

CAP AND ENVIRONMENT IN THE EUROPEAN UNION

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PREFACE

A study on CAP and the environment in the European Union was commissioned by the Directorate-General Environment, Nuclear Safety and Civil Protection (DG XI) of the European Commission, and was carried out by the Agricultural Economics Research Institute (LEI-DLO) (The Hague, the Netherlands). The support of the European Commission is gratefully acknowledged. The objectives of this project were (i) to analyse the (direct and indirect) effects of the Common Agricultural Policy (CAP) on the environment of the European Union and (ii) to make an inventory of environmental measures already affecting agriculture in the European Union.

The study was guided by a Steering Committee of the European Commission, which included the following persons:

P. Godin	(DG XI/D.1) (chairman)
B. Buffaria	(DG VI-01)
M. Debois	(DG XI/E.2)
Ms. M. Franch	(DG XI/D.1)
M. Scheele	(DG VI/F.II.2)

We gratefully acknowledge the critical remarks and useful suggestions made by the Steering Committee during all stages of the project. We also benefited largely from comments received from A. Buckwell (Wye College, University of London) who was with DG VI (Unit 01) by that time.

Many people contributed to the completion of the report. First, we very much appreciate the suggestions and documents provided by the agri-environment correspondents in Member States. Progress of the study was reported to two meetings of the group of national 'agri-environment' correspondents. The discussions during these meetings have been very helpful to the identification of an input from Member States. Written comments were provided by G. van Dijk, Department of Nature, Forest, Landscape and Wildlife of the Ministry of Agriculture, Nature Management and Fisheries in the Netherlands; and A. Howarth, Rural Development Division, Department of the Environment in the United Kingdom. This was very helpful and has been highly appreciated.

Important contributions on France and Spain have been made by P. Rainelli and F. Bonnieux from the Institut National de la Recherche Agronomique (Rennes, France) and by C. Varela-Ortega, J.M. Sumpsi Viñas and E. Iglesias from the Universidad Politecnica de Madrid, Departamento Economía y Ciencias Sociales Agrarias (Madrid, Spain). Many other people also contributed to the completion of this report. Information was made available by ministries and institutes in various Member States. A full list of organizations that provided infor-

mation to the study is listed in Appendix A of the report. We are very grateful to the wide support, useful suggestions and critical remarks we received in Member States.

A final draft of the report was reviewed by external experts in the field of agricultural and environmental policies in the European Union. Helpful suggestions were provided by M.L. Louloudis (Department of Agricultural Economics, Agricultural University of Athens, Greece) and M.L.M. Vieira (Instituto para o Desenvolvimento Rural e Gestão Ambiental (IDRGA), Lisbon, Portugal). We highly appreciate the important remarks made on the report and suggestions given in response to our request by H. Caraveli (Athens University of Economics and Business, Athens, Greece); P. Lowe (Centre for Rural Economy, University of Newcastle upon Tyne, United Kingdom); J. van der Straaten (European Centre for Nature Conservation, ECNC, Tilburg, the Netherlands); D. Wascher (European Centre for Nature Conservation, ECNC, Tilburg, the Netherlands); and M. Whitby (Centre for Rural Economy, University of Newcastle upon Tyne, United Kingdom).

Several people of LEI-DLO also contributed to the project. We gratefully acknowledge the contributions made by F.E. Godeschalk and P.J.G.J. Hellegers for the provision of data from FADN. Also, useful comments and suggestions to the report have been made by C. van Bruchem, T. de Groot, P.J.G.J. Hellegers, K.J. Poppe, I.J. Terluin and P.J.J. Veenendaal.

SUMMARY

Background to the report

There is an increasing concern in Europe about the deterioration of the environment, by the public opinion, local authorities, Member States and the European Commission. Awareness of environmental problems due to farming practices also increased during the past decade. The Treaty of the European Union (Article 130R) calls for the integration of the environment into other Community policies. Environmental conditions are increasingly required in agricultural policy. The 1992 reform of the Common Agricultural Policy (CAP) recognized the need of contributing to an environmentally sustainable form of agricultural production and food quality. Some measures have been implemented. However, large differences remain between Member States and in many respects it is still too early to judge their implications on the environment and landscape.

CAP support provided an incentive to consolidate holding and incorporate marginal land. It also stimulated the use of agrochemicals by price support measures. Negative impacts of CAP on the environment primarily concern the deterioration of water resources and of soils as well as the decline of biodiversity and the environmental dimension of landscape. CAP however also provides incentives to the maintenance of landscape and viability of rural areas. Landscape for example is cultivated by agriculture, which is an example of a positive impact on the environment. However, processes of marginalization and abandonment of agricultural land might also have negative effects on landscape and the environment.

The impact of CAP on the environment in the European Union (EU) could not be isolated from other conditions. Other development trends of society and policy do also affect the allocation of production, farm structure and the intensity of agriculture. Important in this respect are regional and environmental policies, as well as economic, fiscal and employment policies. Such a diverse pattern of existing relationships among agricultural and other policies, and the environment, however, support the need to analyse relationships among CAP and the environment which are currently known in the EU; and to identify any gaps in the information currently available.

Objective of the report

The objectives of the report are twofold:

- firstly, to analyse the principal consequences - positive and negative - of CAP for the environment in Member States or representative regions;
- secondly, to provide an assessment of existing EU and national environmental requirements (i) in agricultural policies and (ii) in environmental policies affecting agriculture.

