible under CAP for several years but never adopted in a big way, due to political reservations about supporting one particular rural group whilst not supporting their neighbours.

Paying support per farm

We gave rather more attention to this variant, in two different forms:

- simply converting the current level of support for each farm into a direct support payment, or "compensatory cheque";
- adjusting the level of support per hectare (under the next variant) to take account of the previous support given to each farm.

The first version, the "compensatory cheque", was explored in each of our case studies, mainly to see how farmers would respond to a form of entirely production-neutral, unconditional support. As we suspected, most farmers found the idea difficult to take seriously, as they did not believe that they would be offered support without at least some link to land or agricultural production. We too

thought this option politically somewhat unrealistic and so did not develop it further as a serious policy proposal.

The second version, adjusting support payments per hectare to the individual farm, is considered in the next section.

Paying support per hectare

This option - area payments - seemed to us to be the best and most realistic variant, for the following reasons:

- Area payments offer the potential of relatively production-neutral support (compatible with the forthcoming GATT round).
- Support would continue to be linked to an objective agricultural measure - land area and land use - and thus would not represent too radical a departure from current support systems.
- The principle of area payments has already been established through the Arable Area Payments Scheme (and the existing IACS system could be used to administer it).
- Area payments would facilitate greater integration of environmental concerns into livestock support systems, by moving the emphasis away from the animal towards the land, and hence the environment.

The ideas developed in the remainder of this report therefore concentrate on area payments.

How much reform?

Three options, of increasing radical-ness:

- just replace beef & sheep headage with area payments;
- bring in dairy as well, at the same level, i.e. partial replacement of price support;
- completely remove price support & replace the whole lot with production-neutral direct payments.

Work through the pros & cons of each, and conclude that the middle one is as far as we can get within our dual objectives of preserving farm incomes & retaining budget neutrality.

Our proposals

This section presents our initial proposals for the better integration of environmental concerns into livestock support systems, in three stages:

- our proposed overall approach;
- initial ideas and some different variations;
- development of the preferred variant in some detail.

Overall approach

Logically, if not chronologically, policy adaptation would proceed through the following three stages:

- *Initial re-balancing* of livestock support to make it completely production-neutral (de-coupling). This would obviously apply to headage payments but should also apply to price support, though this would be more politically sensitive.
- *Monitoring* the effects of this revised policy against the specific objectives of each region.
- *Further re-balancing* of livestock support, away from blanket payments towards payments more closely targeted to the specific agricultural, environmental and social objectives of each region.

Some suggestions for how each of these steps could be achieved are given below:

Initial re-balancing

One approach would be to move to a "forage area payments scheme", analogous to the arable area payments scheme but without set-aside. As with the arable area payments scheme, payments would be differentiated by regions and could initially be based on current levels of production and support in each region, so as to achieve area payment levels which compensated for the direct support withdrawn. The Agri-environmental Zones developed in Chapter 6 would form a good starting point, with Member States given the option to propose more detailed sub-zones.

It would also be desirable that the arable area payments and forage area payments should converge on comparable land in each region so that, for the first time since its inception, the CAP did not provide an artificial incentive for conversion of grassland to arable, or *vice versa*.

Two alternative approaches could be used for calculating initial compensatory payments: a regional basis or a holding basis.

Regional basis for calculating payments

Methodology

- Form regions in which livestock systems and forage productivity are relatively homogeneous (e.g. our proposed Agri-environmental Zones, plus any sub-zones).
- Calculate total regional receipts from livestock support: BSP, SCP, ewe premium etc. (and price support, if included) for a reference year.
- Divide total receipts by total forage area in the reference year and use this as the standard forage area payment for the region.
- At this stage we are considering only beef and sheep support, and so it would be necessary to exclude dairy cows and the land which they use.

An example

- **UK** (1995; source: "Agriculture in the UK")

.....-
.....Total beef & sheep premium payments £980m
(1,225 mecu)

  - Total forage area (temporary, permanent & rough grazing, ...excluding common grazing) .....11,248,000 ha
  - Adjustment for dairy cows & followers .....(approx. 3,168,000 LU @ 2.0 LU/ha) .....1,584,000 ha
  - .....Estimated beef & sheep forage area .....9,628,000 ha
  - **Average current premium payment .....= proposed forage area payment £102/ha**
(128 ecu)

- This rate may be compared with:
  - .....Maximum HLCA payment (SDAs) £89/ha
  - .....Maximum HLCA payment (DAs) £61/ha
  - .....Cereals area payment: England £269/ha
  - .....Cereals area payment: Wales (non-LFA) £236/ha
  - .....Cereals area payment: Northern Ireland (LFA) £230/ha

Advantages

- Simplicity:
  - standard payment throughout the region;
  - no need to record livestock numbers or individual allocations;
  - premium entitlement would automatically move with land transfers.
- Moves straight to an area basis and thus provides a basis on which to build land management conditions and incentives, without the current conflicting incentive to maximise livestock numbers.
- Budget neutrality: the total payments to beef and sheep farmers in each region would remain unchanged.

Drawbacks

- Would cause a considerable re-allocation of support between livestock systems and between types of grassland (temporary grass, permanent grass and rough grazing) - *The detailed Forage Area Payments System (FAPS) described at the end of this chapter includes different payment rates for different types of forage land, to reduce the extent of re-allocation of support.*
- How to deal with common grazing? - *This issue is looked at in more detail in the case studies, where several different examples of common grazing occur, and discussed again in Chapter 9 in the light of this experience.*
- How to deal with land used for dairying and thus not currently in receipt of premium payments? - *We propose that the area of forage land on which premium could be claimed would be reduced by the estimated area of land required to produce the farm's milk quota (c.f. the current calculation of dairy forage area used to calculate overall stocking rate for premium purposes).*

Holding basis for calculating payments

Methodology

- Calculate, for a reference year, the total receipts from the different livestock premium schemes and convert this into a "grazing livestock premium" entitlement.
- This would effectively become a holding-level quota for premium payments (like the ewe premium) but, unlike the ewe premium, it would not be necessary to have a particular number of livestock to receive the premium. It could be made tradeable if desired.
- The total holding premium entitlement would be expressed per hectare to produce a holding-specific rate of FAPS.

Advantages

- Would more accurately compensate individual farmers.

Drawbacks

- Suckler Cow Premium and Ewe Premium would work fairly well, but Beef Special Premium is more complex, as a portion of the premium will "feed back" through the chain to increase the price of stores and calves. It might therefore be necessary to reduce slightly the compensation rate to producers previously in receipt of BSP and increase slightly the compensation for SCP.
- Complexity: having to calculate and administer different area payments on each farm, with all the complexities of land sale and rental.
- Inequity: how would farmers react to seeing their neighbours receive quite different rates of payment per hectare?

It is these last two drawbacks - complexity and inequity - which made us decide to drop the idea of a holdings basis for area payments and instead concentrate on developing the regional basis into a workable scheme.

Defining objectives and monitoring against them

We have obviously not been able to apply the FAPS system in practice and see what happens, but we have both thought through its likely effects and explored them with all of our case study farmers. It is clear that in each zone there would be additional environmental measures which would be desirable, and which the simple move to area payments would not alone be sufficient to achieve. These measures range from overall control of stocking rates through to detailed seasonal grazing management and protection of individual features.

Further re-balancing

To address these further environmental concerns, we propose that the straightforward re-allocation of existing support from a headage to an area basis would comprise "Tier 1". Subsequent tiers would provide additional rates of payment for more direct environmental management. More specifically, we propose three tiers:

- Tier 1 - basic livestock support, paid on an area basis without any special environmental conditions (i.e. simply compensation for the headage payments withdrawn).
- Tier 2 - "broad brush" environmental restrictions, such as maximum and minimum stocking rates or cattle:sheep ratios, which could be applied across large numbers of farms without excessive administrative cost, and would not been seen by farmers as conflicting too seriously with the business of farming. Potentially, Tier 2 could come to affect a large proportion of all forage land in the EU.
- Tier 3 - detailed environmental management, as currently applied in ESAs and similar scheme. This offers the greatest potential for delivering environmental goods, but is quite expensive in terms of administration and additional effort/income forgone by the farmer; thus Tier 3 might be more carefully targeted, with the objective being to attract only a relatively small proportion of land into this tier.

The exact details and payment rates for each tier would vary between Agri-environmental Zones; the final section in this chapter sets out in detail the FAPS scheme and tiers as applied in our pilot case study area. Variations of this were then offered in each of the other case study regions.

Proposed approach for dairy

The main objective here is to reduce the marginal incentive to produce, in a way which would apply to a reduction in output as well as to an increase[17], and thus would encourage de-intensification.

However, with dairy farming there is no existing system of headage payments to re-allocate as area payments, so any change in policy here must tackle the more difficult issue of price support. Our proposed mechanism is to reduce the EU milk price and compensate the farmer for some or all of this reduction through the combination of a forage area payment and a "milk premium payment", calculated periodically as the difference between the EU market price and a politically agreed [higher] target price (i.e. a deficiency payment, similar to the beef and sheep variable premium schemes which used to apply in the UK; an appropriate name could be the "Milk Variable Premium Scheme" or "MVPS").

The forage area payment would bring in a unified system across all grazing livestock, dairy, beef and sheep, and would thus remove the need to estimate the proportion of forage area on a mixed farm which should be attributed to the dairy herd. It would bring the general benefits of an area-based payment which were discussed in Section 7.1.7. above (e.g. production neutrality, relative GATT acceptability and compatibility with the IACS system) and in particular would be disincentive to intensification (as the farmer would want to claim the FAPS payment on as many hectares as possible) as well as starting to relate dairy support to land area and land use, thereby creating a good basis on which to develop "tiers" of environment conditions.

The Milk Variable Premium Scheme would make up the shortfall between the current EU market price and the target price, for all the milk which the farmer produced, up to the limit of his quota. Any excess production would simply fetch the market price and would not attract premium. Up to this point it would function very like the proposed two-tier quota system. However, where support is delivered through the milk price (as at present) it can only be given for milk actually produced, whereas a direct payments system introduces the potential to "de-couple" the payments from production. In other words, a farmer could be paid MVPS on the full amount of his milk quota, even if he did not actually produce all of this milk. Different targets could be set for different regions, so that where the intensity of dairying is currently causing problems, such as nitrate pollution, a farmer might need to produce only 75% of his quota in order to receive his full MVPS entitlement, his marginal return from the last 25% would be the new, lower EU milk price and he would thus have some incentive to reduce production and deintensify. Where the problems are very different and environmental or social objectives require the maintenance of dairy cow numbers (e.g. in some mountain regions) the farmer would still be obliged to produce 100% of his milk quota in order to receive the full MVPS payment.

At the most radical interpretation of the idea, in areas where the current intensity of dairying is a serious problem, the MVPS payments could be completely decoupled from production, so that the farmer would receive premium payments on the full extent of his milk quota even if he produced no

[17] The proposed two-tier quota system would reduce the marginal returns to additional milk production but would still mean that a farmer who reduced production would sacrifice the full CAP-supported milk price for each litre less that he produced.

milk at all. It would thus become a social or compensatory payment, based purely on historical production as recorded by the quota system (and hence similar to the "compensatory cheque" or the holdings basis for calculating area payments, as discussed above). However, as the farmer would need to continue holding quota in order to qualify for MVPS payments, he could not transfer his quota to another producer and so increase milk production there.

The strengths of the MVPS concept are that it would become a very flexible mechanism for giving support to dairy farmers, which could be related to market conditions and local environmental requirements, and that each producer's entitlement would be based on his existing quota holding, an established and widely accepted allocation mechanism which would avoid any need to create and allocate "dairy cow quota". If the MVPS was regarded as transitional or compensatory measure, then it could be phased out through either a reduction in the target price, or in the proportion of the shortfall which would actually attract compensation.

Just as the attractions are obvious, so too is the main drawback - cost. Switching the burden of support from consumers to taxpayers could have potentially devastating effects on the CAP budget. Every ecu paid out to dairy farmers under the FAPS or the MVPS would constitute an additional cost to the budget.

Our proposal is that the FAPS payment should be set at a uniform level for beef, sheep and dairy, derived by simply expressing the current expenditure on headage payments on an area basis (see the UK example above). The greatest uncertainty is the size of the MVPS payments, which would depend on the new market price for milk in the EU, and on the agreed target price.

These proposals would have two counteracting effects on the EU milk market: the reduction in prices would tend to make farmers produce less and consumers buy more, but the removal of quotas as an absolute constraint on sales would allow farmers to expand their production. It is clear that EU internal demand for milk would rise, but not clear whether supply would rise or fall, and thus whether the EU would remain a net exporter or become an importer; all depends on the price.

The new internal milk price would depend on whether the EU was an importer or exporter of milk products. If it remained a net exporter, then the only way to allow farmers to produce milk in excess of their quotas, without paying more on export refunds, would be to reduce the EU price until it was at or close to the world price (which would tend to fall if EU exports increased and rise if exports decreased). However, if the EU turned into a net importer of milk products, then it would be possible to retain a measure of import protection (within the limits of GATT) and thus maintain an internal milk price above the world market level. To estimate the new equilibrium milk price we would need recourse to an appropriate econometric model.

The new target price[18] would be a political decision. It would certainly be necessary to make some reduction in the target price, in line with the new FAPS payments which the farmers would now receive. This would mean that they would continue to get the same level of support as before, but would receive a proportion of it as a direct payment rather than as price support. Any further

[18] We are here using the term "target price" rather loosely, and it might not exactly correspond to the target price in the current intervention system.

reduction in the target price would represent a decision to compensate farmers only partially for the drop in the milk price. In the current political climate it is likely that some reduction in the overall level of support would be made, but it is difficult to predict its extent.

Available to offset against the new costs of the FAPS and MVPS payments would be some substantial savings in the costs of disposing of the current EU milk surplus, estimated at 4.3 billion ecu in 1995. Depending on the approach taken, it should be possible to dispense with export refunds, thus saving 2.0 becu, and to reduce the costs of consumption aids for butter and skimmed milk powder as domestic prices fall and consumption rises. The total annual saving would thus be somewhere between 2.0 and 4.3 becu.

Detailed description of the FAPS scheme, as used in the case studies

The following instructions and illustrations were given to each of our case study interviewers. (This section summarises some of the arguments presented above, to form a "stand-alone" description of our proposals).

Objective

- To replace headage payments (which generally encourage more intensive stocking) with a "Forage Area Payments Scheme" which would, at its most basic, be completely independent of livestock numbers and thus production neutral.
- To develop the system into a series of "Tiers", each of which offers higher payment rates for farming practices which are more environmentally-friendly, or which meet other defined policy objectives for the region.

Methodology for the basic FAPS scheme

The methodology outlined here is illustrated with figures for the whole UK, quoted here and in the attached tables. Some of the figures are still "guestimates" and so should be regarded as illustrations of the method, rather than final figures. Nix-derived gross margin budgets for principal livestock systems are also attached, to illustrate current levels of livestock support.

Form appropriate regions

- Form regions in which livestock systems and grassland productivity (for similar types of grassland) are relatively homogeneous. These regions should be administratively practical and so should be based as far as possible on existing administrative divisions and/or (and likely to work well in many cases) on LFAs and "mountainous areas". *The basic "Agri-ecological Zones" had already been developed by the time the case studies were conducted, and each case study was based in a different region.*
- For the UK, these regions might be LFA (split into DA and SDA) and non-LFA land, in each of England, Wales, Scotland and Northern Ireland, i.e. eight basic regions, with four of them split into DA and SDA payment rates.

Calculate total amount of livestock payments to be re-allocated

- Calculate total receipts from livestock support: BSP, SCP, ewe premium etc. [and price support] for a reference year. This would be done separately for each region.
- For the UK (1995) this total is £979 million.
- This amount is to be redistributed over forage area to derive a basic "compensation payment" for the loss of headage premia.

Calculate "adjusted forage area"

- Calculate the total areas under each kind of forage:
  - Arable forage crops (e.g. maize silage, fodder beet)
  - Temporary grass
  - Permanent grass
  - Rough grazing (sole rights)
  - Common grazing
- Set for each forage category a "productivity coefficient" appropriate for the region, based on permanent grass = 1.00 (the objective of this is to take account of the fact that farms with larger areas of improved pasture or intensive forage crops will currently be producing more livestock and receiving more headage payments, and thus will require higher levels of compensation).
- Local information should be used in setting these figures, but as an illustration, for the UK they might look something like:

Arable forage crops
1.50
Temporary grass
1.30
Permanent grass
1.00
Rough grazing (sole rights)
0.40
Common grazing
0.35

- Multiply the area of each forage category by its "forage productivity coefficient" to arrive at an "adjusted forage area" (AFA) for each region.
- Estimate the forage area currently used by dairy cows [and followers] and subtract this from the total AFA, on the grounds that dairy farmers are not about to be deprived of any headage payments and hence do not require compensation. The most appropriate way to do this might be to base it on each farm's milk quota, as is currently done when calculating overall stocking rates for premium purposes.

Calculate basic compensation rates for each category of forage

- Divide total livestock headage payments by total AFA in the reference year and use this as the base FAPS payment for the region (applicable to permanent grass).
- For the UK this comes out at about £141/hectare[19].
- Multiply the base payment by the "forage productivity coefficients" to calculate a payment rate for each category of forage.
- Again using the UK as an example, the payment rates would be:

Arable forage crops
£212/ha
Temporary grass
£184/ha
Permanent grass
£141/ha
Rough grazing (sole rights)
£56/ha
Common grazing
£49/ha

- Calculate a simplified rate for small farms (e.g. under 20 ha) who do not wish to submit detailed IACS returns. E.g. if a typical small hill farm in the UK comprised about 20% in-bye land and 80% hill, then the simplified payment would be calculated as (0.2 x Permanent pasture rate + 0.8 x Rough grazing rate) = £73/ha. *This variant was not actually applied in the case studies, as we wanted to test out the full FAPS system.*

Payment system

- Farms would submit on their IACS return their areas of forage under each category, and would be paid on these areas, completely independent of the numbers of livestock kept.
- The adjusted forage area required for the dairy herd would be calculated, based on the farm's milk quota, and the payment would be reduced by this area time the "Permanent pasture" payment rate.
- Small farmers (below the defined regional threshold) would have the option of submitting an IACS return detailing each type of land and showing it on their farm map, or of accepting the regional "simplified payment rate".

[19] This figure is higher than the figure of £102/ha quoted earlier in this chapter, as at that stage we were simply considering total forage area, of which a high proportion is rough grazing. We are now using "adjusted forage hectares", which gives a smaller total area for the UK, and hence a higher payment rate per "adjusted forage hectare".

- To be eligible for payment, the basic criterion would be that the land must be producing the "crop" for which the payment is claimed, i.e. "Permanent pasture" must be maintained as such, if it reverted to rough grazing then the payment would drop accordingly; "Rough grazing" must be maintained as grazing, if it reverted to scrub then payments would cease. This might require appropriate definitions in some regions.
- As a budgetary stabiliser, and to avoid creating a new incentive for intensification, the maximum payment rate for a given piece of land would be determined by its condition in the reference year, i.e. a farmer would not be prevented from improving his rough grazing, but he would only receive the "Rough grazing" payment rate for it. (This follows the AAPS approach, whereby a farmer is not prohibited from ploughing up permanent grass and cropping it, but if it was not under crops in the reference period then it cannot qualify for area payments).

In summary, the approach outlined so far is not designed to build additional environmental constraints and incentives into the basic livestock support system, but to remove the existing environmentally-damaging aspects and thus to produce an environmentally-neutral and production-neutral baseline on which additional measures can be built:

Creation of environmental "Tiers"

The concept of replacing all existing livestock support with environmental management agreements is not realistic, for several reasons:

- it would require a massive administrative effort and cost;
- it would be wide-open to fraud unless large sums were spent on policing;
- it would involve an excessive degree of interference in how farmers farm, rather than the current focus on what they produce.

It would also run a considerable risk of giving many farmers environmental payments for the kinds de-intensification which they would undertake anyway, once the current artificial incentives to intensify were removed.

The objective is to produce an administratively and politically realistic scheme, based on the following tiers:

- Tier 1 - basic livestock support payments, based on FAPS as a compensatory measure for headage payments withdrawn;
- Tier 2 - a slightly higher level of payment for basic environmental cross-compliance, based on measures which are simple to administer right across the EU;
- Tier 3 - higher levels of payment for specific environmentally-friendly farming practices.

Tier 1 - Basic livestock support regime

- Based on the FAPS payments calculated above but scaled down somewhat to release additional funds for the additional environmental tiers.
- As an example, Tier 1 payments might be set at 80% of the FAPS payments calculated above (i.e. £113/ha for permanent grass in the UK).

- This would be relatively simple to administer, being based on areas of land (which does not move), recorded through the existing IACS scheme, and would not even require the number of livestock to be returned.

Tier 2 - Broad brush environmental constraints

- Based on a simple-to-administer measure, normally stocking rate.
- To reflect differences in land carrying capacity, stocking rates should be expressed in terms of AFA, i.e. LU per Adjusted Forage Hectare. This is simply applying the logic of the top half of the equation (adjusting for different types of livestock) to the bottom half as well (adjusting for different types of land).
- Both maximum and minimum stocking rates should be set, so as to discourage over-grazing (e.g. in Wales) and under-grazing (e.g. in the Alps). Total abandonment and cessation of grazing would render it no longer "Rough grazing" and hence ineligible for any payments.
- The difference between Tier 2 and Tier 1 would be in many ways analogous to the current extensification premium.

Tier 3 - Environmental management

- At this level there should be much more scope for creating schemes appropriate to the individual region, its objectives and problems, its farm structures and administrative infrastructure.
- Tier 3 would probably comprise a "menu", different in each region, based on any of the wide range of environmental schemes which have already been applied successfully, eg:
  - area payments for land maintained under a particular management regime;
  - supplements for habitat re-creation;
  - payments for the maintenance and re-creation of features;
  - whole-farm schemes where the individual payments are increased slightly if the individual activities are fitted into a coherent whole-farm conservation plan.
- Within appropriate regions, Tier 3 menu payments could also be offered for non-farming land management, such as the deliberate creation of wilderness or semi-wilderness areas.
- Payment rates would be at more than 100% of the basic FAPS payment.

Regional budgetary stabilisers

- For each region, a budgetary stabiliser would be set, based on the total beef and sheep payments in the reference period. (This would be analogous to the Regional Reference Herds used for payment of Beef Special Premium, essentially for budgetary purposes).
- Member States would be invited to submit to the Commission proposals for the payment levels in each Tier for each of their regions, within their overall budgetary ceiling and following broad guidelines laid down by the Commission.
- Member States could thus place their own level of emphasis on environmental or other objectives, gradually reducing Tier 1 payments and making more funds available for Tier 2 and, particularly, for Tier 3 measures.
- Where the total value of claims exceeded the regional FAPS ceiling, then all payments would be scaled down *pro rata*.

Replacement of price support with FAPS payments

- All the above calculations are based on replacing only direct headage payments with forage area payments. The same principle could be applied to the market support element of the CAP livestock regimes, which would remove the remaining major artificial incentive for intensification. *This option was explored in several of the case studies.*
- This could then be extended to include the dairy regime, so it would no longer be necessary to estimate a farm's dairy forage area and subtract it from the area eligible for payments. *the MVPS system was tested in those case study areas which had significant numbers of dairy farms.*

Incorporation of non-environmental objectives

- As an option, Member States could also be invited to submit proposals, within an agreed overall framework, for other schemes which addressed non-agricultural, non-environmental goals for each region, such as economic growth or the creation of employment. These schemes would be funded out of the regional FAPS budget ceiling.
- Agriculturally-related contenders (some of which are already in place in some Member States) could include:
  - farm diversification and marketing grants;
  - incentives for early retirement and new entrants;
  - incentives for land consolidation;
  - employment subsidies, e.g. shepherding subsidies.
- More radically, Member States could be given the option of moving funds out of the agricultural "pool" created by the FAPS budget, into regional development schemes which were not of a specifically agricultural nature. This might be appropriate in regions where years of livestock subsidies have proved clearly inadequate to maintain rural employment - but it might also be regarded as outside the current scope of the FEOGA budget.

These options were not explored in the case studies, and have not been developed further in this report.

An example: the Scottish Hebrides

Tier 1

In this region the more "intensive" land uses tend to be the more environmentally desirable, and so quite good results could be expected from just the first step of converting headage payments to corresponding area payments, reflecting the productivity of the different land uses.

For our initial calculations we assumed that typical stocking rates on the different land uses were:

- Oats/barley.....1.10 LU/ha
- Fodder roots.....0.90 LU/ha
- Rotational grass.....0.75 LU/ha
- Permanent grass.....0.50 LU/ha
- Rough grazing.....0.20 LU/ha
- Heather moorland.....0.10 LU/ha

Subsequent discussions with farmers suggested that this may over-estimate the productivity of cereals, whilst at least some farms achieve distinctly higher stocking rates on their rotational grass. To develop the system properly, more information should be used to calculate the typical output from each land use in terms of UME (utilisable metabolisable energy) and to create a standard system of "adjusted forage hectares" which would give comparability between and within regions.

To calculate an initial payment rate, we took a reference farm which received £26,500 (31,800 ecu) annually in headage payments for a typical mixture of cattle and sheep, adding up to 140 LU. Thus a payment rate of about £190/LU (228 ecu) should be budgetary neutral, assuming farming systems remained unchanged. This converts into Forage Area Payments of 0.50 x £190 = £95/ha (114 ecu) for permanent pasture, etc.

Tier 2

The main objective here would be to address the stocking rate and balance on the hill land, which makes up the majority of the area. However, because farms operate as complete systems, with stock spread across the different land use types, overall farm targets should be used.

Our initial proposals are:

- Stocking rate between 0.15 and 0.25 LU/ha.
- Cattle to comprise between 30% and 70% of total LUs.

This Tier would attract a higher level of payment for each land use, e.g. 20% above Tier 1.

One possible approach would be to set the Tier 2 payment rate for budget neutrality and to set Tier 1 at e.g. 80% of the current equivalent payment, thus freeing up some funds for Tier 3.

Tier 3

The main objectives of Tier 3 are to further improve the quality of hill grazing management, and to encourage lower inputs and particular management practices on the rotationally cropped land.

For the pilot case study area of Islay, the obvious interpretation of FAPS Tier 3 would be as Tier 1 of the existing ESA scheme, thus taking advantage of the work which has already been carried out to develop relevant environmental management prescriptions for this area.

Case studies

Rationale

Previous experience of attempts at environmental policy development in agriculture suggests strongly that farmers' reactions to new support mechanisms are often rather different to those that purely economic (or in some cases rational) principles would predict (*see Mitchell. K. 1996 (ed) - The Common Agricultural Policy and Environmental Practices, EFNCP, Lyndhurst).* This being the case we were keen to obtain some "bottom-up" reaction to the ideas being developed - across all of the main zones that had been identified.

Objectives

The objectives for the case studies are as follows:

- To add more detail and local "colour" to the general picture of the range of systems to which new policies would have to be applied across the zones;
- to investigate in practice the links between livestock policies, livestock systems and the environment, and thus to give the assumptions and theoretical analysis detailed above some practical field testing;
- to explore the policy options with real farmers in real situations (especially in situations where we would expect new policies to generate changes in practices which are positive for the local environment);
- to compare farmers' reactions with the overall policy objectives for each zone;
- to give farmers and environmentalists from different areas an opportunity to voice their ideas for the better integration of environmental concerns into livestock support policy.

Criteria for selection

Clearly within the budget of this project a detailed survey, collecting data suitable for statistical analysis, would not be possible. However, using the EFNCP network and focusing primarily on systems which are subject to significant influences from the CAP livestock regimes, it was feasible to select as a case study one major farming system in each of the agro-ecological zones identified in Chapter 4. (As the original brief and budget for the project provided for a total of six case studies, two of the zones were combined under one study.)

The case study zones are therefore Atlantic Lowlands, Atlantic Mountains, Continental Lowlands/Mountains, Mediterranean Mountains, Mediterranean Lowlands and Alpine. The Continental Lowlands and Mountains zones were covered by one study in a mid-altitude area. The Macronesian and Boreal zones were not included.

The criteria for selecting the case studies was as follows:

- they should be typical of the broad pattern of livestock production in the zone, rather than concentrating on particularly interesting habitats;
- they should satisfy the Commission's requirement for a good distribution across the Member States;

- from a practical point of view they should be areas where the EFNCP had a consultant (or consultants) with a good knowledge of both the environmental value of the area and of the farming systems, as well as a wide range of contacts with farmers and agricultural departments.

Methodology

Background research

- For the first part of the case study each consultant was asked to review the basic relationship between farming and the environment in the study area. This included an assessment of the trends in the predominant farming systems, the main driving forces behind these trends and the implications for the environment;
- the second part of the study involved targeting a minimum of six farms which were typical of the areas' main farm structure and grazing livestock systems. Farms were selected so as to provide a wide range of variation in age of farmer, level of interest in the environment, tenure (to include owners, tenants, common graziers, etc) and farm quality;
- the consultants were given flexibility to adapt the methods to their local situation both to take into account the way the FAPS might be applied in that situation and, importantly, the attitude and receptiveness of the farmers. The different approaches taken by the consultants may partly explain the quite strong differences in attitudes to the proposals from the farmers in the different regions, although many other factors will also have played a part (farming situations, age of farmers, local traditions, etc).

Farm visits and farmer interviews

- Before finalising a field method for interviewing farmers a pilot study was carried out in the Inner Hebrides case study area (on the island of Islay). Four farmers were visited by three of the research team. These agreed to be "guinea pigs" and be interviewed so that their reaction could be used to finalise the interview questions (see 6.3.2 and Appendix 1).
- In order to standardise as far as possible the interview technique across the six case studies all of the consultants met in the alpine zone (Valle d'Aosta) and worked through the results of the pilot study and considered its application in the Alpine zone and in their own areas.
- The exact questions each set of farmers were asked is given in section 6.3 below, but in general the consultants aimed to ask the farmers:
  - to describe their farm - stock type and numbers, area of crops and grass pasture management;
  - how they would respond if headage payments were withdrawn, but they received a cheque equivalent to their current total receipts from headage payments, without the requirement to continue farming. A figure was calculated and offered to each farmer;
  - as above, but with the constraint that the land had to continue being farmed for livestock;
  - how they would respond if both headage payments and price support were withdrawn and a compensatory cheque given. Farmers were offered a new, higher lump sum and given an indication of how the sale price of their stock would fall;
  - to respond to the FAPS idea, Tier 1. They were shown possible payment rates and given a figure for their whole farm under the current management system;
  - to respond to FAPS Tier 2 and FAPS Tier 3.

Results

Following the criteria outlined above, and after incorporating the views of the Commission, the six areas listed below were selected for case study:

- Pays de la Loire, France (Atlantic lowlands)
- the Inner Hebrides, Scotland (Atlantic mountains)
- The Black Forest, Germany (Continental lowlands/uplands)
- Feneos, Greece (Mediterranean mountains)
- Extremadura, Spain (Mediterranean lowlands)
- Valle d'Aosta, Italy (Alpine).

This section presents summaries of each of the six case studies. The full studies are available as a separate document which forms Volume II of this report.

Atlantic lowlands, Pays de la Loire, France

Description of the area

The study area is the département of La Mayenne in the Pays de la Loire region. Agriculture in the département is predominantly livestock. The average farm size is 31ha (40ha for full-time farmers). The département can be divided into four areas with the following characteristics:

South-west: dairy, arable crops, pigs (outdoor) and poultry;
North-west: dairy and pigs with intensive holdings of 30-35ha;
South east: beef, arable crops and poultry, with larger holdings (40-45ha);
North-east: beef and cereals, less intensive than other parts of the département.

Currently, over 25% of the UAA is under permanent grassland. However, land-use patterns in the département have changed considerably during the past 25 years as a result of agricultural intensification. Permanent pastures have declined in area from 289,000ha to 127,000ha, whilst forage maize has increased from 22,000ha to 90,000ha. Temporary grasslands have increased in area from 67,000ha to 93,000ha.

Although total milk production has remained largely unchanged, dairy cow numbers decreased from 275,000 in 1983 to 198,000 in 1995. The number of specialised dairy producers declined by about half in the same period (see 15), whilst an increasing number of livestock farms raise beef cattle as well as, or instead of, dairy cattle (see 16).

Table 8.17: Number of holdings by farming sectors

	1988	1993	1995
Dairy	7,500	4,370	3,995
Dairy + beef	1,435	1,860	1,630
Beef	2,615	2,460	2,530
Mixed	2,390	2,320	2,210
Poultry	245	305	285
Sheep/goats	2,095	1,430	1,785
Cereal/other arable crops	810	705	515
Others	240	255	310

Table 8.18: Evolution of dairy and beef cattle numbers

	1983	1990	1995
Suckler cows	40,000	60,000	71,000
Dairy cows	275,000	207,000	198,000

Main environmental features

The most characteristic landscape of the area is *bocage*, although land consolidation projects have resulted in widespread losses of hedgerows. Some replanting is now being undertaken by farmers with grant-aid.

In addition, there are various local sites of environmental importance (heaths, wetlands, caves), although agricultural intensification has reduced their extent. For example, many wet grasslands of importance for birds have been lost due to drainage and conversion to arable cultivation. The marshes of Fourneau, valuable for their flora, have been partly destroyed by afforestation with pines.

The main environmental issue associated with agriculture in the area is nitrate pollution of ground water, particularly in the north-west where there is a high density of livestock (dairy cattle and pigs) and high rainfall. In the département as a whole, over 20% of communes recorded an NO_3 level in water supplies of over 50mg/l at some time during 1995. There is also concern about pesticide pollution (e.g. atrazine) of surface water in some places.

The farmers and their farms

Four of the farms are primarily dairy producers, whilst two combine dairy production with a significant beef enterprise. All six are located in the northern part of La Mayenne.

Two of the farms are organic whilst another two are involved with the association ALDIS (an NGO working on the issue of sustainable agriculture) and therefore can be expected to be significantly more environmentally aware than the average farmer in the area. All of the farmers are aged between 32 and 42.

Table 8.19: Overview of the case-study farms

Farmer	A	B	C	D	E	F
Area (ha)	34	30.9	35	38	51.5	45
Dairy cows	32	30	23	23	24	37
Replacement heifers	25	25	24	29	20	36
Bull	-	-	-	1	-	-
Bullocks	-	-	26	-	-	6
Bull calves	-	-	-	-	70	-
LU/forage ha[1]	1.38	1.65	1.96	1.36	1.3	1.52
Permanent grass	7	1	2	20.5	4	1
Temporary grass	20	22	14	10	19.7	37
Maize	7	4.2	11	-	20	3
Wheat	-	3.7	1.6	5.5	6	4
Other	-	-	-	2	1.8	-

Note 1: These are estimates only. In accordance with the EU system, cows and bulls = 1LU. Heifers and bullocks are assumed to be 6-24 months old and therefore = 0.6LU. For the bull-calves, half were assumed to be 6-24 months and half to be under 6 months old (the latter do not count towards total LU). All grassland and maize were counted as forage area, although in practice, if the farmer already claims arable support for the maize crop, then this should not be included in the calculation of the forage area.

Options offered to farmers

1. Status quo.
2. Cheque replacing livestock headage payments.
3. Cheque replacing all CAP support, including arable area payments, dairy and other price support, with removal of milk quotas. CAP market support measures were estimated to represent the following percentage of current prices:
   beef - 33%
   sheepmeat - 30%
   milk - 50%
4. FAPS
   Level 1
   Level 2
   Level 3 - assumed to be equivalent to the ALDIS code of practice for sustainable agriculture. The key element of this code of practice is that 3/4 of the forage area of the farm should be grassland which receives no artificial fertiliser. There are also detailed requirements concerning the application of organic fertiliser, the cultivation of maize and the conservation of the countryside.

The FAPS system was interpreted by the consultant in such a way that the theoretical forage area payments were much higher than intended under the original FAPS methodology. Consequently, all of the farmers received a considerable increase in subsidy under the scenario 4. In practice, this may not have influenced the farmers' responses to a great extent: their reactions were mostly more concerned with the principles, rather than with the amount of the payments on offer.

Farmers' responses

The farmers' responses are summarised in 20. In many cases, the farmers offered an opinion on the proposed policy changes, but without saying how they would respond in terms of their own farm management. In these cases, their response is summarised in the table as "positive" or "negative".

Notable reactions include the fear that the removal of milk quota and price support would result in a "production race" and that the FAPS system would lead to a "land race" as farmers tried to increase the area they could claim on, particularly of more intensive land uses with a higher FAPS payment. In practice, the latter could be prevented by the use of a "base area" system as used in the arable regime.

Several farmers made the point that, under an area payments system, grassland should be paid at the same rate as crops such as maize, otherwise the more intensive and most polluting farms would receive the higher payments and would be encouraged to maintain their intensive, maize-based production system.

A number of the farmers expressed fears about society's reaction to massive direct payments under the "cheque" scenarios. There was also concern about the social injustice of the CAP, under which the largest subsidies are paid to the biggest and most productive farms.

Table 8.21: Overview of farmers' responses

	A (age 32)	B (age 35)	C (age 40)	D (age 32)	E (age 42)	F (age 38)
Status quo	Extensify	Already has extensified No change	Wants to reduce work load	Biodynamic dairy; no change	(No data)	Wants to reduce stocking
Cheque replaces headage payments	Unaffected (no beef cattle)	Unaffected (no beef cattle)	Positive	Unaffected (no beef cattle)	Negative	Positive
Cheque replaces price support and headage payments	Extensify	Negative (leads to increased production)	Increase milk production and give up beef	Increase milk production slightly	Extensify	Negative
FAPS 1	Extensify	No change	Give up beef	Some small changes	Negative (it favours intensive land uses)	Negative (it favours intensive land uses)
FAPS 2	Positive	Positive	Positive if paid at FAPS1 + 20 %	Positive	Positive	Positive
FAPS 3	Positive	Positive	Positive	Positive	Positive	Positive

Conclusions for the environment

Under the current systems of CAP support, dairy and beef production in this area is characterised by high stocking densities and widespread use of forage maize, a combination which has led to problems of nitrate and pesticide pollution in water.

Existing incentives (e.g. Regulation 2078/92) are considered inadequate to achieve a significant reduction in stocking levels or a change to grasslands at the expense of maize. High area payments for maize and headage payments for beef cattle are part of the problem, in that they compete with 2078/92 incentives.

The FAPS system, particularly levels 2 and 3, seems to have the potential to achieve some of the extensification which is required in order to alleviate the pollution problem. However, the results of the scheme would depend on factors such as how farmers would respond in practice to the removal of milk quotas and milk price support and on the relative levels of area payments for grassland and maize. If high area payments for maize were maintained, it is unlikely that there would be a significant move to grassland.

All of the farmers interviewed either have already extensified, are planning to extensify or were receptive to the idea of extensifying their production systems, particularly under the scenarios FAPS2 and FAPS3. Because farm D and F are organic and farmers A and B have been involved with ALDIS, their responses cannot be considered representative of farmers in the area as a whole.

However, the concerns and reactions of the two "conventional" farmers (C and E) were in fact surprisingly similar to the others.

Atlantic mountains, Hebrides, Scotland

Description of the area

The case study area includes the southern Inner Hebridean islands of Tiree, Mull and Islay together with the adjoining mainland of Argyll. This area of western Scotland is one of the most biologically diverse areas of the United Kingdom and includes large tracts of land which are high in biodiversity and species richness. In a European context it also includes a large proportion of the Atlantic and hyper-oceanic vegetation communities of the European Union. Although some of this richness is attributable to the natural features of the area (varied geology, topography and climate) a considerable contribution has been made by the activities of farmers (over several centuries); virtually all of the non-forested land is under some form of agriculture, mostly involving livestock.

Traditionally, farms were mixed (with sheep, suckler cattle, dairy and crops) using regional breeds of livestock and crop varieties well adapted to the local soil and weather conditions and the poor nutritional quality hill pastures of natural vegetation. However, in recent years (and partly in response to EU support payments) there has been a trend towards more intensive production methods (e.g. housing of livestock, indoor lambing and calving, silage instead of hay, reseeding pastures, supplementary feeding, use of concentrated feeds). Associated with these changes, there has been a considerable amalgamation of farms, an increase in average farm size, an increase in mechanisation and a reduction in labour units. This has led to considerable rural depopulation and a skewed population age structure (towards the old), as well as biological impoverishment through a more simplified landscape.

Main environmental features

The environmental (or conservation) value of the Hebrides is partly a reflection of natural ecological variation (mountains, sea cliffs, bogs, fens, heathlands, etc) and diversity, but this is intimately intertwined with the predominant land-use, namely agriculture. There has been a long history of livestock farming in the Hebrides and virtually all of the "natural" vegetation communities that occur are in fact some form of pasture land. They have survived, as in many other remote parts of Europe, as an essential component of a low-intensity farming system. Of particular biological value is the patchwork mosaic of arable cultivation and pastures of semi-natural vegetation required for extensive livestock rearing using natural suckling. The mixture of pastures, meadows and croplands (the latter used for production of winter fodder) combine with natural features such as sand dunes, cliffs, bogs and marshes to provide conditions needed by a very wide range of plants, birds, mammals and invertebrates. For example, on the island of Islay, low-intensity farmland management has been shown (*Bignal, Curtis and Matthews, 1988*) to create the spatial and temporal biological diversity needed for the maintenance of 10 bird species in Annex 1 of the EU Wild Birds Directive *(Bignal and McCracken, 1996* for review) including the globally threatened corncrake *Crex crex*. Some of the most restricted biotopes in Europe, and many plants with a very restricted western European distribution, occur commonly in association with Hebridean agriculture. The survival of their floristic richness is intimately linked with traditional farming practices. However, these practices are changing rapidly and in much of the Highlands and Islands of Scotland this mixed type of livestock based farming is no longer practised. Instead, cropping has virtually ceased and the majority of fields are now pasture. Cattle rearing has either fallen markedly or has been discontinued completely and sheep numbers have increased across the whole area.

The farmers and their farms

Ten farmers were interviewed, seven on the islands and three on the mainland. They were chosen to include owner-occupiers, tenants, crofters (part-time farmers with small holdings and access to common pastures), working farm managers and non-resident managers. They were mostly aged between 25 and 45, so there may be a bias towards the younger farmer. Farms ranged in size from 325ha to 1,200ha, with two extreme exceptions - the croft of only 81ha and the large hunting estate of 5,000ha. All of the farmers were very open-minded and cooperative, and were all interested in the general question of the direction that reform of the CAP would be taking. Only one was particularly sympathetic to environmental conservation per se, they included both natives to the area and relatively recent newcomers. The farms were typical of the area in so far as they were all livestock based and all focused primarily on sheep production; and all reflected rather well the regional trends in agriculture outlined above. The farms all included the typical mix of mountain and hill pastures and more fertile land on low ground, and supported a remarkable array of wildlife including birds such as golden eagle (*Aquila chrysaetos)*, sea eagle (*Haliaetus albicilla)*, chough (*Pyrrhocorax pyrrhocorax)*, hen harrier (*Circus cyaneus)*, peregrine (*Peregrinus peregrinus)*, barn owl (*Tyto alba)*, short-eared owl *(Asio flammeus)*, corncrake (*Crex crex)* and (during winter) barnacle geese (*Branta leucopsis)*, white fronted geese (*Anser albifrous)* and greylag geese (*Anser anser)*. The farms included Ramsar sites, Special Protection Areas and proposed Natura 2000 sites.

Table 8.22: Overview of the case study farms

	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6	Farm 7	Farm 8	Farm 9	Farm 10
Farm area	344ha	640ha	874ha	1,208ha	81ha	714ha	280ha	5,000ha	323ha	840ha
Permanent grass	72ha	130ha	37ha	120ha	8ha	44ha	108ha	37ha	59ha	155ha
Crops	8ha	20ha	26ha	88ha	16ha	16ha	12ha	3ha	12ha	0
Rough grazing	264ha	490ha	810ha	1,000ha	57	654	160	4,960	252	685
Sheep	600	1,300	700	733	180	700	555	1,410	480	732
Suckler cows	20	0	24	20	0	51	0	14	30	
Dairy cows	-	-	-	40	-	-	-	-	-	-
Current CAP Support	£31,000	£52,000	£35,000	£39,000	£5,720	£36,494	£12,638	£48,986	£23,672	£23,263
Total farm income last year	£15,000	£13,500	£16,000	?	?	?	?	?	?	?
Location	Islay	Islay	Islay	Islay	Mull	Mull	Mull	Argyll	Argyll	Argyll

Options offered to farmers

The farmers were asked how they would respond to the following scenarios:

1. Status quo, i.e. farmers were asked what their plans were assuming no change to the CAP.

2. Replacement of existing CAP headage payments with an annual cheque of the same amount with no conditions attached.

3. As 2 above, but with the requirement that the land had to continue being farmed for livestock.

4. As 3 above, but without CAP price support and with an equivalent compensatory amount added to the annual cheque taking into account a hypothetical fall in beef and lamb prices by about 30%.

5. The Forage Area Payment Scheme (FAPS) tier 1.

6. The FAPS tier 2 and tier 3, with more emphasis on the concepts of farming with a variety of environmental conditions and less on the actual payment rates.

To calculate an initial payment rate for FAPS (tier 1) a reference farm was used (number 3 in 23) which received £26,500 (31,800 ecu) annually in headage payments for a typical mixture of cattle and sheep amounting to 140LU. Thus, a forage area payment rate equivalent to about £190/LU (228 ecu) on this farm should be budget neutral, assuming farming systems remained unchanged. This converts into Forage Area Payments of 0.5 x £190 = £95/ha (114 ecu) for permanent pasture, etc, see 24.