The report is about the impacts of CAP on the environment and landscape. Emphasis is given to the environmental impacts after the 1992 CAP reform.

Agricultural policies in the EU which are part of the analysis include market and price policy, Less Favoured Area Directive, agricultural structure policies, agri-environmental measures, early retirement measure, forestry measures, incentives for alternative crops (e.g. non-food set-aside), organic farming as well as quality and label policy. The integration of environmental concerns into the implementation of other (regional) and rural development programmes financed from the EU Structural Funds will also be examined.

Regarding the environmental effects of market and price policy, focus will be on a limited number of agricultural products. This is because market support measures and direct payments are mainly directed towards crop production (cereals, oilseeds, protein crops, tobacco, olive-oil and some fruits and vegetables) or livestock production (beef, dairy and sheep). The assessments of environmental consequences will focus on a limited number of products including cereals, beef, grapes, sheep, pigs and dairy.

Other policy measures in CAP (e.g. structure policies) mainly focus on production factors and conditions put to production methods, rather than on products. Environmental effects to be considered are related to the use of chemical inputs (plant protection products and fertilizers), extraction of water for irrigation purposes, supply of animal manure and emissions of ammonia, soil quality (including soil erosion and overgrazing), landscape (e.g. marginalization and abandonment of rural areas) and biodiversity.

Approach used and delineation of the report

The report is based on desk research drawing from existing information and available research studies. Emphasis is given to the 1992 CAP reform, and their effects on the environment. No modelling work was elaborated in the framework of the study, but it was based upon assessments made so far regarding CAP and the environment.

The Common Agricultural Policy

The original objectives of the Common Agricultural Policy are specified in the well-known Article 39 of the 1957 Treaty of Rome. These objectives were described as follows:

- to increase agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimal utilization of the factors of production, in particular labour;
- thus to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture;
- to stabilize markets;
- to ensure stability of supplies;
- to ensure that supplies reach consumers at reasonable prices.

No objectives that relate to the environment and nature are specified in Article 39 of the Treaty of the European Union, nor in other Articles of the separate agricultural section of the Treaty (Articles 38-47).

CAP covers a wide range of measures, including:

- CAP market and price support measures;
- accompanying measures;
- horizontal socio-structural measures (Objective 5a);
- regional and rural policy (Objective 1 and 5b);
- other policies like incentives for alternative crops, quality and (eco-)label policy, biomass production, farm diversification, etc.

The 1992 CAP reform is aimed among others to improve the competitiveness of EU agriculture, to restore market balance and to stimulate less intensive production methods. Measures were adopted in order to reduce surplus production, reduce price support (together with more targeted direct income support), and improve environmental soundness of agricultural production. The Commission was well aware that the shift in policies could result in an increase of the agricultural budget but was prepared to accept this.

Issues of environmental concern in the EU

Issues of concern regarding deterioration of the European environment include quality of water, soils and air, biodiversity, landscape and natural habitats:

- there is some empirical evidence that the use of plant protection products poses a threat to the environment. Usage levels of plant protection products are highest in areas with intensive farming practice, because of the risks of the occurrence of pests and diseases;
- losses to the environment of nitrogen from agriculture include leaching of nitrates to surface and groundwater, emissions of ammonia to the atmosphere, as well as denitrification. High supply levels of animal manure from intensive livestock farming may affect quality of the available drinking water resources. Nitrate levels in some groundwaters therefore need to be reduced and eutrophication of surface waters is particularly a problem in certain areas of the Union;
- the quality of landscape and loss of habitats are important as well. It includes qualitative aspects as well as more quantitative considerations in parts of the EU. Large quantities of fertile soils are lost due to soil erosion. This is mainly due to inappropriate management of agricultural land. Overgrazing is observed in some parts of the Union, and will affect the growth, quality and species composition of vegetations, and subsequently lead to habitat loss and reduced biodiversity. Marginalization is a process of agricultural land to become less viable due to economic, social, political and environmental factors. It may occur in regions with unfavourable natural, economic and social conditions;
- biodiversity is the variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexities of

which they are part; this includes diversity with species, between species and of ecosystems (Article 2 of the Convention on Biological Diversity). Semi-natural grassland and heathlands are maintained by low-input agriculture. They are very important to biodiversity. The majority of semi-natural grassland have disappeared in the lowlands of Northwestern Europe due to intensification of agriculture.

Relationship between price policy and the use of agrochemicals

Application of the law of diminishing marginal returns implies that a reduction of output prices may induce a reduction of production and of input use. A decline in production and input use may be achieved by reducing the level of support, since the incentives to farmers for using intensive production methods with high usage of inputs are weakened. At lower prices, more extensive farming systems may be encouraged and the negative environmental consequences of farming activities could be reduced. The promotion of environmental sound production methods is one of the objectives of CAP reform. It is however difficult to assess empirically to what extent lower prices would induce a reduction in the use of inputs. Production techniques are connected with present price relations between outputs produced and inputs used. A change in these price relations will take at least some time to have effects on production methods. Other factors than output price levels are important as well, such as the price of land and the farm structure (e.g. cropping plan, stocking density and farm size). Furthermore, input response to price changes may vary across regions. Direct effects of price changes may be reinforced or compensated by the impact of liquidity and security constraints, by shifts of the production function or by reducing the inefficient input use. This makes empirical estimates of response elasticities rather difficult.

Environmental measures in agricultural policy

Several Council Regulations already include environmental measures. They are summarized in figure 1.

Council regulation	Environmental requirement	Point of action
Arable crop	Yes	Land management of set-aside
Wine	No	
Beef (and veal)	Yes	Land management
Sheep	Yes	Land management
Pigs	No	
Dairy	No	
LFA	Yes	Landscape
Structure efficiency	Yes	Input use, landscape
Structural Funds	Yes	Input use, landscape
Agri-environmental programme	Yes	Input use, landscape
Forestry measures	Yes	Land use
Early retirement measures	Yes	Land use, landscape
Organic farming	Yes	Input reduction

Figure 1 Overview of Council Regulations and Directives considered and environmental requirements identified

Note: Environmental clause relates to the action required by the farmer in order to be eligible for state support.

Environmental policies affecting agriculture

Environmental policies in Member States largely changed during the past decade, broadening the perspective from a reduction of point-source pollution towards the inclusion of targets on non-point source pollution. The Single European Act stipulates that the Community should consider environmental implications in adopting policy. Various Directives have been accepted during the past decade, which include objectives on the environment and a time frame for their achievement. The implementation is left to Member States, thus allowing them to achieve the common goal of unity in ways that recognize the national character of each.

Important Directives are:

- Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (Nitrates Directive). This Directive includes regulation on how to handle manure and fertilizers in zones which are identified to be vulnerable to the leaching of nitrate;
- Directive 91/414/EEC concerning the placing of plant protection products on the market. This Directive plays a major role in the development to authorization of plant protection products and use in the Community;

- Directive 92/43 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive). This Directive is to 'contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora of Community interest';
- Directive 85/337 (EEC) requiring environmental impact assessment of certain public and private projects. The Annex to the Directive lists the projects for which an impact assessment is compulsory and those for which it is voluntary;
- Community guidelines on State aid for environmental protection (EEC94/C72/03). Guidelines for state aid are provided on investment aid, horizontal support measures and operating aid. In the agricultural sector, the guidelines do not apply to the field covered by Council Regulation 2078/92 concerning the agri-environmental measures.

Reform of the cereals regime and the environment

The potential impact of 1992 reform of the cereal regime on the environment and landscape comes from changes in price support and from the set-aside regulation. Lower prices may induce farmers to reduce their use of agrochemicals. However, farmers may change their cropping plan towards products more intensively using agrochemicals (fruit, vegetables, potatoes). On the other hand, experiences in Spain show that, because of a decline in cereal prices, the production pattern on irrigated land changes so that water is increasingly used for crops with lower water demand. The conclusion is that lower prices have complex implications for the agricultural system and environmental benefits at one aspect may be offset by others. Differences across Member States are largely due to different farming systems and biophysical conditions.

The set-aside scheme can be applied in a rotational and a non-rotational basis. Farm specific features, like soil productivity and cropping plan, affect the farmers decision whether to opt for one form or the other. Of both options, the non-rotational form appears to have a more favourable impact on the environment and landscape. A greater diversity of plant species is likely to develop, and this will subsequently support a greater variety of fauna. The management rules on the treatment of land which is put aside are, however, crucial to the environmental impact of both forms of the set-aside scheme.

Reform of the beef and sheep regimes and the environment

The animal sectors including beef, sheep and dairy are of major importance to nature conservation, as they manage most of the areas with high nature values. They may maintain viability of extensive farming systems and subsequently to prevent abandonment of agricultural land.

Extensification of livestock production in response to the reform of the beef and sheep regimes has been limited so far. Experiences in Member States with the scheme indicate the relative inattractiveness of the premium to the farmer and the ineffectiveness of the measure to reduce livestock density. Also, in a number of Member States the decrease of institutional beef prices did not reduce stocking density during the past couple of years because monetary

changes caused an increase in prices valued in national currency. Furthermore, livestock producers did benefit from a decline in prices of feed concentrates.

Wine production and the environment

According to Council Regulation (EEC) 1442/88 a producer of wine can apply for an uproot premium. Member States may provide conditions for such compensatory payments. Such conditions refer to the identification of areas where to reduce production of grapes. Member States also have the possibility to preserve areas for the production of grapes. The only condition in this Regulation which might affect the environment and landscape in a direct way is to compensate farmers on the uprooting of the production of grapes. Furthermore, the Accompanying Measures allow to compensate farmers for the preservation of the region and grow traditional types of wine.

The area for growing grapes reduced by some 10% after the introduction of the uproot premium. Adoption by farmers to uproot wine is relatively high in the regions La Mancha (Spain), Sicily (Italy), Languedoc (France) and in Greece. Such a decline in land utilized to grow grapes will affect usage of chemical inputs. In addition to this effect it may also affect landscape by means of an increasing vulnerability to soil erosion in case the land is not used agriculturally. No assessments have been made so far regarding the impact of the market organization on wine for the environment and landscape.

Pig production and the environment

In general, pig production in the EU largely contributes to excess amounts of livestock manure produced. However, it is also important to stress that in the 'montados' and 'dehesas' systems in Portugal and Spain grazing systems with black pigs largely contribute to the maintenance of landscape and ecosystems.