Table 8.25: The Forage Area Payments Scheme (FAPS)

	Average national stocking rate at present LU/ha	FAPS TIER 1 Equivalent payments/ha (Budget neutral)	FAPS TIER 2	FAPS TIER 3
Cereal	1.10	£209	Payments 20% higher than tier 1: with target being stocking rates and balance on hill land. **Requirements:** Stocking rate 0.15 to 025 LU/ha Cattle to comprise between 30% and 70% of total LU's	Specific, targeted payments and enhanced rates for example: hill grazing LU/ha Lower inputs rotational cropping hay rather than silage regional livestock breeds organic option
Fodder roots	0.90	£171		
Rotational grass	0.50	£95		
Permanent grass	0.75	£142		
Rough Grazing	0.20	£38		
Heather moorland	0.10	£19		

In discussion with farmers it became clear that this may over-estimate the productivity of cereals, but in this case study area a financial incentive for cereal growing would in fact have environmental benefits (through encouraging a mosaic of land use on the more fertile ground).

Farmers' responses and environmental implications

1. Under the status quo scenario, virtually all of the farmers would continue farming as they do at present with the only potential change likely to follow the recent trend of concentrating more on sheep and grass pasture and less on cattle, cropping and grass meadows. Since conducting the interviews, the BSE crisis in the UK has added to the pressures on beef farmers and this, in conjunction with high lamb prices, will tend to reinforce this trend. The one farmer that was considering reducing breeding ewe numbers (in favour of hogs on which headage payments can be claimed) is likely to rethink this strategy because of the reduction made in these compensatory payments to reflect higher lamb prices. In effect the status quo will do nothing to reverse the negative environmental trend and would, if anything, make matters worse over time.

2. It was difficult to know whether the farmers took seriously the option of an annual cheque with no conditions. Some definitely thought it too unrealistic to respond to. Of the four farmers that gave a response, two would give up farming altogether, one would continue regardless and one (surprisingly) would intensify. Two farmers mentioned the possibility of managing the farm for hunting. From an environmental viewpoint it would achieve nothing positive to sustain or enhance the nature conservation value of the farmland.

3. With the payment conditional on continuing livestock farming, more than half of the farmers would reduce livestock numbers and increase the current proportion of cattle to sheep. Associated with this might be some decrease in the number of labour units which might have social implications. However, from an environmental viewpoint the basic reaction would be neutral to positive.

4. Under the basic FAPS scenario, with approximately the same level of financial support, but with this linked to area and not to the number of livestock, more than half the farmers interviewed would reduce livestock numbers and increase their current proportion of cattle to sheep. Some potential problems were exposed at this level - for example the way very large farms currently partly used for hunting would be "winners", and very small farms and crofts often with access to common grazing, would be "losers". These problems are not insolvable but they do need careful consideration. It is important that these issues are identified at an early stage. Those farmers currently farming in an environmentally sensitive way also tend to be overall "winners".

5. Reactions to the possibility of higher payment rates (tiers 2 and 3) for complying with a variety of environmentally positive farming operations (such as sheep stock reduction and an increase in the proportion of cattle to sheep) were similar to the reactions to the basic FAPS, with eight out of ten prepared to enter into tier 2 and six out of ten prepared to enter into tier 3. Since half the farmers' own reactions under the basic FAPS scenario were to reduce their stock numbers and consider growing winter fodder, entering into tier 2 did not seem particularly onerous to them.

Conclusions

On several, if not all, of the farms sampled, current CAP livestock payments appear to be playing an important role in maintaining livestock numbers and are thus indirectly preserving a farming matrix with a (potentially) high environmental value. So at the most general level of land use (i.e. agriculture rather than forestry or hunting for example) the current livestock support regime is positive; it is at the more detailed level that it is clearly failing to meet environmental objectives. Livestock farming in the Less Favoured Areas (LFA) of Scotland relies heavily on subsidies (see 26) and in a free market, with no indirect support, it would be unlikely to survive. It is important to remember this when considering instigating policy reforms for environmental reasons. Our aim must be to redirect payments towards the environmental features that we value and to those which only farmers can maintain, but at the same time we must introduce these changes in such a way that we do not "throw out the baby with the bathwater".

Although it may just be a reflection of the fact that this area was the pilot for the case studies, the reactions by farmers, from a wide range of backgrounds and interests, to the concept of area payments replacing headage payments was very positive. They found them acceptable in principle and potentially attractive in removing from them the pressure to keep excessive numbers of livestock. From an environmental perspective there were two very positive aspects. Firstly, mainstream support (the FAPS) would be encouraging a more benign farming system; and, secondly, this support (linked to the land) would provide a much more positive platform for the farmers, particularly when considering adapting their farming operations in order to receive more specific environmental payments (tiers 2 and 3). Many of the farmers also felt that focusing on areas (and the land) required the "environmentalists" to describe more clearly exactly what they value on farmland. This produced a better atmosphere within which to discuss how to use the farmers' technical abilities to achieve specific environmental objectives through farm management practices.

Some interesting problems emerged. For example, for common grazing pasture, especially where this was in association with crofts which may be only a few hectares in size; a recurring issue in much of the Highlands of Scotland would be the question of very large farms (estates) which are used only partially for farming, but primarily for hunting (mostly red deer). Fundamental issues which would need to be addressed for FAPS to be widely applicable are regional differences in land types, the classification of forage types and the accurate assessment of the extent of each type. National agricultural census returns and the EU Integrated Agricultural Census System (IACS) ought eventually to be able to address this. In principle it ought to be easier to monitor areas than livestock. Some farmers expressed concern about whether environmentalists could set the clear environmental objectives that would be needed for FAPS tiers 2 and 3 - although with FAPS tier 1 it might be easier, over time, to develop these.

In conclusion, the farmers' reactions to the FAPS was that from their point of view it would probably be more acceptable than headage payments and it would harmonise better with Regulation 2078/92 schemes. From an environmental perspective there would be clear advantages. There would however, be some new practical and administrative problems which would need to be addressed in order to devise a simple, workable scheme.

Potential solutions to these and other issues are discussed in more detail in chapter 7.

Table 8.27:

	LFA Mainly sheep	LFA sheep and cattle	LFA mainly cattle
Sample size	73	98	99
Average farm size	1,115ha	388ha	107ha
Direct subsidies as a % of output	49%	30%	19%
Direct subsidies as a % of net for income	205%	183%	118%
Direct subsidies per ha	£20.13	£54.73	£104.78

Continental lowlands/mountains, Black Forest, Germany

Description of the area

The study area is the Provincial Administrative District of Freiburg (Regierungsbezirk Freiburg) in the south-western part of Germany in the Federal state of Baden-Württemberg (Bundesland Baden-Württemberg). The area comprises parts of the upper Rhine valley (alt. 200-300m), front mountain ranges of the Black Forest (alt. 300-700m), high mountain regions of the Black Forest (alt. 700-1,500m), plains between the Black Forest and Swabian Jura (alt. 650-750m), western parts of the Swabian Jura (alt. 700-1,000m) and hilly lands and basins in the western Lake of Constance region (400-800m).

Below 400m cereal cropping usually dominates (intensive maize in the Rhine Valley) with occasional variations such as orchards (Rhine Valley and Western Lake of Constance area). Between 400m and 800m, depending on climate and relief conditions, grassland and mixed cropping systems are found. Between the altitudes of 600-800m, permanent grassland is most common. In the Black Forest region dairy production prevails. Finishing of cattle is of less importance.

The average farm size in the Provincial District of Freiburg (including part-time and full-time farms) is about 15ha (status 1994). About 60% of all farms operate as part-time holdings with a range of 30% to 90% in some areas. The average number of dairy cattle per farm in the Provincial District of Freiburg (including part-time and full-time farms) is about 11 heads (status 1994). The average annual lactation per dairy cow (including part-time and full-time farms) is approximately 5,200kg (status 1994).

Main environmental features

The most important threat to the region with particular concern in the Black Forest is the dramatic decline of agriculture in the last thirty years and the associated loss of grassland plant communities of high biodiversity. Between 1974 and 1994 the number of part-time and full-time farms has decreased by more than half.

Of even greater impact, because it threatens the basic economic structure of the region, is the number of closures of dairy farms which in the same period of time declined by almost 70%. Despite the effects of concentration there has been a loss of about 80,000 dairy cows since 1974. This development is accompanied by immediate afforestation; which in turn means the disappearance of extensive meadows and pastures and the characteristic plants and animals. Many of the plant communities of mountainous grasslands are of European nature conservation significance. In fact, extensive grasslands are one of the most threatened habitats in the continental lowlands. In many communities, the wooded area has doubled in the last 40 years. In the Central and Northern part of the Black Forest in particular, the landscape patterns have changed significantly.

The prognosis for agriculture is not good and one development of great concern is the level of training for the agricultural sector in the area. One indicator is the number of trainees. In 1994, there were only 26 trainee farmers (in their first year) in the Provincial Administrative District of Freiburg in comparison to the 250 trainees per year needed to secure the future of about 8,000 full-time farms in the area.

The farmers and their farms

The farms are located on a transect from the front mountain range of the Black Forest in the west towards the basins of the western Lake of Constance area in the east. 28 gives an overview of the case study farms.

The selected farms can be regarded as well managed dairy farms (full-time farmers) run by open minded entrepreneurs. The selection of suitable farms for the study was discussed and planned with officials of local Advisory Boards for Agriculture (Ämter für Landwirtschaft, Landschaftsentwicklung und Bodenkultur). It is not typical that dairy farms are managed by full-time farmers. Depending on the region, the percentage of full time dairy farms is about 5-30%. It has to be pointed out that the eight dairy farms can be regarded as farms with good potential in their regional geomorphologic and environmental framework.

Table 8.29: Data of farms

Farm-No.	1	2	3	4	5	6	7	8
1. Geographical/structural situation								
Production sector	dairy/FT	dairy/FT	dairy/FT	dairy/FT	dairy/FT	dairy/FT	dairy/FT	dairy/FT
Locality	SBF	SBF	CBF	CBF	EBF	EBF	WLC	WLC
Altitude	700-1,100 m	850-1,150m	550-700 m	350-550 m	650-750 m	600-650 m	600-700 m	550-650m
2. Characterisation:								
Farm-size, total area (ha)	70	52	50.6	41	35	95	60	35
Grassland (ha)	68	52	29.9	29 (24)	22	45	32	27
Cropped area (ha); (milk producing area)	2		5.8	7.5 (5)		50 (10)	28 (12)	8
Wooded area (ha)			15	5	13			
Milk quota (kg)	118,000	78,000	138,000	288,000	85,000	210,000	205,000	110,000
Average milk yield per cow (kg)	3,900	3,800	6,800	6,500	5,000	5,000	5,600	5,500
3. Husbandry:								
Species and breed (milk cows)	HW	HW	SchB	SchB	FV/VW	SchB	SchB	FV
Number	30	20	36	45	16	45	50	21

Farm-No.	1	2	3	4	5	6	7	8
Species and breed (fattening/breeding)			LimX				SchBX	FV
Number			13				8	28
Livestock ratio (forage area)/ha	0.52	0.46	1.7	3.1	1.0	1.2	1.6	1.6
Livestock ratio (total agricultural area)/ha	0.52	0.46	1.65	2.47	1.0	0.75	1.35	1.4
6. Scenarios/loss of income								
Milk prices would drop to 0.30 DM per kg (regional milk price at the moment around 0.60.- to 0.65- DM)	37.760.-	24.960.-	48.300.-	90.300.-	29.750.-	73.500.-	71.750.-	38.500.-
0.12- DM extra payment per kg quota milk	14,160	9,360	16,560	34,560	10,200	25,200	24,600	13,200
80% sum in DM that has to be allocated to area payments	30,208	19,968	38,640	72,240	23,800	58,800	57,400	30,800
Area payments which have to be allocated per ha milk producing agricultural area in DM	444	384	1,332	2,006	1,081	1,069	1,304	1,140
7. Farmers' preferred scenario	D	D	B	B	D	D	D	D

Notes: SBF = Southern Black Forest, EBF = Eastern Black Forest, CBF = Central Black Forest, WLC = Western Lake of Constance Region, FT = Full-time farmer, HW = Hinterwälder (Hinterwald-Cattle), SchB = Schwarzbunt (Friesian-Holstein-Cattle), Lim = Limousin-Cattle, FV = Fleckvieh (Simmental-Cattle), VW = Vorderwälder (Vorderwald-Cattle

Options offered to farmers

The standard questionnaire and scenarios (tiers) had to be modified and adapted to the regional conditions. The developed area payment schemes are based on assumptions that refer to a hypothetical, but nevertheless, realistic regional dairy farm. It was assumed that this model farm operates under appropriate conditions for production, this includes: stocking rate: 60 dairy cows; grassland: 50 ha; cropping: 20 ha; milk quota: 300.000kg/ha. This farm will be faced with a loss of income of about 77,000 DM per year. The area payment schemes were calculated in such a way as to account for about 800 to 1,000 DM per ha of milk producing agricultural land. The highest payments can be obtained for environmental friendly production. The farmers were asked about the consequences of the presented scenarios to their farms.

Scenario A:

How would you react as a farmer if headage payments and price support for milk production were withdrawn?

Assumptions:
- Meat prices would decline by 33% and milk prices by 50%.
- There are no quota or other restrictions on the milk market.

Scenario B:
As scenario A, but you receive compensation payments (you will receive a cheque with the same amount of money you will lose due to price reductions)?

Assumptions:
- At least the same area of agricultural land has to be managed.
- Meat prices would be stable and milk prices would fall by 50%.
- There are no quota or other restrictions on the milk market.

Scenario C:
As scenario A, but you will receive area based payments, but these payments would only account for about 80% of the sum you will lose due to price reductions.

Assumptions:
- Meat prices would be stable and milk prices would fall by 50%.
- Milk quotas will still exist.
- You would receive additional compensatory payments 0.12 DM (= 0.06 ecu) per kg for quota milk.
- Area payments per ha agricultural land which can be allocated to dairy production are paid according to a list of 8 production schemes.

Scenario D:
As scenario A, but you will receive area based payments but these payments would only account for about 80% of the sum you will lose due to price reductions.

Assumptions:
- Meat prices would be stabile and milk prices would fall by 50%.
- Milk quotas will still exist.
- You would receive additional compensatory payments 0.12 DM (= 0.06 ecu) per kg of quota milk.
- Area payments per ha agricultural land which can be allocated to dairy production are paid according to a list similar to the MEKA scheme, but focusing on higher payments for environmentally friendly land use practices.

Farmers' responses

Most of the farmers interviewed (6 out of 8) were receptive to the idea of extensifying their production systems and would accept an area payment scheme (FAPS).

The farmers' responses are summarised in 30. Six farmers would opt for scenario D, two farmers would prefer scenario B.

Depending on the regional conditions, farmers mentioned one major problem with the concept of area payments. This is, that on average only about one third of the cultivated land is owned by the farmer himself. As other programmes have already shown, the landowner often desires to participate in programmes of this nature with the result that rents increase considerably. Farmers who operate on their own land and have large holdings, as for example in the Central part of the Black Forest, would be the main "winners". On the other hand, farmers who work very intensively on small holdings, and those who mainly work on rented land would be the big "losers".

As an experiment, interviews were also conducted with two groups of dairy farmers (28 and 20 farmers respectively). Two farmers of each group were chosen to apply the scenarios to their farms. The groups opted as followed:

- First group (28 farmers): scenario A: 8; scenario B: 9; scenario C: 4; scenario D: 7 (the farmers in this group (referring to the regional context) can be considered to have good production potential).

- Second group (20 farmers): scenario A: 0; scenario B: 0; scenario C: 2; scenario D: 18 (the farmers in this group (referring to the regional context) can be considered to have production disadvantages).

Conclusions

None of the farmers interviewed would be capable of coping with an unsupported agricultural system. In general, the intensity of production in the study area is fairly low compared to other regions such as in the Rhine valley or in the foreland regions of the German Alps (Allgäu). The only products which can be produced in vast parts of marginal areas such as in the Black Forest are meat or milk. There have been attempts in the past to increase the productivity, but these failed because of the geomorphologic and climatic constraints. From an environmental point of view, an intensification of agriculture is not desirable. Indeed, in many respects the ideal situation would be to maintain the area of land under agriculture (rather then forestry), and lower the management intensification. Even under the best conditions production costs for milk are in the range of 0.48-0.52 DM per kg. Finishing of beef cattle provides no alternative since the necessary energy could not be produced in the area. Apart from the cost factor of the import of high-energy food, this would immediately result in additional environmental problems (e.g. where and how to dispose of slurry).

Mediterranean mountains, Feneos, Greece

Description of the area

The case study area is Feneos, in the mountainous uplands of Korinthos. Sheep and goat rearing for milk production is the main economic activity in the area. Livestock numbers have declined by about 50% in the past 30 years, but have remained steady during the last ten years.

Table 8.31: Landuses and livestock in Feneos

Cultivated farmland	4,540ha
Rough grazing	16,800ha - 48% private
	- 52% public
Forest	7,370ha
Sheep	23,300
Goats	9,600
Suckler cows	1,330
Dairy cows	50
Pigs	300
Poultry	28,000
Sheep/goat holdings	220
Average holding size	88 sheep/goats
	7.7ha farmland

Most of the natural pastures (rough grazing) are grazed all the year round with cereal stubble and crop residues providing additional grazing in the summer. Cultivated pastures are grazed from February to the end of May, or mid-April if they are to be cut for hay. Some flocks are taken up to mountain grazings from May to October.

The mean available pasture is 0.391ha of rough grazing per head and 0.034ha of cultivated pasture per head, with wide variations between villages.

Although some concentrates are grown on the farm, most farmers also buy concentrates such as cotton-seed cake, sugar-beet pulp, etc.

Durum wheat is an important source of income for many farmers, as it receives a CAP area payment of 430 ecu/ha compared with 67 ecu for barley or 233 ecu for maize. Forty-five per cent of the cultivated farmland in the area is under durum wheat.

Main environmental features

There is great diversity of grazing lands in Greece, ranging from mountains to lowlands, islands to mainland, and including grasslands, shrublands and forests of many different types. The productivity of these different grazing lands varies greatly, as does the appropriate stocking density. The definition of zones and forage categories is therefore extremely difficult.

The management of State-owned and communal grazing lands and forests is a major environmental and resource-use issue.

Most of the natural pastures have been degraded through centuries of overgrazing and many are still being overgrazed, in spite of the decline in stock numbers during the past thirty years. However, some mountain pastures are now suffering from abandonment and undergrazing.

The management of communal grazing lands is the responsibility of the Communal Council of each village. Grazing is, in principle, free for all, with no restrictions on either grazing periods or stocking rates. Grazing therefore is usually distributed between livestock owners on the basis of tradition.

Much of the existing legislation concerning public grazing land is either inadequate, or is not properly implemented. The legal complications have added to the unwillingness of shepherds to take their stock up to mountain rough grazings. They now tend to concentrate at lower altitudes.

The issue of grazing in forests is particularly controversial. Seventy-nine per cent of forests are State-owned or communal. Grazing rights in forests may be leased by Communities and Municipalities. Grazing is prohibited or restricted when the forest is in the phase of artificial or natural regeneration. Grazing, particularly of goats, may also be prohibited for other reasons, on the decision of the forest authority. Stock farmers feel that grazing is excessively restricted and that this results in an accumulation of understorey vegetation which represents a serious fire risk.

The farmers and their farms

The farms selected for interview are all in the village of Mati, in which 70 of the 100 families are involved in livestock production. The average farm size is 125 sheep/goats and 7.9ha of farmland (total farmland in the village is 600ha). The available grazing land is 1,600ha.

The village receives a total of 330,000 ecu in CAP direct subsidies (not including price support), of which approximately half is livestock headage payments and half is arable area payments, mainly for durum wheat.

Crops are cultivated with little or no use of fertilisers and yields are low and declining in some cases. CAP area payments for durum wheat are the main incentive for cropping.

Table 8.32: Overview of the six farms

Farmer	A	B	C	D	E	F
Grain crops	3.4ha	4.5ha	8ha	3ha	12.5ha	5ha
Forage crops	5ha	7ha	4ha	4ha	5ha	7ha
Grassland	10ha	10ha	13ha	-	-	10ha
Rough grazing	5ha rented	-	-	40ha commons	15ha rented 25ha commons	-
Ewes	130	105	200	150	50	80
Rams and hogs	20	20	-	25	-	-
Goats	50	-	-	-	250	60
LU/forage ha	1.5	1.1	1.76	0.6	1	1.24

Options offered to farmers

The farmers were asked to respond to the following scenarios:

1. The removal of all headage payments.
2. An annual cheque replacing headage payments.
3. The principle of area payments replacing headage payments.
4. FAPS Levels 1/2/3

Farmers' responses

1. Removal of all headage payments

This scenario produced mixed reactions, ranging from reducing stock and extensifying production, to increasing stock and intensifying production. None of the farmers said he would give up altogether, presumably due to the lack of alternative employment.

2. Cheque replacing headage payments

Again, the responses varied considerably, although four said they would reduce their stock numbers from current levels. Three of the six said they would use more purchased feed.

3. The principle of area payments replacing headage payments

All of the farmers were opposed to the principle of area payments replacing headage payments, mainly because of their small farm areas and the fear that their level of subsidy would be reduced as a result of the change. See point 4. below.

Table 8.33: Overview of farmers' reactions

	A (age 57)	B (age 35)	C (age 40)	D (age 25)	E (age 28)	F (age 45)
Removal of headage payments	Get rid of goats; reduce sheep; reduce feed purchases.	Increase stock, buy more feed, intensify. If arable support removed, cease cropping.	Reduce sheep and intensify system. Grow more wheat, unless arable support removed.	Intensify sheep production, growing more forage to save on feed purchase.	Give up sheep and reduce goats, concentrate on wheat. If arable support withdrawn, increase sheep.	Reduce stock and develop cheese production to maintain income.
Cheque replacing headage payments	Reduce stock to minimum and let land. Buy feeds.	Reduce sheep and intensify system.	Reduce sheep from 200 to 50. Reduce grazing and use purchased feed.	Reduce sheep to 100.	As above.	As above.
The principle of forage area payments	Negative.	Negative.	Negative.	Negative.	Negative.	Negative. A cheque would be better.
FAPS 1	Stocking density looks high due to use of feeds and stubble. FAPS doesn't allow for this.	Negative.	Negative.	Negative.	Negative.	What criteria can be used to set area payments fairly for all different EU regions? Very difficult.
FAPS 2/3	Negative. Better to fence off commons.	His pastures are not overgrazed. Negative.	Negative.	Negative. Better to fence off overgrazed commons.	Negative. Common land he uses is not overgrazed.	Negative.