Pig production hardly receives any protection under CAP, and direct effects of CAP on the environment therefore are likely to be limited in that sector. Indirect effects of CAP, however, are considered to be rather important in this sector, i.e. through the use of feed concentrates. The use of cereals produced in the EU has become more attractive under CAP reform compared to the use of imported feed concentrates. Although not observed yet, this may have an impact on the location and intensity of animal production in the EU, especially with regard to pig and poultry production. A more balanced use of minerals in the agricultural sector might result. The future location of pig production is largely affected by environmental policy in some Member States (e.g. the Netherlands, Belgium, Denmark, parts of Germany and of France).

Dairy production and the environment

After the introduction in 1984 of the milk quota system, farm size on average showed an increasing trend, both in term of the number of animals and the area of land used agriculturally.

Stocking density of dairy farms slightly reduced in the EU since the mid-1980s. The impact of milk quota on extensification depends on quota transfer arrangements. Transfer of quota to other holdings may also require buying of land in some Member States, which counteracts intensification of milk production. The milk quota system could also have contributed to the abandonment of the traditional use of mountain pasture areas in parts of Spain. Structural adjustments in dairy production are important as well. The share of other cattle increased at dairy farms, and production of sheep increased in parts of Europe in response to the limits put to national milk production. A shift in farm management has occurred in response to the quota system, from output increase towards a reduction of expenditures on input. An improvement in treatment of minerals observed in dairy holdings may have had a positive effect on the environment.

The LFA Scheme and the environment

The LFA Scheme is oriented to allow for continuation of farming in less-favoured areas by ensuring a minimum level of population or by conservation of the countryside. Three types of areas are distinguished, including (i) mountain areas characterized by a considerable limitation of the possibilities for using the land and an appreciable increase in the costs of working it, (ii) LFA in danger of depopulation and where the conservation of the countryside is necessary, and (iii) small areas affected by specific handicaps in which farming must be continued in order to conserve the countryside. These three types of areas represent approximately 56% of total Utilized Agricultural Area of EUR 15 in 1995. In EUR 15, some 61% of all less-favoured areas are under Article 3.4; 35% derive from Article 3.3 and only 4% is devoted to small areas which are affected by special handicaps (Article 3.5). Often, type three areas have an interest from an environmental point of view since they include areas with specific handicaps (small area, poor water supply, periodic flooding, etc.) where agricultural activity should be continued in order to maintain the countryside.

A positive effect of the LFA scheme on landscape is to maintain a viable agricultural structure. This applies especially in marginal areas with very low net incomes. Compensation plays a significant role in such circumstances. However, negative effects of the LFA Scheme may also arise in case the intensity of livestock production exceeds certain thresholds. The introduction of stocking density limits to obtain compensatory allowances (e.g. 0.2 livestock units per hectare in mountain areas with altitude over 1200 meter, and one livestock unit per hectare of forage crops in the other LFAs) would in particular circumstances involve an intensification of grassland management.

Environmental or management conditions on stocking density for getting compensatory allowances may be required in order to reduce overgrazing. Such conditions are set in national LFA schemes only to a very limited extent, making the apparent benefits of this scheme for nature conservation rather small. Environmental and management conditions presently are only introduced in the United Kingdom.

Structural funds and the environment

At the reform of the Structural Funds (2052/88) the section 'Guidance' of the EAGGF was integrated with the European Social Fund and the European Regional Development Fund. The agricultural sector can be supported by co-financing projects executed under Objective 1, 5a and 5b. Objective 5a measures are oriented to accelerate adjustment of agricultural structures. These measures regroup various measures mostly taken over from legislation existing before the reform of the Structural Funds and include those of the LFA directive and of the improvement of the structural efficiency. Under Objective 1 and 5b regional measures are co-financed by the Fund. The projects under these two objectives are to promote the development of regions whose development is lagging behind (Objective 1) and to encourage rural development (Objective 5b). Within the programmes, one of the priorities is maintenance and improvement of the environment. One of the categories of assistance for the EAGGF Guidance Section (Regulation 4256/88) in Objective 5a is to the protection and preservation of the environment. Similarly, in Objectives 5b and 1 regions it is towards the development of rural areas (preservation of the countryside and the environment, rural and tourist infrastructures, and development of forestry activities). Conditions on the implementation of Objective 5a measures are adopted by Member States themselves and, as a result, they vary widely in scope. In respect of Objectives 1 and 5b Member States submit a regional development plan also including an indication to be made of assistance under the different funds.

Member States have many possibilities to designate plans and programmes focussing on specific local and regional problems. The programmes developed have to be submitted for approval and co-financing to the Commission. As required by the Regulations, the Council support framework (CSF) indicate that competent environmental authorities will be involved in the management of the CSF and of the operational programme (OP). In 1993 the Council approved 6 new regulations to manage the Structural Funds for the period 1994-1999. It includes a budget of ECU 141 billion for this six-year period, which is approximately a third of the total budget of the EU. Development plans for Objectives 1 and 5b must in the future include an appraisal of the environmental situation of the region concerned and an evaluation of the environmental impact of the strategy and operations planned, in accordance with the principles of sustainable development and in agreement with the provisions of Community law in force. The intensification of ex-post and ex-ante evaluation with special regard to environmental impact is central in the approach. Environmental considerations in the programming documents are now compulsory.

The accompanying measures and the environment

Regulation (EEC) 2078/92 is an aid scheme which is aimed to encourage farmers to introduce or continue with agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside. The regulation aims to 'encourage farmers to make undertakings regarding farming methods compatible with the requirements of environmental protection and maintenance of the countryside, and thereby to

contribute to balancing the market; whereas the measures must compensate farmers for any income losses caused by reductions in output and/or increases in costs and for the part they play in improving the environment'. The agri-environmental measures under Regulation (EEC) 2078/92 have three general purposes:

- to accompany the changes to be introduced under market organization rules;
- to contribute to the achievement of the Community's policy objectives regarding agriculture and environment;
- to contribute to providing an appropriate income for farmers.

The implementation of programmes under Regulation (EEC) 2078/92 is based on proposals developed by national and regional authorities in the Member States. The programmes which have been accepted by the STAR Committee have recently been summarized (De Putter, 1995). Participation of the programmes is assessed to range across Member States between 3% of UAA (the Netherlands) and 25% of UAA (Germany). Participation by farmers of the programmes submitted by Austria is assessed to be very high (90% of the total number of farms) (table 1).

Table 1 Characteristics of programme budget of Council Regulation (EEC) 2078/92 by Member State

Country	Budget (ECU/ha)	Participation (x 1,000 ha)	Participation (% of farms)
Belgium	123.0	63.0	5
Denmark	88.5	210.0	10
Germany	142.0	3,000.0	50
Spain	30.6	4,073.8	15
France	51.3	6,343.9	20
Ireland	66.6	1,036.3	20
Italy	74.4	1,484.9	10
Luxembourg	160.5	16.4	15
Netherlands	144.7	67.4	5
Austria	105.0	3,194.0	90
Portugal	83.2	871.7	20
United Kingdom	?	?	?
European Union	97.2		

Source: De Putter, 1995: 143.

Programmes which are developed under the agri-environmental regulation have multiple objectives on the environment and landscape, including protection of flora, fauna and groundwater resources. However, they also have economic and social objectives, which often brings competition between the different interests. There is concern as to whether some zonal

programmes will be challenged as simply aiming to increase farmers incomes, especially when these programmes are located in the poorest regions where governments may regard nature conservation as a relatively low priority. A careful monitoring effort is needed to assess incentive payment schemes for their success in achieving environmental objectives and their effectiveness as policy instruments.

Council Regulation (EEC) 2079/92 for an early retirement scheme in agriculture allows for support to be paid to full-time farmers and agricultural workers aged 55 years and over for stopping agricultural work. The measure is aimed at improving production structures and at controlling agricultural production as well as helping older farmers. Member States are not obliged to develop national programmes. No programmes have been developed yet in Luxembourg, the Netherlands and the United Kingdom. The scheme has an environmental clause as land transferred to other farmers is to be used in a way that it serves the environment (Article 6.4 and 6.5). This has been introduced to prevent farmers to abandon their land after retirement.

Council Regulation (EEC) 2080/92 includes a support scheme, which is designed to encourage afforestation of agricultural land. This is considered to be important with respect to land use and environmental protection. The objective of the support scheme is to:

- accompany changes in the market and price policy;
- contribute to woodland improvement;
- contribute to the kind of nature management that serves nature conservation; and
- counteract the greenhouse effect and absorb carbon dioxide.

Effects on the environment of Council Regulation 2080/92 cannot be observed yet. This is mainly due to the lack of detailed environmental requirements in the programmes, the rather low participation level, and the short time period since the scheme was introduced in most countries. Furthermore, since regional or even local administrations are responsible for its implementation, the environmental impact may clearly differ between regions. In some regions, monitoring of forestry practices and potential environmental impacts are very strict while in other regions neither an environmental evaluation nor even an simple project is required.

Incentives for organic farming and the environment

Council Regulation 2092/91 on organic production of agricultural products includes uniform and harmonized rules of this type of production. Organic farming can be defined as a system of managing agricultural holdings that implies major restrictions on fertilizers and plant protection products. This method of production is based on varied crop farming practices, is concerned with protecting the environment and seeks to promote sustainable agricultural development. It differs in a variety of ways from conventional farming. It is considered that organic farming among others:

- does not pollute soil and groundwater from plant protection products;
- increases biological diversity among plants and animals;
- reduces leaching of minerals.

The agri-environmental measures under Regulation 2078/92 include aid to farmers who undertake to introduce or continue with organic farming. It has been implemented according to Regulation 2092/91. The area under organic cultivation in 1993 included more than 400,000 hectares, which is about four times the coverage in 1987. This area, however, remains a limited share (about 0.3%) of total utilized agricultural area of EUR 12. Germany accounts for more than half the area in the EU which is cultivated according to the principles of organic farming.

Concluding remarks

Limited studies on the environmental effects of CAP have been conducted so far in relation to certain issues and regions. Knowledge remains very patchy in relation to the effects of market and price policies on the environment and landscape. Therefore, further research efforts in the field of linkages between agriculture and the environment are necessary. Strongly needed are efforts to disaggregate the agricultural sector to better capture the complexities of agricultural commodity programs and changes in the composition of agricultural production as a result of changes in policies, which might have important environmental implications since some commodities are more environmentally damaging than others (as are agricultural policies, too). So, the approach to study the relation between agricultural policies and the environment has to focus on policy instruments and products. Furthermore, the environmental impact of agricultural policy may also differ over time and across regions, due to specific local circumstances. Both agricultural production and environmental impacts depend highly on location specific environmental conditions. Reality is much too complex to allow generalizations about the environmental impacts of agricultural policies. Therefore, in assessing the environmental impact of CAP, the widest possible attention should be given to local/regional differences of environmental consequences of policy instruments identified per product.