4. FAPS 1/2/3

The application of the FAPS system resulted in a considerable theoretical loss of subsidy for all of the farmers interviewed. This seems to be due to a combination of two factors:

- in calculating the FAPS payments, the consultant used the same "optimum" stocking rates as were estimated for the Scottish pilot study; these rates are considerably lower than those currently found on the interviewees farms;
- area payments were calculated only for the private farmland area, which is generally very limited, and not for other important areas of forage, such as cereal stubble and communal rough grazings; this factor affected particularly farms D and E, which use common grazings.

Because of the way the FAPS was interpreted and because of the potentially major complications in trying to apply an area payment system to the various types of public grazing lands in the area, the farmers did not favour a forage area payment system, and would prefer to keep headage payments.

Two of the farmers commented that the problem of overgrazing should be dealt with by fencing off degraded areas and managing them through controlled grazing.

Other comments from farmers

The farmers commented that the payment they get now for durum wheat should be paid for growing other crops, such as barley, vetch and lucerne, which would be more useful for feeding livestock. If they grew these crops instead of durum wheat, they could reduce the pressure on grazing land and save money by buying in less extra feed.

Apparently there are a number of young people in the village willing to continue with livestock farming as a way of life. There are no other employment opportunities for them. They feel that CAP subsidies are very important in making the economy of the village viable and that they should not be removed. However, they also need better medical services, both for themselves and their livestock.

Conclusions

The application of the FAPS is especially problematic in this area (and in many other parts of Greece) because of the large extent of public grazing land and the currently poor state of administration of this land. The particular issues affecting this land cannot be tackled by the CAP, but rather require better cooperation between farmers, foresters, agronomists, environmentalists and local authorities in order to arrive at a rational system of administration and management. Practical measures, such as the fencing of degraded pastures, may be more effective in achieving environmental gains than changes to the CAP livestock support system.

Mediterranean lowlands, Extremadura, Spain

Description of the area

Extremadura is located in the south-western corner of the *meseta*, covering 4.2 million hectares. Much of the region is covered by siliceous soils of low fertility. The reference yields for non-irrigated areas under the CAP arable regime range from 0.9 to 1.8 t/ha. The average livestock density for the region as a whole is 0.28 LU per ha of forage, excluding pigs.

The landscape is dominated by vast rolling plains which are under a mixture of permanent pasture and extensive arable cultivation. Large tracts have an open canopy of evergreen oaks, forming the agro-ecosystem known as "dehesa", which was the focus of this case-study. The dehesa farming system combines extensive livestock raising with extensive arable cultivation and silviculture. Cattle are mainly of hardy regional breeds, though often crossed with Charolais or Limousin to produce calves for fattening outside the region. Calves are suckled naturally. Sheep are mostly Merino and are raised for meat and, to a lesser extent, for milk.

Traditionally, extensive raising of the Iberian pig was widespread in the dehesas, but this sector was decimated by African Swine Fever from the 1960s onwards. The disease has recently been eradicated and pig raising is now increasing again.

The grazing of livestock and occasional cultivation of oats and triticale on long rotations for forage prevent the development of a shrub layer and maintain a largely natural pasture, rich in flora but of low productivity. The production of dry matter varies considerably and is very much dependent on climatic conditions. Although the average is 1,000-3,000kg of dry matter per hectare per year, this may drop to as low as 600kg in marginal areas or very dry years.

Dehesa pastures dry out completely in the long summer and supplementary feed is necessary for livestock production. Traditional sources were cereals and legumes produced from the occasional cultivation, grazing of stubble and the foliage and acorns of the oaks. In the summer, stock were taken to upland pastures in other regions (transhumance). Since the 1970s, this practice has tended to die out and the use of purchased feeds has increased greatly, which has been a key factor in permitting increased stocking densities.

Main environmental features

The region is of exceptional nature conservation value for a wide range of species, including reptiles, amphibians, flora, mammals, etc. Currently, most of the available data relates to birds. SEO/Birdlife has identified 50 Important Bird Areas (IBAs) in Extremadura, covering a total surface area of 2,998,266 ha, over 70% of the regional surface area.

It is an important characteristic of the region that the extraordinary level of biodiversity is an integral part of the farmed landscape. Apart from in certain areas of more intensive production, the majority of the countryside is under extremely extensive agricultural management. Livestock raising is characterised by extremely low stocking densities. The arable makes low use of agrochemicals and fertilisers. Fallow periods of several years are common.

The dehesa system in particular maintains a high proportion of the elements which would have existed when the region was in a more "natural" state, combining grassland, open woodland and scrub in an extensive landscape mosaic which provides a range of habitats for several dozen vertebrate species, including one of the richest bird communities in Europe.

The essential components of tree cover and semi-natural pasture under extensive livestock grazing are still intact over vast areas and harbour exceptional communities of wildlife. Nevertheless, the management changes which have taken place in recent years have brought with them certain environmental impacts which are of concern and which put into question the longer term conservation of the dehesa. The principal environmental concerns at present are as follows:

Clearance

Tens of thousands of hectares were cleared during the 1960s, 70s and 80s, principally to make way for new irrigated agriculture. New irrigation projects which involve dehesa clearance are still being carried out, but to a lesser extent than in the past.

Lack of tree regeneration

Apart from wholesale clearance, the gradual thinning of dehesa tree cover has been arguably the principal environmental concern since the 1970s. Many commentators report a general decline in average tree densities, from a typical 40 stems per hectare in the past to as few as 10 or 20 today.

The problem of regeneration has been exacerbated in recent years by increased stocking densities and grazing pressure. It is difficult to estimate appropriate stocking densities for dehesa farms, as the carrying capacity varies considerably both between farms and between years (rainfall is the key limiting factor). Because of the severe impact of livestock on young trees and pastures in drought years, conservative stocking levels are recommended, as is the use of forage crops as a means of storing surplus dry-matter production in good years. At present, the extent of overstocking is not known, although the phenomenon is apparent on many dehesa farms in dry years.

The decline in shepherding means that stock are more likely to damage young trees. The decline in transhumance means that stock are now present in the dehesas during the late spring and summer, thus further adding to the grazing pressure on young trees, which are the only natural source of forage during the very dry summer months. The free-range grazing of cattle is particularly damaging to young trees.

Concentration of grazing pressure

Without shepherds, the more accessible areas of the farm tend to be grazed more than the remote corners. In the longer term, this leads to the disappearance of trees in the former areas, and the gradual accumulation of scrub in the latter. Although some patches of scrub may be beneficial for wildlife, these often end up being cleared by heavy machinery under "improvement" programmes. Alternatively, they may be destroyed by fire. In both cases, there is a high risk of soil erosion. Overall, the concentration of livestock on the more accessible pastures tends to result in a gradual deterioration in the dehesa ecosystem.

Competition with wild fauna

As well as affecting tree regeneration, the increased stocking levels which have become common in recent years result in greater competition with wildlife for food, particularly during the dry summer period when resources are scarce.

Decline in arable cultivation

The abandonment of arable cultivation has taken place on a large scale in the dehesas, resulting in a general loss of the habitat diversity provided by pasture, cropped and fallow land. Certain species are thought to be dependent on the habitat mosaic provided by cultivated dehesas (e.g. the black-shouldered kite).

Abandonment of traditional features

Throughout the dehesas, stone walls form the traditional field boundary. Apart from a few examples, these walls are mostly neglected and are increasingly being replaced with wire fencing.

Development of hunting estates

Hunting provides a potentially profitable alternative to livestock raising on larger dehesa farms. Some holdings are managed almost entirely for hunting, principally of red deer. Over time, this results in a different vegetation structure from that found in farmed dehesas, with more extensive areas of scrub and dense woodland. On a limited scale, such developments may well benefit nature conservation as a whole, by adding to the diversity of the otherwise uniform dehesa agro-ecosystem.

However, specific problems are associated with the conversion of farms to hunting, particularly the erection of deer fences which limit the movement of fauna and prevent public access. Also, deer estates may be over-stocked, resulting in degradation of both pastures and tree cover.

The farmers and their farms

The farms all include a large proportion of dehesa with some open grassland and cultivated land. Stocking densities vary considerably on the farms, from a low of 0.185 LU/ha to a high of 0.4 LU/ha. In part, this seems to reflect the variability in carrying capacity or productivity of dehesa grassland, although there is also a clear tendency for smaller farms to have higher stocking levels.

Table 8.34: Overview of the six farms

	A	B	C	D	E	F
Farm area	1,100ha	320ha	800ha	320ha	70ha	127ha
Dehesa	800ha	320ha	250ha	245ha	64ha	50ha
Dry grassland	300ha	-	550ha	75ha	6ha	68ha
Cropping	60-80ha	60-90ha	80-90ha	30-35ha	-	3ha
Suckler cows	90	65	145	50	28	34
Heifers	25	-	25	-	-	-
Bulls	4	2	2	-	-	-
Ewes	600	400	-	320	-	-
Pigs	182 + 120 weaners	55	-	80-90 during winter	7	2
Horses	4	-	-	-	-	-
LU/ha (excluding pigs)	0.185	0.4	0.2	0.3	0.4	0.268

Farm size varies from 70ha to 1,100ha, making the group fairly representative of the range of dehesa farms found in the region.

The larger farms currently keep a mixture of stock (cattle, sheep, pigs), whereas the smaller holdings are dedicated principally to beef cattle production. Only one of the holdings (B) has a significant supplementary activity on the farm, in the form of a new rural tourism venture.

Farmers were not asked their age, but ranged from early thirties to mid-fifties, the majority appearing to be in their thirties or forties.

All the farmers are either owner-occupiers, or owner-occupiers with some rented land.

Options offered to farmers

The farmers were asked to respond to the following scenarios:

1. Status quo, i.e. assuming that the CAP remains unchanged.
2. Replacement of existing CAP headage payments with an annual cheque of the same amount, with no obligation to continue farming.
3. As 2., but with the requirement to continue farming along current lines in order to maintain the same broad land use (i.e. a conventional livestock enterprise, but with freedom to alter livestock numbers, cropping patterns, etc.).
4. As 3., but without CAP price support and with an equivalent compensatory amount added to the annual cheque (beef and lamb prices were assumed to fall by approximately 30%).
5. FAPS Level 1.

6 FAPS Levels 2 and 3. Possible environmental conditions under the two Levels were discussed in general terms.

35 illustrates the FAPS scheme which was presented to the farmers. The application of the FAPS presented a particular problem in that the productivity of dehesa grasslands varies considerably between areas and between farms. Many farms have more productive patches, resulting from many years of dunging (*majadales*) or, in a few instances, from improvement through the application of phosphates. Consequently, the use of a blanket rate for dry grasslands and dehesas would result in some farms receiving a large increase in subsidy, whilst those with better pastures and higher stocking levels would be significant losers. Generally, such an outcome would not reflect environmental values. For example, the more productive *majadal* type of grasslands carry higher stocking levels, but are also specifically cited for protection in the EU-Habitats Directive.

Whereas a useable definition exists for distinguishing grassland from scrub and woodland, differentiating between more productive and less productive grasslands is more problematic. To achieve satisfactory results, farms would probably have to be assessed on an individual basis. At present, this would be administratively impossible as the official farm extension service is extremely limited.

For the purpose of the farm interviews, the areas of different categories of forage were estimated rather loosely for each holding, with the aim of avoiding large "winners" and "losers". Satisfactory results were produced. The two farms with the lowest stocking densities were found to benefit from a considerable increase in subsidy, an impression which was exaggerated by the fact that both farms currently do not have premium rights for all of their stock. The farms with the highest stocking levels found that their subsidy was slightly reduced under the FAPS. In practice, small dehesa farms are more highly stocked than large estates and the FAPS will therefore tend to reduce the amount of subsidy currently going to smaller farms whilst increasing the payments to large estates.

Table 8.36: FAPS proposal for the dehesas of Extremadura

	Average stocking level at present (approximate).	Level 1 Basic forage payment per hectare.	Level 2 Basic Level 1 premium plus an additional payment of 5,000 Pts per ha for farmers who comply with certain basic environmental conditions, such as respecting minimum and maximum stocking limits.	Level 3 Basic Level 1 premium plus an additional payment of 10,000 Pts per ha. Conditions would be of a similar type to those of existing 2078/92 programmes.
Improved dry grassland and dehesa	0.5 LU/ha	17,000 Pts		
Dry grassland and dehesa	0.25 LU/ha	8,500 Pts		
Scrub and woodland	0.1 LU/ha	3,500 Pts		

One peculiar consideration for the FAPS in the dehesas is that a proportion of the existing stock on many dehesa farms is made up of foraging pigs which do not receive CAP headage payments. By converting to the FAPS, the forage area currently utilised by pigs effectively receives a "new" subsidy. However, pigs are only present in the dehesa for three months of the year (the rest of the year they are housed) so their contribution to overall stocking levels is less than it might at first appear.

Red deer and wild boar also constitute a considerable proportion of the grazing pressure in the dehesas. On some farms, these are managed as the main economic activity, with domestic livestock being either secondary or not present at all. Farms which are managed principally for hunting tend to be large estates which generate very large incomes from shooting rights. It is not socially or politically desirable to disburse the FAPS forage area payment on land which is predominantly under game rather than domestic livestock. However, this could be avoided, since commercial hunting land is registered with the regional authorities and can be distinguished from farmland for administrative purposes.

Farmers' responses

1. Under the *status quo* scenario, five out of six farmers would increase their stock, and would also increase their premium rights where possible. Headage payments seemed to be a significant influence driving this desire to increase stock. This development would be broadly negative for the dehesa environment.

2. In some cases, the "cheque" scenarios (1. and 2.) produced a simplistic reaction, usually to continue farming unchanged. This may be because the interview was still a bit "cold" at this stage and the farmers had not thought through the implications of what we were proposing. Even so, under scenario 1., three farmers were inclined to consider the possibility of changing from conventional livestock to management for hunting, or the production of ostriches. If widespread, such changes would result in a loss of the natural values associated with traditional livestock raising.

3. Under the FAPS scenario, all the farmers said they would *not* increase stock, and one said he would probably reduce his stock slightly. Two farmers made the comment that under the FAPS they would aim for quality rather than quantity. In general, the FAPS proposal was well received, particularly the flexibility to alter stock numbers without worrying about losing headage payments. In the sense that it would seem to reverse the current trend for increasing stocking densities, the FAPS 1 scenario is potentially beneficial to the dehesa environment.

4. The possibility of additional payments in return for environmental conditionality (Levels 2 and 3) was fairly well received in principle, particularly for maintaining stone walls. Farmers were slightly less enthusiastic about conditions which limited the grazing of stock, but generally sympathised with the aims of the scheme and seemed willing to participate if the incentives were economically attractive and the conditions realistic.

Most of the farmers said they saw the lack of tree regeneration as the main environmental concern in the dehesas and there was a general recognition that many farms are currently overstocked and that this a key factor in preventing tree regeneration. This was an agronomic, as well as an environmental concern, and most farmers agreed that a change to forage area payments could be a useful step in dealing with the problem.

Conclusions

Under the current system of headage payments, increasing stock has been a key objective of many dehesa farmers. Stocking levels are now excessive on many farms. This is the main environmental concern associated with livestock raising in the dehesas: overstocking prevents tree regeneration and is detrimental to wildlife conservation.

The small destocking incentives provided under Regulation 2078/92 are unlikely to be taken up by more than a small handful of farmers. Furthermore, although the quotas on premium rights should prevent an overall increase in national livestock numbers, they do not prevent the concentration of stock in particular regions and areas. The dehesas have a clear livestock producing vocation and are likely to witness a gradual accumulation of premium rights and hence a gradual increase in stock numbers under the *status quo* scenario.

On the basis of the six farm interviews, the FAPS seems to offer a potential basis for tackling the over-stocking problem in the dehesas. It removes the incentive to increase stock and encourages

farmers to concentrate on the quality of production rather than quantity. With the basic area payment of FAPS in place, incentives for adapting stocking levels to the environmental conditions of the land (under Levels 2 and 3) should be much more effective than existing schemes under Regulation 2078/92, which conflict directly with headage payments.
Achieving a general reduction in stocking levels would be beneficial for wildlife conservation in the dehesas. There also seems to be considerable potential for Levels 2 and 3 to promote specific environmental improvements, such as stone-wall maintenance, not ploughing on steep slopes, etc.

Reducing stock is the first step in achieving tree regeneration. Currently, very large payments are made to farmers to plant new dehesas under Regulation 2080/92, whilst the regeneration of existing dehesas is prevented, indirectly, by the pressure to overstock provided by headage payments. Level 3 incentives could be offered to farmers who set aside a proportion of their land for regeneration.

Although it seems to have potential for addressing environmental problems associated with the dehesas, the application of the FAPS in this region would present very significant administrative problems due to the problem of defining different grassland categories.

Alpine, Valle d'Aosta, Italy

Description of the area

The Alpine case study area is the northern Italian region of Valle d'Aosta. The region is located at the western end of the Alps and is the smallest in Italy extending to only 326,000 hectares. Approximately 50% of the region lies over 2,000m and over 30% is pastures and grasslands mainly located above the natural tree line. The local economy is based on agriculture, forestry and tourism with livestock breeding making up 84% of the region's gross income. Dairying is the most important agricultural activity and milk production makes up 38.6% of the regions gross income from agriculture. The alpine cattle breeding farming system employs 2,000 people and official statistics indicate that 70,000ha of natural mountain pastures are grazed by cattle during the summer months and that 26,000ha of valley meadows are cut for hay annually. Most of the milk produced in the region is processed into the Fontina cheese.

Table 8.37: Land use statistics

Pastures	96,000 hectares
Woodlands	90,000 hectares
High Alpine Habitats	110,000 hectares
Other	30,226 hectares
TOTAL	**326,226 hectares**

The dairy cattle consist of three local (regional) breeds of cow which are kept in the mountain grasslands (alpeggio) during the summer where they are milked. There are 350 alpeggi in Valle

d'Aosta, mainly located between 1,500m and 2,800m, although some extend as high as 2,900m. The botanical composition of the mountain pastures are believed to impart a distinctive flavour to the milk and, in turn, to the fontina cheese, Each alpeggio consists of three or four main grazing areas (tramutti) which are exploited in rotation, allowing grasses and herbs to periodically recover from high grazing pressure. During the winter months (October to May) the cows are housed in cowsheds in the valleys. Winter fodder is produced from natural grassland meadows, mostly situated between 1,000m and 1,800m, which are cut (once or twice) during the summer for hay. These meadows lie below the altitudal limit to tree growth and within the conifer belt.

Although cattle number have decreased only slightly in the past 30 years, the number of farms has shown a much greater decline. This has led to a concentration of dairy herds on the more productive land and to the abandonment of more marginal pastures, particularly on steeper slopes. Associated with this concentration has been a gradual shift from dairy cattle to the breeding of calves and steers (suckler cows), the management of which needs less labour.

Table 8.38: Changes in cattle numbers

Year	1961	1991
Number of cattle	47,224.0	43,752.0
Number of farms	8,430.0	2,600.0
Average cattle per farm	5.0	16.8

Main environmental features

Valle d'Aosta is considered to be one of the most important areas for nature conservation and biodiversity in Italy. It has two large and important protected areas: the Mount Avic Regional Park (3,251ha) and the Great Paradiso National Park (70,000ha total, half of which is in the neighbouring Piedmont). Forest covers 25% of the region, mostly composed of *Larix decichta, Pinus uniciata, Pinus excelsa* and a wide range of deciduous species. Grasslands, mainly natural alpine grasslands, cover 20% and in the order of 30% is composed of natural mountain features of great biological and aesthetic value such as glaciers, moraines, cliffs and mountain peaks.

In the alpeggio grasslands there are characteristic alpine plant and animal communities including the world's largest population of Ibex (*Caprea caprea*) together with Chamois (*Rupicapra rupicapra*), Red deer (*Cervus elaphus*), Wild boar (*Sus serofa*), Golden eagle (*Aquila chrysaetos*), Peregrine falcon (*Falco peregrinus*), Ptarmigan (*Lagopus mutus*), Black grouse (*Lyrurus tetrix*) Black woodpecker (*Dryocopus mertius*), and a large number of species of reptiles, amphibians and invertebrates, including several of EEC concern (for example *Carabus olympiae* and *Rosalia alpina*). To a large extent this array of species is dependent upon the mixture of forest and open habitats (mostly grasslands and heaths) which is maintained by the alpine cattle breeding management system. A number of habitats listed in the EEC Species and Habitats Directive also occur in the area, see 39.

Table 8.40: EC Species and Habitats Directive - Valle d'Aosta

Directive reference	Description
24.221/24.222	Alpine rivers and river-bank vegetation
31.4	Alpine and sub-alpine heaths
31.5	Scrub of *Pinus mugo* and *Rhododendron hirsutum*
36.32/36/41/45	Various mountain and mid-altitude grasslands
36.3	Mountain hay meadows

The farmers and their farms

Six farmers were interviewed, all of them having typical farms for the area comprising a main farm in the village (in the valley at between 700m and 1,600m altitude) and an area of alpeggio in the mountains (between 1,800m and 21,000m). Details of the areas and the livestock are given in 41.

Table 8.42: The case study farmers and their farms

Farm	1	2	3	4	5	6
Age of farmers (years)	60	50	35	44	58	52
Main farm area (ha)	25	25	50	20	2	30
Alpeggio area (ha)	200	300	121	12	200	200
Dairy cows	81	124	110	52	5	180
Other livestock	64	77	70	28	238	81

Options offered to the farmers

The farmers were asked how they would respond to the following scenarios:

- Replacement of existing CAP headage payments with an annual cheque of the same amount with no conditions attached.

- As above, but with the requirement that the land had to continue being farmed for livestock;

- Withdrawal of headage payments and a reduction in the price of milk of about 30-50%, with both being replaced by a compensatory cheque, conditional on continuing to farm;

- The Forage Area Payments Scheme (FAPS) divided into:
  - Tier 1 Area payments which are largely production and environmentally neutral
  - Tier 2 Area payments dependent on environmental management (such as reduced stocking rate, reduced or nil chemical fertiliser use, etc)
  - Tier 3 Payment for more specific environmental management (such as leaving pastures for wild herbivore grazing, maintaining shrubs and bushes, riverside management, etc).

Farmers responses and environmental implications

1. The farmers are not specifically asked what they would do under status quo, but the impression gained from the interviews was that all intended to continue farming as they do at present; and all had a great pride in the fontina cheese and its high quality reputation.

2. If offered a "compensation cheque" - an annual cheque - with no conditions attached, five out of the six would continue just as they do at present. The exception thought he would change - by reducing his livestock and also the number of people that he had to employ. Clearly all of the farmers were in the farming profession because of the lifestyle and felt that it was this that was most important to them rather than purely the economic considerations. They regarded farming as a way of life that they had been born into and they felt very strongly that the traditional mountain dairy farming should continue. From an environmental point of view the "compensation cheque" scenario would be neutral.