1. INTRODUCTION

1.1 Statement of concern

The Common Agricultural Policy (CAP) has been a main driving force behind the increase in agricultural production in the European Union (EU) 1) during the past three decades. The intensity of agriculture and the subsequent use of agricultural inputs (fertilizers, feed concentrates and plant protection products) increased partly in response to the price support. CAP also provided incentives to consolidate farm structure, which have led to extensive rationalization of the landscape, as well as pressures on semi-natural habitats. Farming practice intensified in some areas and specialization of agriculture increased as well. The subsequent deterioration of the environment is one of the main issues of concern to the public opinion, local authorities, Member States and the European Commission.

There is an increasing awareness in Europe of the main processes linking CAP with the environment and landscape, both at the level of Member States and the European Union as a whole. Agriculture is one of the most long-standing European common policies and also one of the five target sectors for action of the Fifth EC Environmental Action Programme 'Towards Sustainability' (CEC, 1992). The Treaty of the European Union (Article 130r) requires the integration of the environment into other community policies. One of the principles upon which action by the Community relating to the environment shall be based is the Polluter Pays Principle. This principle implies 'that the polluter should bear the expenses of carrying out the measures (...) to ensure that the environment is in an acceptable state' (OECD, 1975). The Polluter Pays Principle applies to costs of pollution prevention and control measures to encourage rational use of scarce environmental resources.

Trade distortions, surplus production and unbalanced distribution of farm income during the 1980s put pressure to adjust agricultural policies and alter farming practice towards the adoption of less intensive production methods. Awareness of environmental problems due to farming practices increased during the past decade. This has led to the integration of environmental considerations into the Common Agricultural Policy. The 1992 reform of CAP recognized the need of 'contributing to an environmentally sustainable form of agricultural production and food quality and formalising the dual role of farmers as food producers and guardians of the countryside' (CEC, 1992:36).

1) Since the entry into force of the Maastricht Treaty on November 1, 1993, the official name of the Community is European Union. The name European Community (EC) is retained in the Maastricht Treaty to denote the former European Economic Community. To avoid confusion, we have used the term European Union (EU) throughout the report.

Effects of CAP on the environment may be negative or positive

Negative impacts of CAP on the environment primarily concern the deterioration of water resources and of soils as well as the decline of biodiversity. This is amongst others to be due to the high levels of plant protection products used, the high nitrate levels observed in some groundwaters, high levels of water extraction, as well as the mechanical destruction of habitats and landscape because CAP support provided an incentive to consolidate holding and incorporate marginal land. The use of certain capital inputs is high in regions with intensive farming - especially, but not only, fertilizers and other agrochemicals. This was stimulated partly by price support measures of CAP. Also important are animal waste problems and emissions of ammonia in regions with intensive livestock production. Water consumption to irrigate agricultural land increased in regions with high levels of water deficit (e.g. parts of Spain) in response to regional and rural development programmes.

CAP however also might have a positive impact on rural areas and the environment. Landscape for example is cultivated by agriculture, and processes of marginalization and abandonment of agricultural land therefore might have negative effects on the environment and rural areas in specific regions. Income support to farmers in addition to low economic returns then may allow the continuation of farming in such regions. Council Regulation (EEC) 2078/92 (published in the Official Journal of the European Communities on July 30, 1992, L215, pp. 85-90), an aid scheme for an agriculture more compatible with the environment, encourages farmers to adopt less polluting and more environmentally sensitive methods of production. This also is an example of the integration of environmental considerations in Community policies. It includes, among others, compensation to farmers to contribute to improving agricultural income by granting the farmer an appropriate reward for the provision of environmental services.

The effects of CAP on the environment may vary considerably in different parts of the European Union, among others due to a range of factors such as farming systems, farm structure and the efficiency of the farmers in making use of chemical inputs. Differences across regions in the European Union also are large because of the wide range of biophysical conditions in terms of soil quality, water availability and slope, and biodiversity.

Direct and indirect effects both need to be considered

The effects of CAP on the environment of the European Union may be direct or more indirect in nature. Some direct effects are presented in the following:

- the arable sector reform towards lower support prices for cereals with compensatory payments on a per hectare basis, are aimed at encouraging farmers to use less intensive production methods. This is likely to reduce pressures on the environment;
- council Regulation (EEC) 2078/92 includes aid among others to farmers who reduce substantially their use of fertilizers and plant protection products. This scheme is aimed at contributing towards an agriculture more compatible with the environment;

- headage payment schemes in the sheep sector stimulated production. Animal density increased and overgrazing resulted in some areas of the United Kingdom. Overgrazing may lead to habitat loss and reduced biodiversity. The 1992 reform of the sheep regime is intended to encourage less intensive production methods. The government of the UK introduced measures to reduce overgrazing of moorland.

Some examples of indirect effects are the following:

- CAP reform does not affect horticulture in a direct way, but the reform of the arable crop regime may have a displacement effect, in such a way that cereals are replaced by vegetables. A switch from cereals to intensive horticulture might cause an increase in the use of chemical inputs, mainly at rather local levels;
- pig production hardly receives any protection under CAP, and direct effects of CAP on the environment therefore are likely to be limited in that sector. Indirect effects of CAP, however, are considered to be rather important in this sector, i.e. through the consumption of animal feed. The consumption of animal feed cereals produced in the European Union becomes more attractive under CAP reform in comparison to the use of imported feed concentrates. This may have an impact on the location and intensity of animal production in the European Union, especially with regard to pig and poultry production. A more balanced use of minerals in the agricultural sector might result;
- set-aside requirements under CAP reform may limit the options to spread manure from pig farming. The vulnerability to leaching of minerals from organic manure then might increase on the remaining land. However, it may also stimulate traditional farming practice, which could contribute to the maintenance of landscape and nature (e.g. Spain);
- abandonment of agricultural land might result in areas of marginal agriculture in the European Union. Erosion phenomena might result in response to abandonment in such areas. Environmental effects may therefore also increase in response to changing land cover patterns.

Other measures are likely to be important as well

Also important is the consideration that the impact of CAP on the environment in the European Union could not be isolated from other conditions. Other development trends of society and policy also affect the allocation of farming, farm structure, the use of inputs in agriculture, and their subsequent effects on the environment and landscape. Important in this respect are regional policies (e.g. EU Structural Funds and Member States' regional policies), environmental policies and other policies (e.g. economic, fiscal and employment policies).

Such a diverse pattern of existing relationships among agricultural and other policies and the environment however support the need (i) to analyse the relationships among agricultural policy and the environment which are currently known in the EU; and (ii) to identify any gaps in the information currently available on such relationships. The present report is aimed at providing this analysis. It is limited to an analysis on the effects of CAP on the environ-

ment, as well as on an assessment of existing environmental measures in agricultural and environmental policies affecting agriculture.

Existing environmental requirements in policy

Agricultural and environmental policies in the European Union presently already include numerous environmental requirements which affect farming and are aimed at serving environmental objectives. Farming activities are aimed at contributing to a reduction of deterioration of the environment or towards the management and maintenance of landscape and nature values. Such conditions are aimed at contributing to the achievement of a more environmentally sound agriculture in the European Union. They might result either from European legislation or from regional and national policies. Some examples of such environmental conditions are presented in the following:

- farmers are compensated for the reduction of output prices by payment that is based on the number of livestock on the holding. The achievement of a more extensive production of beef is to be expected from the fact that provision of a premium is restricted to specific stocking rates (2.5 livestock units (LU) per hectare of forage area (1995) and to be reduced to 2 LU/ha (1996)). Member States presently are allowed to attach additional or limiting conditions for granting compensatory allowances. It includes environmental and management conditions which encourage the use of practices compatible with the need to safeguard the environment and preserve the countryside. Such conditions are part of the beef and sheep regimes, as well as of the Less Favoured Area policy.
- one of the Accompanying Measures of CAP reform Regulation 2078/92 concerning the agri-environmental measures includes aid among others to farmers who undertake to reduce substantially, or maintain reduction in their use of fertilizers and/or plant protection products, or to introduce or continue with organic farming methods. One of the objectives of the agri-environmental measures is to integrate the requirements of environmental protection into CAP. A number of countries already developed agri-environment policies prior to the introduction of Council Regulation (EEC) 2078/92.
- conditions to farmers may derive from EU environmental policies such as the Habitat Directive, the Environmental Impact Assessment Directive, the Drinking Water Directive and the Nitrates Directive.
- environmental policies at national or regional level increasingly affect farming practice in large areas of the European Union. Important in this respect are requirements in environmental policy to reduce pollution due to mineral losses to waters and soils. Policies also are formulated by Member States in order to reduce the use of plant protection products, as well as policies on wildlife conservation and land use planning. Such policy objectives should contribute towards the achievement of an environmentally sound farming practice in the European Union.

A state-of-the-art review of the environmental actions or measures already affecting agricultural policy (both at EU-level and for Member States) is likely to increase the understanding

of the current relationships among CAP and the environment. Such a review should be based on a classification of environmental clauses according to their area of operation and on an assessment of how far they are implemented by farmers in the European Union. Farming conditions which derive from environmental policy will also be considered since they may contribute largely to the achievement of environmentally sound production methods in the European Union.

1.2 Objectives of the report

The objectives of the report are twofold:

- firstly, to analyse the principal consequences - positive and negative - of CAP for the environment in Member States or representative regions;
- secondly, to provide an assessment of existing European Union and national environmental requirements (i) in agricultural policies and (ii) in environmental policies affecting agriculture.

The report is about the impacts of CAP on the environment and landscape. Emphasis is given to the environmental impacts after the 1992 CAP reform. The report is based on a review of existing knowledge as well as on present regulation in the European Union. Agricultural policies in the European Union which are part of the analysis include market and price policy, Less Favoured Area Directive, agricultural structure policies, agri-environmental measures, early retirement measure, forestry measures, incentives for alternative crops (e.g. non-food set-aside), organic farming as well as quality and label policy. The integration of environmental concerns into the implementation of agricultural and rural development programmes financed from the EU Structural Funds will also be examined. This part of the report will focus on Objective 1 and Objective 5b areas.