3. Not surprisingly, a basic condition requiring continuation of livestock farming produced the same result as 2 above. In Valle d'Aosta there is clearly a very strong link between agriculture (environment) and the rural culture - all of the interviewees regarded farming in this area to be analogous with dairying - despite this being incredibly labour intensive and involving transhumance. Maximising the conditional area payment by converting to suckler cows was not suggested by any of them.

4. The reaction to a 30-50% lower market price for milk was that four out of the six would try to continue (albeit reluctantly), whilst two would quit farming altogether. This reaction can be explained by the great pride that these farmers have in producing fontina cheese which is not only regarded as being of high quality but is a high *value* product. None would wish to continue if they were producing an "ordinary" product, even though they personally might be financially no worse off because of compensatory payments.

5. Under the basic FAPS scenario, all six would continue as before. Again this reflects the fact that the respondents are motivated by wanting to farm, rather than by the subsidy per se. Thus, it made little difference whether the subsidy was calculated on the number of livestock or on the area of pasture.

6. Reactions to the possibility of higher area payments (FAPS tiers 2 and 3) again produced a quite unexpected reaction. Having accepted the basic FAPS concept the interviewees reacted strongly against the idea of further restriction on their agricultural activities. At the tier 2 level, five of the six would continue reluctantly and one would quit. At tier 3 level, all six would quit. There is a very strongly held belief by these farmers that their alpine dairying has created and maintains the environmental value of the area. They felt that specific environmental management was unnecessary and that the very detailed things suggested in tier 3 (for instance leaving pastures for chamois to graze them) was out of the question. In essence, the interviewees wanted to be farmers, not park keepers.

Conclusions

This case study revealed some interesting aspects of the psychology of farmers. They clearly felt that support mechanisms should be provided, but at the same time felt that there was no environmental need to restrict their activities. If farmers were already happy to enter into environmental schemes, or where their reaction to new proposals (e.g. FAPS tier 1) was positive, it was because they could continue what they were already doing. In many respects this is entirely appropriate for a traditional system such as the "alpeggio". Indeed, it may be that it is more cost effective and better for the environment to only go as far as FAPS tier 1 in this sort of situation. Although some of the more idealistic detailed management would not be possible, the basic farming system would survive. The reactions against tiers 1 and 2 may have been partly because the farmers misunderstood the voluntary nature of the scheme.

The issue of maintaining alpine cattle breeding has become a priority for the local administration, and a number of actions have been taken to halt its decline. There already exists a type of area payment (in conjunction with headage payments), but this could be improved to have greater environmental benefit (in terms of sustaining the activities and features associated with dairying (such as the floristically rich periodically grazed alpeggi), by increasing the differential between the payments for dairy cows and those for beef calves and steers. Interestingly, the issue regarded as being most critical by the farmers and the local administration is the development of more integration between agriculture, forestry and tourism in the area and developing a policy which takes into account the environmental implications of this. Area payments as a mechanism for distributing agricultural support could potentially work well in this context.

Summary of the overall farmers' reactions to the interviews

Reactions to an unconditional payment equivalent to current receipts from headage and market support

- Many of the farmers interviewed found the idea difficult to take seriously. In Spain, Greece and Italy most would simply continue as before, perhaps reflecting that for them "farming was a way of life", or at least only making minor changes to their operation. In Scotland and Spain, some initial reactions to this scenario were to give up farming and "go on holiday", and perhaps to consider alternative uses for the land, such as hunting.

- In reality this option was not pursued to any length by the interviewer as being likely. It was very useful though in drawing to the attention of the farmers exactly how much they received annually in payments. It was clear that some were unaware of the level of market support that they were receiving.

- At the prospect of a removal of price support, most of the farmers said that they would not find it economic to produce, although a few felt they could survive by concentrating on quality rather than quantity of output.

- Environmental effect: this is in many ways an unknown quantity, especially due to the possibility of widespread abandonment.

Reactions to a payment equivalent to current receipts from headage and market support conditional on the continuation of livestock farming

- Reactions to a condition to continue livestock farming brought a similar reaction, namely that most would simply continue as before (Spain, Greece and Italy), although in Scotland, where sheep rearing predominated, and in the lowland dairying systems (France and Germany) there was an indication that farmers would lower the intensity of production. This probably reflected the incentive provided by the current support system to maximise stock numbers or output respectively. The lowering of the market price of milk (and in turn cheese) brought a strong negative reaction form the Italian farmers, partly a reflection of their pride in producing a high quality and high value product.

- Environmental effect: neutral to good.

Reactions to concept of the Forage Area Payment Scheme (FAPS)

- Virtually all of the farmers interviewed found the idea acceptable, or even attractive, where it would result in approximate income neutrality. Indeed, it became clear that they regarded it as giving them greater flexibility in their decisions about livestock numbers and type. In Scotland, Spain and France this new flexibility would lead to reductions in livestock or abandonment of current plans to increase livestock numbers. In Italy FAPs would not change the (currently environmentally benign) mountain dairying and in Germany the farmers on the least productive land reacted most positively. The notable exception was Greece, where the farmers were all opposed to a change to area payments. This was due partly to the way in which the FAPS was presented by the consultant, which resulted in large reductions in subsidy for each of the farms; and partly to the particular farming conditions, in which holdings have only a very small forage area, relying on purchased feeds and common grazings for additional sources of forage.

- Environmental effect: good.

Reactions to additional tiers of payments for environmental management

- There were some rather interesting regional differences in farmers' reactions to the idea of additional tiers of payments being built upon the basic FAPS. At Tier 2, in five of the study areas, over half of the farmers said they would enter. In France all would enter and in Italy 5 out of 6 would enter (although with some reluctance). At an hypothetical Tier 3, and without discussing in great detail the specific management operations or the payment rates, again over half of the farmers in Germany, Scotland, Spain and France would enter. In Italy, Tier 3 was considered a step too far and all of the farmers said they would cease farming. To some extent this reaction may have reflected the way the question was put (it seems as if they regarded Tiers 2 and 3 as being compulsory) but it may also reflect the attitude of Scottish farmers in that they wanted to remain farmers and not become some sort of park-keeper or warden. There may be an important lesson to learn in that the farmers in low intensity systems (such as Spain, Italy and Scotland) linked their activities strongly with their life-style and found it difficult to accept management practices which ran counter to this - for instance leaving alpine pastures for chamois to graze in Italy or leaving grass pastures for wild geese to graze in Scotland. Some of the Spanish farmers commented that they would only accept "reasonable" restrictions on their grazing practices (and with full compensation).

- Environmental effect: good.

Conclusions drawn from the case studies

Conclusion 1

A move away from headage payments to a more production neutral form of support tends to favour the environment by removing part of the current pressure for high stocking levels. It is a goal worth pursuing energetically.

Conclusion 2

Forage area payments are acceptable to farmers in principle, as long as they are implemented so that farmers do not stand to lose significant amounts of subsidy.

Conclusion 3

A system of forage area payment forms a good basis on which to build successive tiers of environmental management.

Conclusion 4

Because of regional differences in the environmental characteristics of agricultural land, forage area payments provide a useful focus for the development of a more regionally targeted livestock support policy, linking payments directly to the environmental value of land.

Conclusion 5

The application of a forage area payment system would present certain practical difficulties, such as defining and monitoring different forage types, and specific, often local, problems which would tend

to result in big "winners" or big "losers" (e.g. common grazing land, transhumance, grazing cereal stubble and hunting estates). There are also a number of administrative issues, such as setting payment rates and defining eligibility for payments. These problems probably are not insurmountable but require further investigation.

Discussion and conclusions

This chapter addresses three areas:

- it draws conclusions on the environmental effects of current CAP livestock policy, based on our modelling work and case studies;
- it sets out a number of key principles which we believe should be taken into account when revising livestock policy, whether or not the new policy bears much resemblance to the specific proposals presented in this report;
- it presents our main conclusions about the potential effectiveness and practicality of the FAPS system, as tested by the case studies.

The environmental effects of CAP livestock support policies

Beef cattle, sheep and goats

General effects of support

The different forms of grassland livestock systems can be viewed on two main axes (see 15). One represents grazing pressure, with a continuum from no grazing at all (abandonment) through light grazing pressure, to medium and then heavy (overgrazing). Grazing pressure is obviously correlated to stocking rate, though what constitutes "light" or "heavy" grazing pressure depends as much on the carrying capacity of the land as on the stocking rate.

The other axis represents the mix of livestock, ranging from mixed grazing, to single-species grazing systems.

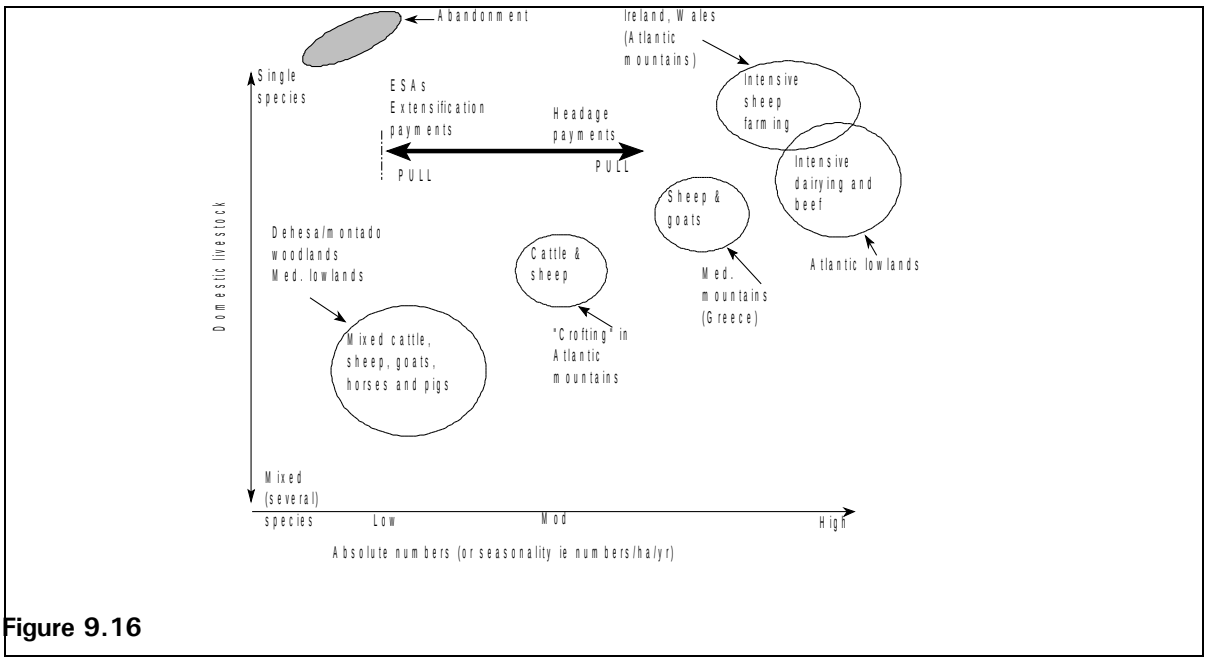

Figure 9.16

Where on this graph the environmental optimum lies depends very much on which particular environmental features are most highly valued: there will be different optima for orchids, ground-nesting birds and grass-eating geese, for example, but for the preservation of most anthropogenic landscapes and habitats it is necessary to avoid the extremes of abandonment and severe overgrazing, and there are often additional environmental benefits to be gained from promoting mixed grazing.

Price support and headage payments have the same effect everywhere in the EU: they encourage farmers to keep more livestock than they otherwise would, increasing grazing pressure and moving to the right on the diagram, unless limited by some specific policy restriction.

Current support policies also tend to have favoured particular species in an area; in the UK the large increases in hill livestock have usually been made up of sheep, whereas in the Spanish dehesas most of the increase has come from cattle. This may reflect the relative profitability of the two species in each area, taking account of the headage payments, but perhaps as important are the labour requirements for local livestock systems: headage payments encourage an increase in livestock numbers, and farmers then seek the easiest way to achieve this. Whatever the causal relationships, it does appear that when livestock support induces an increase in stock numbers, it often favours one species more than the others, with a consequent move to less mixed grazing systems.

Returning to overall stocking rates, CAP support encourages the same shift to the right in all cases, irrespective of starting point or local environmental conditions. Thus it would be far too simplistic to label its environmental effects as generally "good" or "bad". The true effects depend on the local environmental conditions and threats:

Areas at risk of abandonment or undergrazing

Abandonment of grazing lands, with its social and environmental consequences, is a potential risk in several of the areas currently dominated by beef cattle, sheep or goats, for example, parts of the Atlantic mountains, Mediterranean mountains and Mediterranean lowlands zones. Current support policies help to resist this (moving farmers closer towards the "environmental optimum" on the graph), but they are not always sufficient to resist the stronger economic and social trends towards abandonment or conversion of the land for forestry or shooting estates.

One of the limitations of headage payments and price support, from an environmental perspective, is that they relate to the animal and not to the land. Thus, even though farmers in an area may seek to maintain or increase livestock numbers in response to CAP support, they will still try to do so where it is easiest or most profitable, sometimes leading to the phenomenon of localised overgrazing in relatively close proximity to abandoned land. This problem can occur over quite wide areas where transhumance is involved, with farmers intensifying production on their home ground and abandoning the traditional distant pasture.

Where abandonment is a serious problem, there are usually powerful social and economic forces at work quite apart from agriculture, with modern expectations for services and standard of living being very different from those when the traditional livestock systems were developed. Trying to resist these trends through livestock policy alone may be rather like trying to push water uphill, and new forms of carefully targeted socio-environmental policies may be required.

Areas at risk of overgrazing

In other parts of the EU, where land is more productive and social conditions more favourable, general abandonment is not a serious risk at all (though localised abandonment of inaccessible or unproductive grazing land occurs even in the most productive regions, such as marshes and escarpments in the Atlantic Lowlands[20]). Even at world market prices, most of the land would continue to be farmed, often at or close to the "environmental optimum". Here the effects of CAP support are to move away from this desirable point towards overgrazing. Examples can be found throughout the EU, from Ireland to Greece, with overgrazing being particularly common in accessible or highly populated areas.

Headage and stocking rate limits are designed to combat this (and to limit budgetary expenditure) but in general they are far too blunt instruments to be particularly effective. Only one agro-ecological zone - the Atlantic mountains - approaches the 1.4 LU/ha limit for "extensification" and in the most environmentally sensitive and valuable areas, the land's carrying capacity may be many times lower than this. There are two elements to this problem:

- The first is the natural variability of land, even within one farm. A traditional British hill farm comprises an area of valley bottom or "in-bye" land which is relatively productive, combined with a large area of much less productive hill land. Similar situations occur in transhumant systems or in, for example, the Spanish dehesa, with patches of land where stock have been folded at night for centuries being many times more productive than the surrounding land. Any policy instruments which employ stocking rates must take account of the carrying capacity of the land as well as the number and type of stock.
- The second is that the combination of price/headage support and stocking rate limits is very rigid: it encourages farmers to produce at one particular level of intensity, with little regard to the true carrying capacity of the land. Thus there will be farmers all over the EU who are stocking at exactly 1.4 LU/ha in order to qualify for the extensification premium, regardless of whether there land should really be stocked at much lower or higher rates for optimum environmental benefits. It would be far better to have a system which had little or no influence on stocking rates and allowed farmers to decide what was appropriate for their land, as they did in the past when today's landscapes were being developed. Environmental measures could then concentrate on the relatively limited number of cases where this policy resulted in undesirable consequences.

Lowland intensive beef

Intensive beef production in the atlantic and continental lowlands has environmental effects and a policy response fairly similar to that of dairy production, as discussed below.

[20] See Baldock, D; Beaufoy, G; Brouwer, F and Godeschalk, F (1996) *Earning at the margins: abandonment or redeployment of agricultural land in Europe*. IEEP, London and LEI-DLO, The Hague.

Dairy

General effects of CAP policies

There are no headage payments in the dairy sector, but price support has the same effect as in the beef and sheep sectors: it encourages intensification and higher stocking rates (movement towards the right of the diagram). However, milk quotas, which have been reduced several times since their introduction in 1984, do have a significant effect on production systems, pulling production back towards the left (deintensifying). In those countries where quota is tradeable, the price of milk minus the quota rental price is not so far removed from the probable world milk price, suggesting that the two policy instruments of price support and quotas have largely cancelled each other out in terms of the overall issue of intensity of production, i.e. the CAP does not generally have a major effect on the environmental effects of dairy systems, one way or the other.

On the other hand, milk quotas can have powerful structural effects, resisting the movement of production from less efficient to more efficient farms and regions where quotas are not tradeable or national boundaries would have to be crossed, and even encouraging this "rationalisation" where quota is tradeable, by providing a "golden handshake" to the farmer who decides to give up dairying. These structural effects are really only of great environmental importance for that small proportion of dairy production which takes place in mountain areas where production is marginal and environmentally sensitive - a topic to which we return below.

Environmental effects of lowland dairy (and beef) production

On lowland grasslands the technical and economic relationships in dairy production (e.g. high capital and labour inputs, steep response to nitrogen fertiliser, need to spread "maintenance" energy requirements over high milk production) are such that wherever it is worthwhile keeping dairy cattle, it will be worth farming fairly intensively. Even quite major changes in the effective price of milk would have relatively little effect on production system.

Furthermore, most dairy pastures already have levels of inherent or residual fertility which make them of limited floral interest and so reducing stocking rates would not generally bring significant benefits in this area, though a move away from the highest stocking rates would benefit ground nesting birds in some circumstances.

Ground-water pollution by nitrates *is* strongly connected to the intensity of dairy production, but this is a localised problem highly dependent on soil type, rainfall and water catchment systems, which is probably better addressed through targeted local schemes, following the "Polluter Pays Principle". Perhaps more widespread is the problem of pollution of surface water from run-off and from spillages of slurry and silage effluent. This risk increases wherever there are high concentrations of livestock, but the particular hazard posed by dairy farms was recognised in the UK when a government scheme of free pollution advice concentrated its efforts on dairying areas, because experience showed that these were the most common causes of pollution.

Although the support systems for beef production are different, intensive finishing systems based on heavily fertilised pastures, grass and maize silage, are very similar to intensive dairy systems and the same points hold: if they are financially worth doing at all they are worth doing intensively, and anything of great floral interest probably disappeared from the pastures long ago, if it ever existed.

Thus, there are relatively limited opportunities to enhance the environmental benefits of lowland dairy and intensive beef systems through simple alterations to the payment levels or stocking rate, mainstream CAP mechanisms of price and headage support; the benefits will come from more targeted approaches addressing woodlands, hedgerows, headlands etc, specific areas of high wildlife or landscape value, and particular criteria for the management practices. However, we also note that there would be few environmental ill-effects if CAP price support were withdrawn.

Special cases in lowland beef and dairy production

Throughout the "sea" of intensive lowland livestock production, there still exist some "islands" of high environmental or landscape value, either because of their lower inherent fertility (e.g. chalk downland) or because they have not yet been "improved" (e.g. undrained marshes). Because of their lower fertility, these area are more likely to be being used for sheep, beef cattle or dairy followers than for milking dairy cattle, but they may exist in the same areas or even on the same farms.

These areas *are* environmentally sensitive to any intensification and so any pull to the right of current CAP policies does pose a threat. However, as these are limited areas, often requiring quite specific management, they are probably best addressed through specific policies such as ESAs, rather than through mainstream CAP support. The only important interaction here is that where CAP policies do "pull to the right", i.e. encourage intensification, environmental management schemes will have to pay that much more in order to encourage participation and compliance.

Mountain dairying

The situation in mountainous, particularly Alpine, regions is completely different. Here abandonment is a genuine problem and one which price support has not always been able to prevent. For example, there has been a steady trend towards the abandonment of traditional dairy systems in the Italian Alpeggio despite the high level of dairy price support and a number of local schemes. As with beef, sheep and goat systems in areas susceptible to abandonment, there are bigger social and economic forces at work.

Abandonment in these areas often does lead to significant and undesirable environmental effects, though in many cases other livestock systems, such as beef suckler cows, could deliver most or all of the environmental benefits at lower cost (and this change has in fact already occurred in the Pyrenees and the Scottish Highlands). The approach for these areas should perhaps be to forget the question *"How do we preserve dairying in these areas?"* and instead to ask *"Why are people abandoning these areas?"*, *"What environmental features do we wish to preserve?"*, *"What livestock (or wildlife) systems will achieve this?"* and *"What conditions and incentives would encourage farmers to operate these systems?"*.

Attempts to justify the whole EU dairy support policy on the basis of the 6-7% of dairy cows which do play an important environmental role seem to us rather far-fetched, and some more targeted form of support must be more efficient.

Key principles for the better integration of environmental concerns

Stemming from the above analysis of current CAP livestock support, we propose three key principles which should form part of any new system of livestock support:

- zonation;
- production-neutral support;
- adjustment for grassland quality.

There is a fourth principle which we have not developed here, as it is outside the scope of this study, but which we would like to flag up:

- Approximation of livestock and arable support payments.

Zonation

Issues and alternative approaches to zoning have been discussed in some length in Chapter 4; in this section we summarise them and pick out the key points which should apply to any zoning exercise, whether or not it uses the approach followed in this study.

What do we mean by zoning?

By zoning we mean sub-dividing the EU into a number of distinct geographical areas, in each of which:

- there are defined objectives and quantifiable targets which differ from those of neighbouring zones (within an overall policy structure);
- different policies or policy variants apply, e.g. different payment rates, stocking rates limits or even completely different policy instruments, appropriate to local conditions and policy objectives.

Why is it necessary?

- Overall social and economic conditions differ between regions (zones)

thus:

- policy objectives and priorities should be different;

also:

- Livestock systems and farm structures differ between regions

and thus:

- farmers' responses to policy will be different;

furthermore:

- Environmental conditions and problems differ between regions

and thus overall:

- The environmental effects of livestock policy will be different.

In summary, zonation is necessary in order to develop and implement policies which effectively and efficiently meet local objectives.

What principles should be followed when drawing up zones?

- Zone boundaries are required wherever:
  - agricultural systems and structures change significantly;
  - environmental features and problems change significantly.
- They are also desirable wherever:
  - wider social and economic conditions change significantly.

In setting these boundaries, it is important to:

- recognise the trade-off between maximum policy effectiveness and administrative practicality, and seek the right balance in each case;
- use existing administrative or policy-related boundaries wherever possible;
- respect Member State boundaries;
- employ a "zoning hierarchy" which sets clear divisions at a higher level and allows Member States to develop sub-divisions, following general guidelines, in response to their own priorities and administrative resources.

This whole approach is in line with the EU principle of subsidiarity.

Production-neutral support

In chapter 5 we developed our ideas for the Forage Area Payments System (FAPS), central to which are production-neutral area payments. This section summarises the logic leading to that system, mentions a number of possible alternative approaches, and sets out the advantages and disadvantages of headage and area payments, for easy comparison.

Why is it necessary to make support production-neutral?

- All of our analysis and case studies have shown that the current systems of paying support per head and per kilogram of livestock product distort production systems, encouraging farmers to intensify production and/or move to arbitrary stocking rate limits.
- If this distortion is removed, the sustainable carrying capacity of the land will assume greater relative importance amongst the factors which the farmer takes into account when seeking his economically optimum point of production; in many cases this in itself will encourage a move towards more environmentally beneficial production systems.
- Removal of this distortion will also increase the relative importance of market demand, allowing the farmer to pay more importance to quality and other characteristics, thus aiding the balance of the markets.

- Reducing the incentive to keep as many animals or produce as much output as possible will make production systems more flexible and decrease the economic cost of adapting systems in pursuit of specific environmental goals, i.e. it will decrease the level of incentives required for participation in environmental management schemes.
- Decoupling support from production would make CAP support policies much more acceptable to other parties in the next GATT round.

How can this be achieved?

Several variations are possible, including:

- Removing all basic entitlement to agricultural support and only applying support where specific problems arise.
- Paying support based on previous levels of production or receipt of support payments but without reference to current production, e.g. support "bonds" or the "compensation cheque" system explored in the case studies.
- Paying support per person (farmer and/or worker), i.e. income support.
- Paying support per hectares, i.e. area payments.

Of these different options, the one which seems most practical and politically realistic at the moment is that of area payments.

What are the advantages and disadvantages of area payments?

	Headage Payments	Area Payments
ADVANTAGES	❍ Established system: - administratively - farmers are used to it ❍ Gives a measure of control over livestock numbers	❍ Fits into the IACS system ❍ Already applied to arable crops ❍ Production independent (depending on how applied) ❍ Decoupled in GATT terms (depending on how applied) ❍ More closely addresses environmental concerns by targeting land use, rather than livestock ❍ Offers potential for a unified and consistent agricultural support system
DISADVANTAGES	❍ Is related to production, not decoupled ❍ Encourages intensification; ❍ Any attempts to counter intensification with stocking rate limits, extensification payments etc. contradict the overall "pull" of the support system and therefore will be liable to fraud, abuse or manipulation ❍ Farmers tend to reduce stock to the exact level specified, rather than to a level appropriate to their local conditions ❍ Require the counting of livestock, which are mobile, and therefore fraud is a possibility	❍ Is a fundamentally different approach to support, not linked to production ❍ Not currently used for livestock support ❍ Costs of setting up a new system and developing administrative mechanisms which work ❍ Transition will have winners and losers

Adjustment for grassland productivity

The FAPS system, developed in chapter 5 and tested in the case studies (see chapter 6), includes a system of "Adjusted Forage Hectares". This sections summarises and generalises the principles involved, as well as proposing how the Commission could develop this idea into a valuable part of practical policy.

Why adjust support systems for the quality of forage land?

- ❍ The productivity of a particular kind of forage land, e.g. permanent pasture or rough grazing, varies considerably between regions (zones).
- ❍ Even within one zone, different farms can have very different proportions of the different kinds of forage land, e.g. varying proportions of permanent pasture, rough grazing and moorland.

This means that:

- ❍ The current levels of CAP support (headage payments and price support) expressed *per hectare* vary considerably between zones and between farms within zones.

- Environmentally desirable stocking rates also vary considerably between zones and between farms within zones.

Therefore:

- Any attempt to switch CAP support to an area payments basis must take some account of forage productivity in order to avoid creating big winners and losers from the changeover.
- Any environmental policies which monitor stocking rates or set stocking rate limits must take account of the variations in forage type.

We propose that a system of "Adjusted Forage Hectares" or "Forage Units" should be developed to allow direct comparison between different types of forage land. This system should be used in any system of forage area payments and wherever stocking rate targets or limits are set. It should be developed by the Commission and applied in policy just as routinely as Livestock Units are used now. Thus the standard way of quoting [adjusted] stocking rates will become Livestock Units per Forage Unit: LU/FU.

How should Forage Units be defined?

The need and objective is to establish coefficients for the productivity or carrying capacity of different kinds of forage land. The area of each kind of land, in hectares, can then be multiplied by this coefficient to give a figure which reflects the total carrying capacity. The results for each land type can be summed together to give the overall carrying capacity of the farm or region[21].

In calculating these coefficients, the appropriate measure to use would be Utilisable Metabolisable Energy (UME), which reflects the amount of energy which the livestock actually extract from the forage, whether as hay, silage or direct grazing. It is a standard measure in animal production, and there are established procedures for calculating it[22].

It is the relative magnitude of the different coefficients which is important, more than the particular units employed, but we can suggest two different approaches:

- Use of "Adjusted Forage Hectares" to relate everything to the productivity of permanent pasture, which is assigned a value of 1.00 (as used for our case studies). This has the advantage of relating to something very obvious[23], but the disadvantage of varying between regions: a hectare of unirrigated permanent pasture in southern Greece will not produce the same amount of forage as a hectare in northern France.
- Definition of a "Forage Unit" as:

[21] This is a completely analogous procedure to that used in calculating Livestock Units (LU).

[22] This would again mirror the Livestock Units system, which is based on the Metabolisable Energy requirements of different kinds of livestock.

[23] Similar to the way in which the Livestock Units system assigns the value of 1.00 to a dairy cow.

"That area of forage land which, under normal sustainable agricultural production, will support one Livestock Unit"

This has the advantages of tying up with the Livestock Units system and of standardisation across all zones; in addition, the average adjusted stocking rate anywhere in the EU should be somewhere around 1.

How can they be calculated in practice?
The starting point should be a literature review and discussions to see what work has already been done in this field, it may well be that an existing system could be adopted with little or no adaptation.

Failing this, the two main approaches are experimental and survey-based:

- The experimental approach would use the results of grassland trials to estimate UME in different zones; there is already a vast amount of work in this area for managed grasslands, though the forage output from trials almost always exceeds that of commercial farms, and original research might be required to cover some of the less intensive categories of land.
- The survey approach would consider a number of farms in an area and record for each of them: the area of each type of forage land; the number and type of stock carried; the livestock output of meat and milk; the additional feed brought onto the farm and any sold off it. From this the overall UME could be calculated for each farm and a regression of UME against forage areas would estimate the average UME output per hectare for each forage type. This approach might be more appropriate for semi-natural pastures.

What are the main potential problems?
There is an obvious danger here of creating a completely circular argument: if you calculated forage productivity just from the existing stocking rates and livestock output, without considering whether over- or under-grazing currently occur, then any policy based on this you would tend to perpetuate the *status quo*. Thus some concept of "normal" or "sustainable" management has to be taken into account.

For unfertilised semi-natural pastures this may not be too much of a problem, and the survey basis of calculation could use a sample of farms on which pasture quality is reasonably constant, neither being degraded through over-grazing nor steadily giving way to scrub.

For more managed pastures the problem is greater, as their productivity can very considerably according to the amount of fertiliser applied and the cutting/grazing system[24]. We would suggest that the aim should be to measure an agriculturally optimum level of output and not to seek any environmental optimum at this stage; that should be considered separately under the environmental

[24] The same problem is inherent in the Livestock Units system, with the milk output, and hence Metabolisable Energy requirement, of dairy cows varying substantially between regions and between farms.

aspects of policy, otherwise the system will not serve its purpose of converting support per head to support per hectare. One approach would be to refer to the recommendations of the local agricultural advisory service and to estimate the productivity of permanent pasture, rotational grass etc. managed according to these guidelines.

Another set of potential problems relate to how the Forage Units system is applied for policy. There could be a risk of over-simplifying and simply taking the adjusted stocking rate of 1.00 as some kind of norm, with penalties for farmers who exceeded it or "extensification" payments for those who stocked below this level. Such an approach would not work well.

On intensive pastures some farmers will produce 150% or more of the average UME output through good pasture and livestock management; in many cases they will be doing so without any particular environmental ill-effects (leaving aside the possible localised problem of nitrate pollution). Conversely, encouraging farmers to reduce their adjusted stocking rates below 1.00 would bring rather few environmental benefits (see the discussion of the environmental effects of CAP dairy policy, above).

On the other hand, for sensitive semi-natural pastures and "pockets" of high nature conservation interest, it may be environmentally desirable to reduce stocking considerably below the agricultural optimum.

The system of Forage Units is proposed as a tool for developing more effective policy, and not as any substitute for the basic approach of defining zones, identifying the environmental and other objectives within them, and developing appropriate targeted policies.

A final problem to watch out for is creating an incentive for farmers to "improve" grassland from one category to another in order to increase the number of livestock units which they are able to carry and still qualify for some particular kind of aid. In some cases such pasture conversion would be environmentally neutral, or even beneficial, but often it would be detrimental and should not be artificially encouraged; this is again a question of designing the policy carefully to meet the local situation and objectives. This could probably be tackled by setting individual farm base areas, as for the Arable Area Payments Scheme, with farmers only allowed to "upgrade" their land to a more intensive category and obtain the higher payment where there is a good environmental reason for encouraging this[25].

Are there any exceptions where the Forage Units system would not apply?
The most obvious exception is that of setting stocking rate to protect ground-nesting birds from trampling by livestock. Here it is the number of legs per unit area which is of greatest importance, without much consideration of either the type of livestock or the productivity of the grassland, i.e.

[25] For example, in the Scottish Hebrides case study area there was clearly a need for more land to enter the more intensive categories, but in other cases this could lead to very damaging operations, such as drainage of marshes. Again, the need is to fine-tune the scheme to local circumstances.

targets should be set in animals per hectare, perhaps adjusted for the different trampling habits of different types of stock.

Adjusted stocking rate might perhaps be defined as an additional secondary variable, simply for its effect on sward height (which gives the birds their shelter), though a direct sward height target would be preferable.

Approximation of livestock and arable support payments

This study has addressed its brief of considering the environmental effects of *livestock* support policies. A major issue has been the way in which current support distorts production systems, generally encouraging intensification and often favouring one kind of livestock more than another, both with potentially major environmental consequences. But another, arguably even more important, effect of the CAP is to influence whether a particular piece of land is used for livestock at all, or whether it is converted to arable cropping. There are several examples of major environmental stemming from such conversion, e.g. the drainage of marshes of considerable ornithological value, or soil erosion following the ploughing-up of thin, traditionally pastoral, soils. Indeed, one of the elements within the 2078/92 schemes is payment to encourage the reversion of arable land to pasture.

It was outside the scope of this study to investigate these areas, but it has often been argued that CAP arable support policy has proved a powerful stimulus for the ploughing-up of particular areas of pasture. An important element of our proposals is that livestock support should be as production-neutral as possible, not distorting production or encouraging stocking rates to move in any particular direction. We would like to generalise this and propose that CAP support overall should be production-neutral, favouring neither livestock nor arable production on any particular piece of land. In many cases this would encourage farmers to return land to its more traditional uses, which generated the landscapes and habitats which we now value (though there will be exceptions where modern technology and economics have fundamentally shifted the balance).

This objective could be achieved through the medium of area payments, with a particular piece of land receiving the same area payment, irrespective of its use. Such an approach would have the added advantage in the next GATT round of being truly production-independent and therefore much more acceptable than current support systems.

Some issues to consider

Introducing this approach would require a gradual "approximation", or bringing together, of arable and livestock support payments. Because current support levels all have very different origins, the current rates of support per hectare can very considerably and so there would, in some cases, be considerable gaps to bridge. These include the general gap between arable and livestock support rates, and between different commodities within the arable and livestock regimes.

For example, the Arable Area Payment Scheme rates were derived from previous levels of price support, multiplied by average yields per hectare; this has led to oilseed payments approximately twice the size of those give for cereals, with protein crops somewhere in the middle. For lowland livestock

support (including price support), by far the highest rates are for dairy cows, followed by beef cattle and then sheep.

Finally, how would this relate to the proposed Forage Area Payments System? As presented here, the FAPS system would offer different levels of payment for different *actual* forage crops grown, and would thus not be seen as totally production-neutral in these terms. A further development would be required, to base payments on some inherent characteristics or *potential productivity* of the land, to allow the final step of completely decoupling support from production.

Issues raised by the proposed FAPS system

The case studies, and all the discussions involved in their preparation, execution and analysis, identified a number of issues and potential problem areas which would need to be addressed before this system, or a variant of it, was put into operation. It was not our role to produce a finished system which could be applied "straight off the shelf" but we have attempted to take a realistic look at the potential problems and to suggest how they might be resolved.

The issues raised fall into the following categories:

- administrative issues;
- environmental issues;
- distributional issues;
- specific issues of land tenure.

Two final issues - *"Are there better alternatives?"* and *"How does this all relate to CAP reform?"* -will be addressed in the last chapter of this report.

Administrative issues

Once established, the FAPS system would be relatively simple to administer, particularly as it deals with the relatively constant and measurable factor of land. However, initial development and implementation of the system would require particular attention to the three areas of defining and measuring forage types, of setting payment rates, and of actually managing the change-over from headage to area payments.

Defining and measuring forage types

Issue

- How do you define and measure "rough grazing", "permanent pasture", "scrub" etc?
- How do you deal with wide variations in productivity of apparently similar pasture types?

Response

Some aspects of this have been addressed above, under the section on developing a "Forage Units" system. In addition, we would propose that:

- administrators start by looking at the categories already in use for local census and IACS forms, and try to follow these as far as possible;

- where there are wide variations in forage productivity within existing categories, demonstrable by sustainable stocking rates significantly higher than the average for the forage type in that zone, it might be necessary to define new sub-categories (e.g. "improved rough grazing") and to mark these areas on the farm maps.

Setting payment rates

Issue

- What level of headage payment receipts should be used in setting area payments, given that ewe premium varies significantly from year to year in response to market prices?

Response

- Use an average of e.g. the last three years.

Issue

- What level should the Tier 1 FAPS payment be set at: e.g. 100%, 80% or less of current average support per hectare?
- What differential should be paid between Tiers 1 & 2, and Tiers 2 & 3?

Response

- These questions are linked: if the scheme is to remain within the current budget, then additional payments for Tiers 2 and 3 have to be funded by savings on Tier 1.
- It is also a political question, related to how much emphasis should be given to encouraging more environmentally-friendly farming, and how much emphasis should be given to compensating farmers for the loss of headage payments. A phased approach might start off with quite a small differential between Tiers 1 & 2, resulting in relatively low uptake of Tier 2 but almost complete compensation for headage payments withdrawn. Over time the Tier 1 rate could be reduced and more funds made available to attract farmers into the higher Tiers; those farmers who chose to continue farming intensively would see a gradual reduction in their level of support.
- It is very important that the differentials between the Tiers should reflect the payment needed to induce farmers to enter the higher Tiers. A practical approach would be to set targets for the amount of land entered into each Tier of the scheme, and vary the payment rates to suit.
- If it was decided to eventually phase out Tier 1 and pay only for different levels of environmental management (Tiers 2 & 3), there is no reason to expect that the total FAPS payments for Tiers 2 and 3 should add up to the current level of headage payments. In fact, it would be a quite remarkable coincidence if the level of incentive needed to induce farmers into these environmental management Tiers did add up to the same as current headage payments - GATT partners might suspect that the environmental tiers were merely being used as an excuse to continue subsidising farmers.

We return to these important questions in our final chapter as part of our recommendations for how FAPS should be implemented under alternative overall policy scenarios.

Introducing a new system

Issue

- Current livestock support systems are based on headage payments; how much effort would be involved in a switch to area payments?

Response

- The AAPS and IACS system have already introduced area-based payments, requiring a whole-farm map. It ought to be simpler to fund everything from this one system than to pay cropping support on area and livestock support on headage.
- In addition, it is easier in principle to monitor area payments than headage payments, as land does not move. However, the stocking rate limits in Tiers 2 & 3 would still require recording of livestock numbers for those farms who enter these Tiers.
- There would obviously be an administrative cost in making the change-over and developing the new system, but that is implicit in any kind of reform.

Environmental issues

The whole objective of the proposed FAPS system is to improve the environmental effects of CAP livestock support and we are convinced that it could indeed achieve this aim. However, like any policy, it would require care in implementation to avoid undesirable effects in some circumstances. The main danger which we can see is that of inadvertently creating an incentive for farmers to convert traditional pastures to more intensive forage types.

Pasture improvement to collect higher payment rates

Issue

- Would farmers be allowed to "improve" e.g. rough grazing to collect the higher payment rates for permanent or rotational grassland?

Response

The appropriate response should depend on the environmental issues for the area:

- Where more intensive land uses are not desirable, then the farmer should be limited to a base area for claiming at each level. He might be allowed to move to less intensive land uses (and receive the payment rates applicable to them, for whichever tier he entered), but not to move to more intensive uses.
- Where it would be desirable to increase the area of certain intensive land uses (e.g. in the Scottish hebrides where it would be beneficial to have more rotational pasture and cropping), then farmers could be allowed to move into and claim for these land uses, up to some agreed ceiling (e.g. percentage of farm area).
- If, as part of a future GATT agreement, it was the aim to create an entirely production-neutral support system, then land would have to be assigned a category based on historical, rather than current, cropping.

Potential distributional problems

With any switch from one basis of support to another, some farmers are going to be better off and others worse off; the Arable Area Payments System, for example, benefited farmers with below-average yields for their region, and penalised those with higher yields. Such gains and losses are an inevitable and accepted part of policy change. However, if these effects were too extreme then they could prejudice the political acceptability of the whole policy, with big winners being the subject of sensational media coverage and big losers raising strong opposition through their farmers' unions.

Therefore we have attempted to identify the main areas in which big "winners" and "losers" could occur, and to suggest possible responses.

Big winners

Farmers might benefit significantly from the switch to forage area payments where:

Issue

- They have hunting estates which currently carry relatively few domestic livestock on large areas.

Response

Either:

- just accept that there will be some winners (if the overall cost is not too great);

or:

- create an additional forage category of "hunting land" which carries little or no area payment.

Issue

- They are already extensively stocked, perhaps as a deliberate attempt to benefit the environment.

Response

- Accept that, just for once, low-intensity farmers get rewarded instead of penalised through the subsidy system (the press will be much more sympathetic to an "environmentally-friendly" farmer who benefits than to a "rich landowner" who receives a similar windfall).

Big losers

Farmers might lose significantly where:

Issue

- They depend heavily on common grazings or short-term lets.

Response

- See section 4 below.

Issue

- They are currently overstocked.

Response

- If they have been causing exceptional environmental damage, then it seems appropriate that a new "greener" CAP should reduce their subsidies.

Issue

- They currently carry, and can support, high stocking densities because of particular fertile areas of natural pasture.

Response

- See above section on defining and measuring forage quality.

Issue

- They have invested in ewe, suckler cow (or milk) quota, which will cease to have value when payments swap to an area basis.

Response

- This is a general problem of creating systems of quotas or premium rights: they come to constitute a significant capital asset, which people are reluctant to give up, and thus, any change become difficult. The solution usually proposed is to phase the changes in gradually or with advance warning thus allowing those farmers who have recently invested some time in which to recoup a return on their investment.

- Farmers whose systems required additional quota will usually have land in the more intensive categories, which would attract higher Tier 1 payment rates. Thus, they would not tend to suffer an income loss, though they would see the disappearance of a capital asset.

Specific issues of land tenure

This is really a specific, but very important, kind of distributional issue: how to allocate area payments in a way which effectively compensates farmers for the headage payments withdrawn, when they own the livestock but do not own the land? The three main variants of this issue are long-term lets, short-term lets and common grazings.

Long-term lets

Issue

- Who claims the area payments, the landlord or the tenant?

Response

- It must be the tenant, because:
  i) he is the one who manages the land and hence determines the type of forage "crop" and the number and type of stock on it;
  ii) he is the one who currently receives headage payments and so requires compensation;
  also:
  iii) he is the one who currently submits the IACS form.

Issue

- Won't the landlord just put up the rent by the amount of the area payment?

Response

- Rents *should* reflect the value of the land to the tenant, and hence the profitability of farming, thus headage payment (and price support) are already reflected in rents[26].
- Landlords might indeed try to increase rents, because the link between subsidies and land area would be much more explicit than at present.
- But if the current rent reflected the true economic value of the land, the tenant would find it very difficult to pay the new higher rents and still make a profit, as he would no longer receive headage payments. Thus landlords would have difficulty in actually letting the land and would have to bring the rents back down again.
- Where the FAPS system actually made the farmers better off, landlords might manage to capture some or all of this increased profit through higher rents.

Short-term lets

Issue

- Many farmers are dependent on grazing rented for just a few months at a time, e.g. in Spain, where the livestock keeper may own almost no land of his own, and graze animals on a variety of rented pastures and stubbles throughout the year (often supplemented by common grazing -see below). Who would claim area payments for this land?

Response

- One possible response is for the manager of the land to claim FAPS, as in other cases. This would remove direct payments to the livestock owner who currently receives the support. The reduced profitability of livestock production *should* be reflected in lower rents for seasonal grazing, and where rents are currently very high this could be sufficient to compensate the livestock owner.

[26] Ricardian Theory of Rents.

However, where overall annual rents are currently lower than the headage payments, no amount of rent reduction could fully compensate the livestock owner, and he would be worse off.

- In principle, there is no fundamental reason why there should not be "negative grazing rents": if a land manager wanted to claim FAPS on some area of land but did not himself own any livestock, he could actually pay farmer to put his livestock there in order to prevent the land reverting to scrub (and thus losing his entitlement to FAPS rough grazing payments) or in order to meet the stocking rate requirements for Tier 2 or 3. This would actually result in explicit payments to farmers for environmental management.
- An alternative approach would be some kind of nominal allocation of forage area (or "grazing rights") to livestock owners who depend heavily on short-term lets, based on their historical livestock numbers and/or livestock quota allocations. This could give full compensation but would have to be very carefully managed to avoid double counting.

Issue

- What about multiple uses of the land, e.g. grazing by different people at different times, or production of a cereal crop (for which area payments are given) followed by rented grazing of the stubbles?

Response

- For full-time pasture land (i.e. not growing any other crop), the FAPS payment could simply go to the land manager, who might then be forced to pass some of the benefit onto the graziers through reduced rents.
- For cropping land already in receipt of arable area payments, the simplest and logical response would be to say that support has already been given on that land and no more is due, though this would not give any form of compensation to the graziers from whom headage payments had been withdrawn. (A precedent exists in the current IACS system, where cereal stubbles cannot be used in the calculation of forage area for assessing extensification premium, on the grounds that that land has already been taken account of in assessing another form of CAP support).
- A system of nominal area allocations based on previous livestock numbers and/or quotas (as discussed above) would overcome this.

Possible research approaches

As these are particularly important issues, we would suggest research along the following lines:

- look at the extent to which existing CAP support becomes capitalised in land values and reflected in rents. Look particularly at how the introduction of AAPS affected land rents, as this is completely analogous;
- consider other areas where support is given at one point in a chain and expected to knock-on to other producers, e.g. the effects of end-price support on animal breeders, or the effects of SCP and AEP on lamb and calf prices.

Common grazings

Issue

- For many farmers, a significant part of their forage resource is common grazing land, where they do not manage any specific area of land on which to claim FAPS. How would they be compensated?
- A related question is how to encourage common grazings to enter Tiers 2 and 3, and to be managed appropriately?

Response

- Where there is already some form of grazings committee or local council which manages the land and allocates grazing rights to farmers, the committee could submit the FAPS claim and share the premium out to its members, in proportion to their grazing rights. Where the members so agreed, the committee could enter into higher tiers of the scheme, passing on the higher premiums to its members but also reducing the numbers of stock which each farmer was entitled to graze and ensuring that members met any other obligations, such as cattle:sheep ratios or grazing periods.
- In some cases, e.g. Scottish crofts, common grazing rights are allocated in proportion to the carrying capacity of the croft's own land (its arable, permanent grass and rotational pasture). In these cases it would be should be possible to increase the payments on the croft land, make no payments at all for the common, and arrive at the same distribution of premium payments.

Issue

- What about where the land is owned by e.g. the state or the church, who traditionally allow farmers to graze it but are not obliged to act in their interests. Wouldn't these land owners simply collect and retain the FAPS payments, without passing any of it on to the farmers who have lost their headage payments?

Response

- Where the land owner is the state or the local authority but farmers have some form of existing grazings rights, and the issue is important enough, the owner could be obliged to create some form of grazings committee to collect and allocate the FAPS payments, and to control the livestock numbers (which would probably bring better management into these areas). In practice, some form of grazing rights probably exist in most areas, even if they are not well managed or enforced; the sudden introduction of significant sums of FAPS payments would probably force old structures to be revived and revised.
- Where common grazings make up a relatively small proportion of the total and neither farmers nor land owners could be bothered to form these new structures, the premium rights might simply be waived.

- Where the landowner currently sell or auctions grazing licences to farmers, and thus it is the landowner rather than the grazier who currently enjoys the benefit of the grazing rights, then this owner could claim and retain the FAPS payments, though he would probably find that the amount he could charge for the grazing rights would go down dramatically (this is effectively the landlord and tenant case as discussed above).

Possible research approaches

This issues could be explored by research along the following lines:

- The allocation of common grazing rights varies considerable from area to area and often follows generations' old precedent. It would be necessary to look in detail at a number of different cases and discuss alterative approaches with farmers and the managers of common grazings.
- In implementing FAPS, Member States would have to submit proposals to deal with this issue, which might include national legislation on the establishment and operation of grazings committees, and on the allocation of premium payments.
- Look also at how common grazings are already handles under IACS, e.g. in calculating a farm's forage area when assessing its entitlement to extensification premium. The problem may already have been solved.
- Some problems may persist, such as where a livestock keeper uses a complex and highly variable mixture of roadside grazings, common land, woodland and stubbles, without any clearly defined rights. Some individual "awkward" cases should be selected and looked at in detail, after the basic issues have been resolved for a particular area.
- If the problems appear unsurmountable in some cases, Member States could be allowed to propose some form of compensation based on previous livestock numbers or premium rights (following a general framework laid down by the Commission), if they could demonstrate to the Commission that there was a local special case making area payments inappropriate.

Conclusions on the practicality of the FAPS system

It is clear that there are a number of issues which would require careful consideration, but this would apply to any major policy change. However, we are convinced that the FAPS system is a realistic proposition and that all of the major problems could be addressed adequately[27] if it was really decided to address the objective defined at the beginning of this study, i.e.

> *"To [introduce] new forms of livestock support policy which benefit the environment, maintain farm incomes and do not increase budgetary expenditure"*

If the policy debate has now moved on, then alternative solutions could be found. This issue is explored at the end of the next and final chapter.

[27] In practice there would be quite some considerable work involved in developing the new system and adapting it to the local conditions, but it is this kind of fine-tuning which will bring the real environmental benefits. It might be appropriate to allow the use of EU Structural Funds in Objective 1 areas for some of the research and administrative development work required.

Recommendations

One of the issues in this study was just how radical we should be in considering alternative forms of livestock support. There are two elements to this:

- *How much support should be given?* - with alternatives ranging from the view that farming should be supported indefinitely (in line with the history of the CAP to date), to the idea that farmers have no basic right to support, and payments should only be given for specific environmental goods produced.
- *How should this support be delivered?* - ranging from the *status quo*, through minor adjustments to payment rates and stocking rate limits, to replacing headage payments and ultimately removing price support.

At the beginning of the project we agreed that it would be too radical to consider major changes to the total level of support, and so we concentrated on the second element - finding imaginative alternatives to the current CAP mechanisms so as to benefit the environment whilst protecting farmers' incomes. Our "*Immediate recommendations*" therefore concentrate on this objective.

However, as the study progressed and the next GATT round grew steadily nearer, it became clear that people in many quarters *were* starting to question whether basic agricultural support should go on for ever, and the need emerged for ideas as to how environmental issues could be brought into a much more radical reform of the CAP. Therefore we have added a section on *"Next steps"* (see Section 10.2), suggesting how our ideas on Forage Area Payments could be developed further during a next stage of reform.

Immediate recommendations

For beef, sheep and goats

Overall approach

- Remove all headage payments and replace with Forage Area Payments.
- Remove all related limits and quotas.
- Introduce the Forage Area Payment Scheme (FAPS) with three tiers:
  - Tier 1 = compensation for headage payments withdrawn, without environmental constraints. At this Tier, payment rates would be directly proportional to the productivity of the forage land, in order to be fair, compensation for headage payments withdrawn (e.g. temporary grass would receive more than permanent grass, which would receive more than rough grazing);
  - Tier 2 = higher levels of payment for compliance with broad environmental constraints, such as maximum and minimum stocking rates and cattle:sheep ratios;
  - Tier 3 = environmental management schemes, generally leading on to the various levels of the existing ESA schemes.
- Establish "Agri-environmental Zones" with different payment levels and environmental conditions applying to the Tiers within each zone.

- The decision as to whether to start reducing price support is a separate one, and is not a central part of these recommendations.

Actual development of the scheme would proceed along the following lines:

Zones

The Commission should establish:

- Highest level zones
- Broad guidelines for defining sub-zones

Member States should:

- Propose sub-zones
- Define problems & objectives for each

Tiers

Commission should establish:

- Broad rules for what each tier should comprise

Member States should:

- Propose detailed environmental rules for each tier (with reference to existing schemes)

Implementation

Commission should develop:

- System of Forage Units
- Guidelines for defining & measuring forage types
- Guidelines on dealing with common land & other issues
- Ground rules about transferring land between categories

Member States should:

- Develop specific land categories which fit their circumstances & existing systems
- Procedures for dealing with local peculiarities of farm structure & ownership
- Detailed implementation rules

Finance

Commission should:

- Set basic Tier 1 rate
- Set payment bands & guidelines for Tiers 2 & 3
- Establish regional budgetary stabilisers, i.e. if total area payments were projected to exceed this sum, then all rates would be reduced proportionately to bring the total within budget

Member States should:

- Propose the rates for Tier 2 and each step of Tier 3 (with reference to existing schemes)

Guidelines to follow:

- Tier 1 payment should be *less* than full compensation for the average amount of headage payments withdrawn (perhaps 80%), as:
  - farmers will have an opportunity to reduce production, cut costs and so make their income loss rather less than the amount of headage payments withdrawn (principle of diminishing returns);
  - farmers will have the option of entering higher tiers and so increasing their receipts from the scheme;
  - it is necessary to make some savings on Tier 1 to fund the Tiers 2 & 3.
- The differential between successive tiers should be based on the level of incentive required in order to encourage uptake and not on any principle of compensation or reference to previous levels of support - this is covered by Tier 1. This payment rates could be set most economically by establishing target areas of land to enter each tier in each zone, and regularly adjusting the payment rates to maintain this level of uptake. Increasing the target uptake of higher tiers would be a political decision implying the allocation of more resources to environmental objectives, either from additional budgetary expenditure or by reducing Tier 1 payments and so reducing the level of support for "environmentally unfriendly" farmers.

Macro effects

- Applying the principle of regional budgetary stabilisers, total CAP expenditures on direct support will be unchanged, it will just be distributed as area payments rather than headage payments.
- Average subsidy payments to farmers will remain unchanged; those who remain in Tier 1 will lose slightly, those who enter higher tiers will gain.
- About this average there will be individual winners and losers, though this should be kept to a minimum by careful local implementation.
- Livestock numbers & production will fall, quite significantly. Removing headage payments is equivalent to a "price" drop of about 40% for both beef and sheep, and one might expect a similar drop in production, just from this effect.
- The tiers will also have their effects: farmers in areas of undergrazing may need to maintain livestock numbers to continue getting Tier 1 payments (i.e. to stop reversion of forage land to lower payment classes), and perhaps increase them to enter the higher tiers; farmers in areas of overgrazing will need to reduce numbers to enter higher tiers.
- The net effect will certainly be a decrease in numbers & output.
- For beef, this might wipe out the current 8% surplus production and so remove the need for intervention and export refunds, with potential savings of up to 1.9 becu/year (pre-BSE figures!).
- For sheep, where the EU is not self-sufficient, there will be no savings on market support, and it might be necessary to adapt the market management (e.g. increase the volume of levy-free imports) to avoid an increase in the EU market price.

Dairy

Overall approach

- Extend the full FAPS system to cover land used by dairy cows, with the same payment rates as beef or sheep pasture in the same zone.
- Specific details of higher tiers would have to consider the particular features & environmental effects of dairying.
- Reduce the milk support price to slightly *more* than offset the additional income provided to dairy farmers by the new area payments (same rationale as above, where Tier 1 should be slightly less than the amount of headage payments withdrawn - *might be in the order of a 10% price drop*).
- Maintain milk quotas unchanged.

Macro effects

- No major effects on dairy cow numbers or output: quotas would keep total production constant, whilst the need to qualify for area payments would keep livestock in the marginal areas (except for perhaps a small swing from dairy to suckler cows).
- Effects on dairy farm incomes would be as for beef and sheep: on average, neutral.
- Some savings in milk market support, as the smaller differential between EU and world prices would bring down the cost of export refunds.
- Increase in budgetary expenditure through paying the new direct support (area payments) to dairy farmers.
- According to our rough calculations, the savings on beef and dairy market support would *roughly* balance the extra cost of giving area payments to dairy farmers.
- However, if detailed costings showed that it would simply be too expensive to extend Forage Area Payments to dairy farmers, then dairying could be excluded from FAPS, and farmers with dairy cows as well as beef & sheep would have their forage area reduced by an estimated "dairy forage area" based on their milk quota (as used at present to exclude dairy cows from the calculations of forage area for the Extensification Premium).

Overall implications

Benefits

- The current incentives to intensify provided by CAP support would be reduced.
- This would be very significant for beef and sheep, with a 40% drop in the overall "price" and a two-thirds reduction in production-increasing CAP support.
- For dairy this would be rather less significant, perhaps a 10% price drop, representing a 15-40% reduction in the amount of production-increasing CAP support.
- This would go a long way to reducing farmers' resistance to entering higher environmental tiers, and would decrease the incentive to cheat in these schemes or in Nitrate Vulnerable Zones (particularly applicable to dairy farmers).

- Creation of an integrated system of agricultural-environmental support, with a continuum from basic CAP support through to ESAs, in place of the current contradiction between these two systems.
- Creation of a broadly applicable Tier 2, which would benefit the environment and yet allow farmers to regard themselves as farmers, not park keepers.

- Establishment of zones as a sound basis for defining objectives and targets, and further developing rural policy.
- Creation of a system of Forage Units with widespread applicability in livestock policy.

- Significant reduction in production-increasing & trade-distorting support (c.f. next GATT round).

Drawbacks

- Inevitable creation of some winners and losers.
- Danger of some undesirable side-effects, which would need to be monitored and addressed as the policy developed.
- Administrative and political work involved in making the changes.

General

- Broadly budgetary neutral.
- Broadly farm-income neutral.
- Would move to a more unified CAP support system, based on area payments for all crops and livestock.

Next steps

Political choices

There are at least three different ways of looking at where the CAP might go next, based on different political perspectives:

- Increase the environmental element.
- Increase the acceptability of CAP to GATT partners.
- Reduce the farmer's basic right to support & put more emphasis on the production of environmental, social and other "goods".

(N.B. the pressures for a fundamental change in agricultural support may well be fuelled by environmental concerns and GATT, but it would be possible to meet the objections from these two quarters whilst still continuing to support farmers indefinitely. If farmers' basic support is being eroded, that represents a much more fundamental change of direction)

There are several elements in common, but each viewpoint suggests a slightly different direction:

Environmental:

- Remove price support (to further reduce the incentive for intensification and the dis-incentive to enter environmental schemes)
- Increase the targets and incentives for uptake of the higher environmental tiers

GATT:

- Remove production-increasing support, leaving just:
  - support which is genuinely decoupled from production
  - payments which are genuinely for environmental goods produced
  - other forms of social support for rural areas

Fundamental change:

- Remove price support
- Remove all area payments which are not linked to the provision of specific environmental or social goods

Developing the ideas from the environmental perspective (our brief):

Removing price support

- All three political aims would be favoured by the removal of price support, either immediately or gradually.
- Higher rates of FAPS, supported if necessary by a Milk Variable Premium Scheme (MVPS) for dairy producers, could be used to provide compensation - full or partial, temporary or permanent - for price support withdrawn.
- In essence, the proposed Milk Variable Premium Scheme (MVPS) addresses the problem that the total level of support per hectare (price plus headage) to dairy farmers is much greater than that offered to beef or sheep producers in the same region. Thus dairy farmers would be given an additional direct payment, the MVPS:
  - payment rate based on the difference between the market milk price and a target milk price, reduced in line with the amount of support given through FAPS payments;
  - payment would be limited to the farm's milk quota;
  - where there is no pressing social or environmental need to maintain production at current levels, farmers could be allowed to produce less than their full milk quota, yet still receive MVPS payments for the full quota amount (thus providing compensation whilst further decoupling support from production).

Increasing the uptake of higher tiers

- Increase the target area of land to enter each of the higher tiers and adjust incentives accordingly.
- This would generally require increasing the *differential* between different tiers, but if Tier 1 payments were being reduced, the uptake of higher tiers would tend to increase even if their absolute payment rates remained constant or even decreased, i.e. a steady reduction in Tier 1 rates with a rather slower drop in rates for higher tiers would actually represent an increase in the relative emphasis on the environmental tiers.

Reducing Tier 1 payments

- A gradual reduction in the payment rate for Tier 1 would favour each of the three political aims set out above - reducing basic support and putting more emphasis on environmental measures - but at the cost of reducing total support to farmers.

- There are two different potential endpoints of the kinds of reform discussed above:

(1) If basic farm support continues:

- Creation of one uniform Tier 1 payment in each zone, representing the established practice of supporting farmers without reference to specific social or environmental objectives, which would be based on land potential and/or historic use, irrespective of current land use, whether crops or livestock. Such a form of support would be pretty close to neutral in its effects on production, trade and the environment - or at least, as close to neutral as any large-scale ongoing transfer of funds can be.

(2) If basic entitlement to farm support is withdrawn:

- Abolition of Tier 1, with farmers being paid a market rate to produce environmental goods, starting with out Tier 2. In areas where farming is essentially profitable, quite low payment rates would suffice to attract farmers into Tier 2, but in marginal areas where abandonment is already a problem, much higher rates would be required, at or above current levels of support[28].
- The following two diagrams illustrate this approach for two different areas: intensive lowland dairying, which would generally continue even without CAP support, and Alpine Alpeggio dairying, where continued or even increased support is necessary if this environmentally-valuable farming system is to be retained.

[28] If the objective is eventually to phase out Tier 1, why introduce it in the first place? It would be possible, and simpler, to move straight to a system of environmental tiers, starting at Tier 2, and to provide temporary compensation for price support withdrawn in the form of payments based on the farmer's previous entitlement to support. Now that the CAP contains milk quotas, sheep quotas and suckler cow quotas, the majority of livestock support has already been converted into "property rights" which could form the basis for a "degressive compensatory instrument": direct payments starting at, say 80% of last year's support, then 60%, then 40%, until basic support had been phased out in five years and only environmental and rural development schemes remained. A starting point of 100% compensation would correspond to the "compensatory cheque" offered in our case studies and the "support per farm" approach considered in Section 7.2.6 (where they were considered politically unrealistic).

If this approach were taken, it would be necessary to monitor the uptake and effects of the environmental tiers, as each successive reduction in the compensatory payments would have structural effects and would affect farmers' willingness to enter into environmental tiers at a particular payment rate.

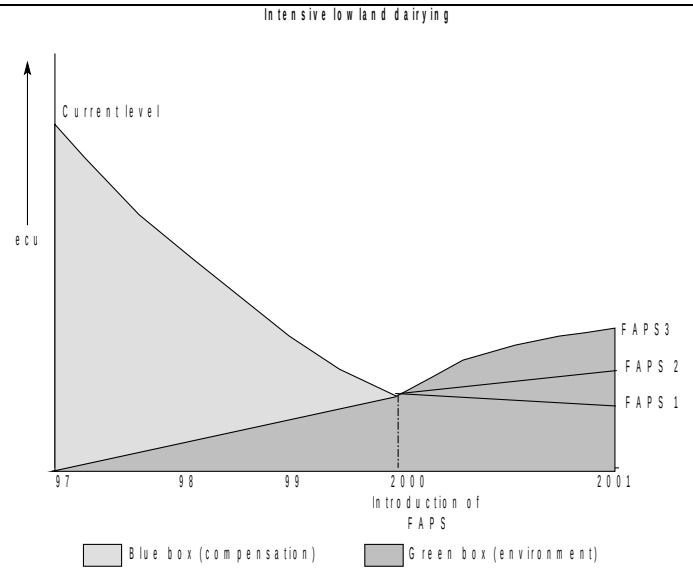

Figure 10.17

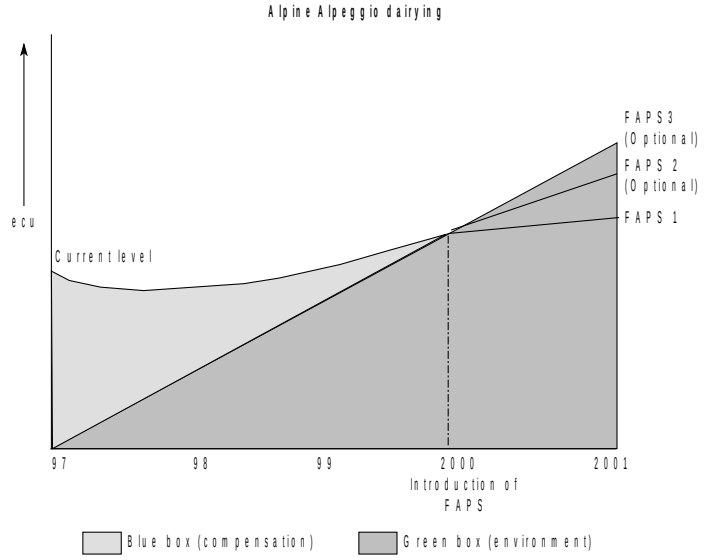

Figure 10.18

From the point of view of the farmer and landowner, Option 1 (continuation of basic agricultural support) is clearly preferable.

From the point of view of economic efficiency and overall social equity, Option 2 (removal of farmers' basic right to support) is clearly preferable, as it would lead to freer trade, more efficient resource allocation, and the removal of the "regressive taxation" inherent in the current system of price support.

From the point of view of the environmentalist the two options are equal. Provided the distorting effects of price support are removed and sufficient funds are made available to draw farmers into environmental tiers, it really doesn't matter whether the farmers' basic entitlement to support stays or goes.

Annex 1: Implementation details of livestock premium schemes

Annex 1.1: Implementation of Beef Special Premium in the EC

	BL	DK	D	GR	SP	FR	IR	IT
Reference year chosen	1992	1992	1990	1992	1992	1992	1992	1991
Introduced as a regional ceiling	√	√	√	nk	√	√	√	√
Number of regions	√√	√	√√√	nk	√	√	√	√
Total ceiling on claims 1994/95 ('000 head)	293	325	3,093	140	552	1,909	1,287	1,287
Number of application periods per year	nl	nl	nl	√√√	nl	nl	√√√	√√
Limit on number of applications per year	√√√√√	nl	nl	nk	nl	√√√√	√√√	√√
Premium paid at slaughter	X	√	√	X	X	X	X	X
Administrative documents								
- for each animal	√				√	√	√	√
- register kept by producer		√	√	√	√		√	
Spring slaughter premium	X	√	√	X	X	X	√	X
Estimated % of animals claiming second BSP	low	3	20	5	18	nk	90	1
Claims exceeded in 1993 regional ceiling	X	X	X	nk	X	nk	X	X
Estimated % of claims excluded due to stocking density	nk	5	..	nk	some	nk	3-4	60
Estimated % qualifying for extensification premium	nk	11	15	nk	80-90	nk	60	0

Notes:

nk - not known

nl - no limit

1. Only in Northern Ireland

.. insignificant

Source: COPA/COGECA November 1994

Annex 1.2: Implementation of Suckler Cow Premium quotas in the EC

	BL	DK	D	GR	SP	FR	IR	I
Reference year chosen	1992	1992	1992	1990	1992	1992	1992	199
Total of individual ceilings ('000 head)	430	144	692	148	1,498	3,913	1,000	87
% reduction to establish the National Reserve	1	nk	3	2	2	3	1	
Is leasing possible?	√	√	√	nk	√	√	√	n
Is the sale of quota possible?	√	√	√	√	√	√[2]	√	√
% syphoned off when quota transferred without land	10	10	15	5	10	15	nk	1
No. of sensitive zones (ring-fencing of quota)	6	0	nk	nk	2	Each Dept	Whole country	n
Additional SCP quota rights allocated following change in definition of small dairy producers (units)	36,080	..	nk	nk	nk	nk	64,000	n
Value of national supplement to SCP (ecu/cow)	20	0	nk	20	20	25	20	2
No. of application periods per year	1	1	1	1	1	1	1	N lim
Estimated % excluded in 1993 due to stocking density	nk	3	low	nk	0	0	2-3	n
Estimated % qualifying for extensification premium	nk	23	nk	nk	90	nk	>50	n

Notes:

1. Only in Northern Ireland
2. Only via national reserve

nk - not known

.. insignificant

Source: COPA/COGECA November 1994

Annex 1.3: Implementation of Annual Ewe Premium quotas in the EC

	BL	DK	D	GR	SP	FR	IR	IT	LUX	NL	P
ear chosen	1991	1991	1991	1991	1990	1989	1991	1991	1991	1991	1989
r of quota units ('000)	nk	104	nk	6,500	18,500	7,065	4,700	nk	nk	850	nk
to create the National Reserve	1	1	3	2.5	2	0	1.5	3	nk	3	3
ssible?	√	√	√	√	√	X	√	√	√	X	√
f quota possible?	√	√	√	√	√	X[1]	√	√	√	√	√
completing transfers in 1993	22/3	1/3	31/3	5/3	31/1	31/9	30/4	15/5	nk	nk	28/2
off when quota transferred without	nk	10	15	15	10	15	15	15	nk	1	5

Notes:

1. Only via national reserve
2. Individual producer quota based on 1991

nk - not known

Source: COPA/COGECA

Annex 2: Implementation of regulation 2078/92 by Member State

This annex adds detail to the brief discussion of agri-environmental measures, given in Chapter 2, and is largely based on the review of Whitby (1996). It does not represent a comprehensive review of agri-environmental legislation in every Member State, but does illustrate the kinds of measures currently in force, part of the overall policy background against which any changes to CAP livestock support should be considered.

Denmark

Background and country structure

Denmark is essentially a rural country, 60% of whose total area is under agriculture, 90% of which is arable. There are no centrally designated or protected national landscapes and no explicit "urban view" of the countryside, (a view for example found in England where a large urban population with little contact with the rural environment have a perceived view of the countryside based on romantic idealism).

Agriculture is primarily based on relatively large farmer-owned holdings, working within highly developed co-operative systems for meat and dairy processing, etc. Livestock production is an intensive, highly industrialised sector, subject to rapid and major changes. There is at present a national drive towards organic farming systems, partly in response to problems of contamination of ground water resources, the major source of domestic water supplies. Nitrate leaching and pesticide contamination have been problems in the farmlands of West and North Jutland.

National environmental measures before Regulation 2078/92

In 1987 Denmark developed an Action Plan for the aquatic environment, to improve surface water bodies.

Environmentally Sensitive Area (ESA) measures were introduced under Regulation 797/85, their main objective being the preservation of semi-natural grasslands.

Interpretation of Regulation 2078/92

Management agreements can be made both inside and outside of ESAs but those within receive higher premium payments. By the third round of agreements, payments for permanent pasture were only made within ESAs.

Germany

Background and country structure

Germany is a densely populated and highly industrialised country, where there has been a long history of environmental concern and action, in particular regarding water pollution and loss of biodiversity. Fertilizer applications are some of the highest in Europe and the continuing intensification and specialisation of agriculture is leading to severe environmental problems.

There are strong farming organisations in Germany, which present the view that farming is essentially good for the environment, and also strong land users' rights.

Administration

The Federal Government is responsible for national policy but Landers (districts or counties) are responsible for implementing agricultural structures policy, as well as nature conservation policies.

National environmental measures before Regulation 2078/92

In the early 1980s some site-specific targeted programmes were run by several Lander. In response to Article 19 of EC Regulation 797/85, new and similar schemes were launched by other Lander. Since 1987 most such programmes have been co-financed by the EC under regulation 1760/87. There was a total of some 50 regional programmes, covering 3.5% of the total agricultural area.

Interpretation of Regulation 2078/92

Regulation 2078/92 was an important policy issue for the Federal Government. Implementation is now carried out in part by an already-established joint body called "Common Task" (GAK), the main agency responsible for implementing agricultural structures policy in Germany, which includes schemes for organic farming and for extensive arable, permanent crop and grassland production. GAK's responsibility covers only those measures in 2078/92 which support farming adapted to market and local conditions. i.e. measures (a), (b) and (c) of Article 2, plus the original extensification schemes under Regulation 2328/91. The other measures of Regulation 2978/92 remain the responsibility of the individual Lander.

In the Objective 1 regions of the East German Lander, the EU co-finances up to 75% of the cost of these measures; in the rest of Germany the EU contribution is limited to 50%.

Areas targeted

The approach in Germany has been to deem the whole of the country as an ESA, and thus to apply the measures throughout. However, the resulting lack of targeting and detailed monitoring have been regarded as making the scheme rather ineffective.

Those measures implemented by GAK apply to all agricultural land in the Federal Republic. Participating farms have to bring all of their arable and/or grassland into the scheme and observe a maximum stocking rate of 2.0 LU/ha; in addition, permanent grassland may not be converted to arable.

This Federal level implementation provides for a basic set of measures, and it is then up to the individual Lander to implement more detailed programmes at the local level. These schemes typically involve minimum and maximum stocking rates for rough grazing, of 0.3 and 1.4 LU/ha, respectively; prohibition of chemical fertilisers and pesticides; and limitations on the application of slurry and farmyard manure to the equivalent of 1.4 LU/ha.

Spain

Background and country structure

Spain has a large agricultural sector based on diverse family farms, which is not so intensive as farming in the northern Member States. There is an uneven population spread with generally little competition from other land uses, except in localised areas where activities such as tourism are important. There are a number of areas of pronounced depopulation, such as Castilla or Aragon, which brings a concern to maintain people in agriculture and hence a certain reluctance to encourage extensification. Land consolidation programmes took place under the Franco regime, but did little to alter the social structure.

Considerable modernisation of agriculture took place in the 1960s, though not under any particular reform programme, with greater integration of agricultural production into the agro-industrial sector, increased use of chemical products and increased mechanisation. In the absence of any policy, the uptake of intensive methods followed farmers' inclinations, and many areas have remained quite extensive.

Environmental movements have been quite slow to establish and are still not as effective as those in other countries. Farming unions tend to operate as a weak policy network, with little influence on the implementation of socio-structural policies. Administration involves a combination of central and regional government.

National environmental measures before Regulation 2078/92

There was little in the way of environmental schemes before Regulation 2078/92.

Interpretation of Regulation 2078/92

Spain has adopted three different sets of measures:

1. Those applied at a national level throughout the whole country, including measures to encourage organic farming; to decrease the use of fertilisers and pesticides; for the extensification of arable production, combined with environmentally-friendly farming methods; for the protection of local breeds in danger of extinction; and for environmental training.
2. Those applied in zones selected by the national government in agreement with regional governments. These include areas close to National Parks; wetlands within the RAMSAR Convention; and zones of special protection for birds (ZEPAS). In these zones, more specific measures are undertaken e.g. reduction of stocking rates and control of erosion.
3. Those applied in zones defined by regional governments as being special from an environmental point of view.

France

Background and country structure

There is a deep and persistent agrarian tradition in France, with some medieval land-use systems still traceable today. The rural environment is seen as being about agricultural production and human occupation, rather than about landscape protection and the maintenance of ecological diversity. Environmental awareness tends to have arisen from problems of depopulation, hunting and rural resource protection, essentially maintaining the rural landscape for the rural population and not for the urban one.

Agricultural crises are often seen as national crises, with farmers being the traditional managers and keepers of the rural landscape. The key thrust of policy has been to maintain a viable agriculture population and to stem the tide of depopulation, though recently there has been something of a change in attitude, with an increasingly vocal urban population.

Administration

France has a fairly centralised administration system, involving a national agricultural ministry with a hierarchy of local administrative tiers. The Ministry of Agriculture, local bureaux (DDA) and the semi-public CNASEA are collectively responsible for the implementation of agricultural structures policy.

National environmental measures before Regulation 2078/92

National measures had created natural parks and less-favoured areas as hunting reserves, rather than preserving species for their own sake or areas for their landscape value. Often, measures in France were adopted in response to EC directives and regulations. Most of the designated areas were almost uninhabited, with little or no farming taking place, and measures were adopted to keep farms going in these areas. There was also the "Remembrement" policy for the regrouping of landholdings and farms which had become fragmented, which resulted in substantial changes in the landscape structure, with the loss of many features.

The first pilot ESAs were created in 1989, related more to specific agricultural development issues than to landscape or nature conservation.

The areas targeted covered areas of intensive farming where there was a risk of water pollution; areas of importance for rare species; areas of pastoral farming threatened with abandonment; and areas liable to forest fires. A total of 61 ESA schemes were launched, with 34 part-funded by the EC.

Since 1992 no new ESAs have been designated with the objective of reducing water pollution, as this would be deemed to breach the "polluter pays principle", nor for grazing management to prevent forest fires, as this would tend to contradict EC policy to reduce beef and sheep production. The uptake of ESAs is seen to result from farmers accepting the reality that they must either change their systems to qualify for such subsidies or go out of business.

Interpretation of Regulation 2078/92

The underlying principles have been those of payment for a public service provided, and compensation for income foregone.

There are two levels of agri-environmental measure:

1. Those that apply generally for the entire French agricultural area, including a voluntary grassland premium which protects low-density grazing; and voluntary farm management plans.
2. Those which apply in specified regional and local zones. The regional schemes are of five years' duration with and cover the following environmental themes: protection of water quality; organic farming; lowering stocking rates by pasture land enlargement; and the preservation threatened species and habitats. Also covered is training. Management prescriptions are set at the national level and do not differ between regions.

Local schemes have the twin objectives of protecting sensitive areas and maintaining farming areas threatened with depopulation or abandonment.

Areas targeted
These regional schemes were based around the existing ESAs, with expansion into other areas under the local schemes.

Italy

Background and country structure
Non-selective agricultural policies, associated with the low efficiency of central and local administrations, meant that environmental measures were almost impossible to implement and carry through. Agricultural land was lost to industry and settlement, often in the most fertile plains, whereas marginal areas suffered land abandonment and reversion to scrub.

Administration
Agriculture is split between several ministerial departments, with the inevitable problems in communication that can occur. As a consequence of the process of decentralisation which took place in the 1970s, there is a certain amount of confusion between national and regional bodies as to areas of responsibility.

National environmental measures before Regulation 2078/92
Italy adopted voluntary set-aside, with most of the uptake in marginal areas of hill regions, were yields and profits were low. A list of Protected Areas was produced, covering 7.1% of the country.

Interpretation of Regulation 2078/92
Italy is still implementing an agri-environmental programme, and is currently drawing up a series of zonal programmes, but has been severely constrained by budget resources.

Areas targeted
National implementation has divided the country into four regions: North, Central, South and Islands.

Netherlands

Background and country structure
Dutch agriculture is strongly targeted at production for export, with 60% of all output being exported of which 80% goes to the EU. A very intensive system of agriculture dominates, with high levels of inputs but also high technical efficiency and low wastage. However, the nature of intensive farming has led to severe environmental problems such as pollution from manure, pesticides, carbon dioxide and methane emissions, and degradation of the landscape.

Administration
All those organisations involved with agriculture are linked together in a corporate organisational structure led by "Landbouwschap" - a platform for communication and negotiation between the agricultural sector and the Dutch Government.

National environmental measures before Regulation 2078/92
In 1975 the government "Relation Paper" was issued, looking at the relationship between agriculture, conservation and landscape. This considered the formation of management agreements and new nature reserves.

A "National Environmental Policy" was set up to ensure that, by the year 2000, no more P and N may enter water courses than through natural processes. This is to be achieved through a series of controls, for example limits on the amount of manure that may be applied to a given area of land. The policy also aims to reduce the national amount of carbon dioxide emissions.

A "Nature Policy Plan" was set up in 1990, aiming to separate nature conservation from agriculture and to return 150,000ha from farming to conservation. A "National Ecological Network" was created, comprising areas of nature conservation interest where farmers are encouraged to undertake management agreements, but farmers outside those areas are not entitled to receive remuneration for conservation activities. A multi-Year "Crop Protection Plan" was introduced in 1991 to reduce the dependency on pesticides and restrict emissions to the environment.

Interpretation of Regulation 2078/92
The Netherlands set up Environmentally Sensitive Areas, with regulations on management agreements, whose main objective was to manage buffer zones around nature reserves. In addition organic production is being stimulated and management packages are available for the provision of recreational facilities. Training and demonstration projects are also covered.

Areas targeted
Coverage of 2078/92 is restricted to Environmentally Sensitive Areas which form the buffer zones around surrounding nature reserves.

Sweden

Background and country structure
Forest cover 63% of the total land area in Sweden, with only 8% under agriculture. However, the farmland is vital for nature conservation and the maintenance of biological diversity. The threat to this comes from the loss of semi-natural grassland and reduction in grazing animals. Agricultural policy has been directed to the production of cheap food, which has led to high production in some areas and farm abandonment and reversion to forests in others.

Administration
Parliament drew up the Swedish "Landscape Conservation Measures", using new types of direct payment for specific public services, rather than trying to achieve several objectives with the one instrument of price support.

There is a fairly centralised administrative system, involving the Swedish Environmental Protection Agency, the Swedish Board of Agriculture and the Central Board of National Antiquities, working with the County Administration Boards.

National environmental measures before Regulation 2078/92

A set of "Landscape Conservation Measures" had been introduced, based on individual agreements with farmers. There were no set rates for payment but rather these were agreed between the farmer and the county board, depending on the service provided. General guidelines were issued by the government for the regional implementation of the measures, covering nature conservation and cultural or historical values. The guidelines also covered targeting, monitoring and the use of funds for landscape conservation. These measures were combined with the protection of Nature Reserves and Nature Conservation Areas.

Interpretation of Regulation 2078/92
Sweden is introducing a new scheme to compliment existing measures, targeting the remainder of the semi-natural grasslands and the maintenance of agricultural areas within forested regions. Also included are programmes for environmentally sensitive areas within farmland and an objective to extend organic farming to cover 10% of the agricultural area by the year 2000.

Areas targeted
"Landscape Conservation Measures" are applicable to the whole of the agricultural land, whilst ESAs are targeted at wetlands and permanent grasslands, and at the reduction of nitrogen leaching in the south, through the use of catch crops.

UK

Background and country structure
Grassland livestock production is a major feature, especially in the north and west of the country. The 1970s saw the intensification of farming, led by technological innovation, which has led to some severe environmental problems and a loss of regional landscape character.

The 1980s saw the rise of environmental concerns over agricultural methods fuelled by the CAP. The UK Government took the lead on Article 19 of EC Regulation 797 in 1985.

Administration
All schemes are now run by the Ministry of Agriculture, Fisheries and Food (MAFF) or its equivalent in Scotland, Northern Ireland and Wales. New schemes are often pilot-tested by the Countryside Commission before being handed onto MAFF, as with the Countryside Stewardship scheme.

National environmental measures before Regulation 2078/92
Environmentally Sensitive Areas were introduced in 1987 under EC Structural Regulation 797/85, and the Countryside Stewardship Scheme was introduced in 1991.

Interpretation of Regulation 2078/92
The UK had already undertaken many of the objectives of 2078/92 and therefore submitted these to the EU for approval and co-financing. MAFF is currently aiming to increase the range of ESAs in the fourth round of ESA designation.

Areas targeted
ESA measures apply in their designated regions. The Countryside Stewardship Scheme applies to designated landscape types, some of which occur only in certain areas and others of which may be found throughout the country. There is also a number of specific environmentally-friendly land

management schemes, for example the Countryside Premium Scheme, which seeks to produce conservation goods on set-aside land.

Annex 3: Alternative approaches to defining agri-environmental zones

As part of our research process, we reviewed a wide range of existing maps and zoning systems, to see which, if any, would be most suitable for our purposes: an analytical tool and a basis for policy. This annex briefly summarises the different systems which we considered.

ITE land classification maps

UK map

Coverage

Whole of Great Britain.

Basis

Defines the range of variation in the UK environment using parameters such as altitude, geology, geomorphology etc, divided into arbitrary units called Land Classes. (Bunce *et al.* in press).

Level of detail

Sample units 1 km square which can be used to predict environmental affinities for any part of the UK. It also enables models to be produced and predictions made about landscape and land use change (Bunce *et al,* 1984).

Advantages for this study

Provides detailed information which is based on objective statistical databases. This information is useful for habitat reversion options and identification of areas of marginal agriculture.

Disadvantages for this study

It does not relate to any of the national, regional and local statistics on agriculture, which are based on political boundaries, and reflects environmental potential, rather than actual land use.

European map

Coverage

Whole of Continent.

Basis

Based on statistical analyses of climate, altitude and locational data for 0.5 x 0.5 degree cells (Bunce *et al.*). Data sets for other parameters in the European context are more variable or not available at the required level of detail. This is a land classification with 64 divisions which can be related to landscapes. It is based on a structured hierarchy of

Landclasses; Landscapes and Habitats. All are developed from a statistical base using the AGRISTAT and NUTS database at Level 3 (e.g. provinces, counties, départements).

Level of detail

A map of classes with descriptions providing considerable agricultural information. The area of the map is divided into half degree units (with Britain comprising 7 classes).

Advantages for this study

Provides detailed information which is based on objective statistical databases. This information is useful for habitat reversion options and identification of areas of marginal agriculture.

Disadvantages for this study

It does not relate to any of the national, regional and local statistics on agriculture which are based on political boundaries and reflects environmental potential, rather than actual land use, plus full data are not yet available.

Council of the European map of the natural vegetation

Coverage

Covers the whole of the member states of the European Union and the Council of Europe, excluding Scandinavia. Second edition published in 1987. In four sheets, scale 1:3,000,000.

Basis

The map shows the natural edaphic [features of the soil] and climax vegetation, actual or potential, for Europe. The objective is to show the diversity and richness of Europe's biological heritage. As most of the primary vegetation of Europe has been altered or replaced by secondary, semi-natural or artificial vegetation, these maps show the potential for landscapes to return to natural vegetation types, primarily high forest climax types.

Level of detail

Units depicted on the map show relatively homogenous ecological territories which are characterised by the predominance of a natural or sub-natural primary vegetation. For each territory the sequence of successions has been calculated to produce the 'potential natural vegetation' for land currently under agriculture, forestry or pasture etc. The unit types are plotted across the whole of each country.

Advantages for this study

As the map shows potential natural vegetation, it provides a European wide picture of the potential for habitat reversion for any of the zones described in this study. The level of detail is good.

Disadvantages for this study
Shows potential vegetation cover which could not be related to current agricultural practices or clearly defined regions or counties within each country. Difficult to relate the vegetation types to agriculture within each country.

CORINE land cover plot

Coverage
Spain and France completed 1992 only.

Basis
Records actual land use for those countries.

Level of detail
Very detailed at local level.

Advantages for this study
Useful for comparing zones drawn up for Spain and France.

Disadvantages for this study
Does not cover the whole of the European Union.

Dobris assessment landscape map

Coverage
The whole of Europe. Scale 1: 100,000,000 approx.

Basis
Divides European landscapes into 8 main groups primarily based on level and type of enclosure with further subdivisions according to location. For example "Uplands" comprises northern uplands and mountains. The map was compiled from a variety of sources based on work by Meeus *et al.* (1990).

Level of detail
Shows only country borders and main river systems.

Advantages for this study
One of the closest maps describing agricultural landscapes.

Disadvantages for this study
Not able to relate map to agricultural practices within each country, nor is it possible to relate to regions or counties for which statistical information is available (Eurostat etc).

IEEP low intensity farming system maps

Coverage

These are a series of maps published in 'The Nature of Farming' (Beaufoy, Baldock and Clark, 1994) which were developed to illustrate case studies on low intensity farming systems in nine European countries. The information is displayed at regional level within each of the following countries: France; Greece; Hungary; Ireland; Italy; Poland; Portugal; Spain; United Kingdom.

Basis

The basis for each map varies according to the type of farming system being described, for example routes for transhumance or wood pasture systems.

Level of detail

Fairly detailed for some of the maps, others less clear.

Advantages for this study

Provides information for some of the member states on low intensity, traditional farming systems and systems which are threatened with extinction by market forces and intensification of land use. Information at a scale which could be used if the original information was available. These maps can be used for the sub-zoning of main zones and the development of Tier 2 and 3 measures where resources and policies may need to be targeted to achieve specific environmental objectives.

Disadvantages for this study

Maps only relate to low intensity systems, rather than agricultural systems as a whole. Maps do not cover all the member states. Not every map records the same variables. It is not possible to go back to the original data used to draw up these maps, as the author's own experience within each country were used as sources. Though they were often small there was considerable interest in the detail.

Eurofarm statistics for NUTS regions

Coverage

Europe-wide, and annually updated.

Basis

Collated from national agricultural statistics. These are censuses and surveys by which agricultural information is collected in a strict, structured format (the same for each country) and used to build up statistical databases for specific elements of agricultural production.

Level of detail

There are three levels, Country (NUTS 1); Region (NUTS 2) and county or district (NUTS 3).

Advantages for this study
Provides the most detailed amount of statistical information on agricultural land use. Some specific statistics will be used for analysis of measures for Tiers 2 and 3.

Disadvantages for this study
Due to its strict method of collection by political boundaries it was not always easy to relate to the agricultural or ecological zones. For example, mountainous regions tend to cross both country and regional political boundaries, requiring a certain amount of extrapolation when analysing the data.

FADN (RICA) statistics for NUTS regions

Coverage
Europe-wide and collated annually.

Basis
These are farm accountancy statistics collected in a similar way to the Eurofarm Statistics, using strictly defined methods.

Level of detail
As Eurofarm.

Advantages for this study
Again, considerable detail on an annual basis. Some specific statistics could be used for analysis of measures for Tiers 2 and 3.

Disadvantages for this study
Again inflexible for use with the agri-environmental zones

LFA and Mountainous Areas maps

Coverage
LFAs and mountain LFAs exist throughout the European Union as instruments of agricultural policy, though detailed up-to-date maps are not always available.

Basis
Three categories of LFA:

- Mountain areas with short growing seasons due to altitude (600-800m) or steep slopes at lower altitude '.... in which farming is necessary to protect the countryside, particularly for reasons of protection against erosion or in order to meet leisure needs'.
- Areas 'in danger of depopulation and where the conservation of the countryside is necessary'.

- '... small areas affected by specific handicaps and in which farming must be continued in order to conserve the countryside and to preserve the tourist potential of the area or in order to protect the coastline'.

Level of detail
Operationally, LFAs are defined in very great detail, even down to parts of individual farms. However, the breakdown of most agricultural statistics into LFA and non-LFA was only available at NUTS 2 level.

Advantages for this study
Agriculturally-based geographical divisions which are already well established and incorporated into agricultural policy and agricultural statistics collection.

Disadvantages for this study
The factors used to define LFAs are social (and to some extent political) as well as agricultural or environmental.

Objective 1 and 5b maps

Coverage
Defined throughout the European Union, where applicable.

Basis
Objective 1: Regions whose development is lagging behind; where GDP is less than or close to 75% of the Community average. Southern countries; Italy, Greece, Spain and Ireland.
Objective 5b: Areas within countries where agricultural employment accounts for a high proportion of the total employment; low level of agricultural income and low level of socio-economic development in terms of per capita GDP (CEC 1989).

Level of detail
Detailed, with information available according to region.

Advantages for this study
Provides information on socio-economic indicators within Objective 1 and 5b areas which coincide with areas of agri-environmental interest.

Disadvantages for this study
Based on socio-economic objectives rather than ecological or regional. Does not include areas of agri-environmental interest within lowland farmland.

Conclusions

Each of these maps has been created with a different set of objectives in mind, and none is perfect for our purposes. The ITE stressed that there is no one ideal method of zoning, no matter what GIS tools and data are available, and it is always a question of selecting the approach which will best meet the particular set of objectives.

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