Regarding the environmental effects of market and price policy, focus will be on a limited number of agricultural products. This is because market support measures and direct payments are mainly directed towards crop production (cereals, oilseeds, protein crops, tobacco, olive-oil and some fruits and vegetables) or livestock production (beef, dairy and sheep). The assessments of environmental consequences will focus on a limited number of products including cereals, beef, grapes, sheep, pigs and dairy.

Other policy measures in CAP (e.g. structure policies) mainly focus on production factors and conditions put to production methods, rather than on products. Environmental effects to be considered are related to the use of chemical inputs (plant protection products and fertilizers), extraction of water for irrigation purposes, supply of animal manure and emissions of ammonia, soil quality (including soil erosion and overgrazing), landscape (e.g. marginalization and abandonment of rural areas) and biodiversity.

Environmental actions or measures will be classified according to their area of operation (e.g. land use practice, including erosion and abandonment; use of fertilizers and/or plant protection products; supply of animal manure; extraction of water), and an assessment will be

made of how far they are implemented by farmers in the European Union.

Any gaps in the information that are currently available regarding the direct and indirect effects of CAP on the environment of the European Union, finally, are identified. Some recommendations for research and monitoring are provided.

1.3 Content of the report and readers' guide

Chapter 2 of the report will focus on the Common Agricultural Policy. The main objectives of CAP will be reviewed, and some of the major elements of CAP are summarized. This will distinguish between market and price policy, structural policies (including LFA Directive) and Structural Funds, the Accompanying Measures and other policy measures under CAP regime.

Some of the major relationships between price policy and the environment in the European Union will be reviewed in Chapter 3. Focus will first be on major issues of concern to the European environment (Section 3.2). Also, the literature will be reviewed regarding the impact of (changes in) output prices on the use of inputs in agriculture (Section 3.3).

The second objective of the report is covered by Chapter 4 of the report. Environmental actions which presently affect agriculture in the European Union will be reviewed in this chapter. The inventory will distinguish between legislation which derives from agricultural (Section 4.2) and the ones which derive from environmental policies (Section 4.3).

The first objective of the report is covered by Chapters 5 to 9 of the report. Effects of market and price policy on the environment and landscape will be reviewed in chapter 5 of the report. These effects will be analysed according to agricultural products, and will distinguish between cereals, beef, grapes, sheep, pigs and dairy. Interrelationships among products in response to policy change will also be examined. Emphasis will be given to the 1992 CAP reform. Products examined in the report represent a high share of EAGGF expenditures and cover a high share of land used agriculturally in the EU. Products like tobacco, olive-oil and fruits and vegetables are not covered in the report, but there can be problems with these products too.

The effects on the environment and landscape of various other parts of CAP will be examined in Chapters 6 to 9 of the report. A distinction will be made between the Less Favoured Area Scheme (Chapter 6), agricultural structure policies (Chapter 7), the Accompanying Measures (Chapter 8) and Incentives for organic farming (Chapter 9).

The major findings of Chapters 5 to 9 will be integrated towards an assessment of the effects of CAP on water quality, soil quality, air quality, landscape and biodiversity (Chapter 10). Emphasis will be given in that chapter on a qualitative description of possible relationships between instruments of CAP and environmental quality. Some concluding remarks on the major findings of the study are finally summarized in Chapter 11 of the report. This chapter also identifies some gaps in the information currently known on the relationships between CAP and the environment.

Readers' guide

The report includes investigations at different levels of detail, including two introductory chapters, a review of environmental requirements in policy, as well as an analysis regarding the effects of CAP on the environment and landscape. Figure 1.1 provides a schematic overview of the various parts of the report, which serves as a readers' guide to the report.

Chapters 2 and 3 are *introductory chapters* to inform readers of basic elements of CAP (Chapter 2), of major issues of environmental concern in the European Union and of linkages among agricultural policy and the environment (Chapter 3).

Chapter 4 is aimed at serving readers who would like to get details of *present environmental measures affecting agriculture* in the European Union. It lists environmental clauses in agricultural policy as well as present conditions to farmers which derive from national legislation. This chapter could be read independently of previous chapters.

Chapters 5 to 9 serve readers with an analysis of the effects of CAP on the environment and landscape. Readers with basic knowledge on CAP could start with this part of the report.

Chapter 10 is for those readers with an interest in the relationships between CAP and quality of the European environment. It builds upon the analysis from Chapters 5 to 9.

1.4 Approach used and delineation of the study

The study is based on desk research drawing from existing information and available research studies. Emphasis is given in the report on the 1992 CAP reform, and its effects on the environment and landscape of the European Union. No modelling work was elaborated in the framework of the study, but it was based upon assessments made so far regarding CAP and the location of agriculture in the European Union.

Part of the study was a consultation of experts from appropriate authorities, research institutes and interest groups in Member States. Many organizations contributed to the project. A full list of organizations that provided information to the project is in Appendix A of the report.

The major part of the study is also limited regarding the effects of CAP on the quality of the environment in the European Union. Emphasis is placed on the use of inputs in agriculture and the emissions to the environment. Emissions of ammonia, for example, are considered, but their effects on acidification are not examined. Also, the available knowledge regarding the effects of CAP on the use of plant protection products is reviewed. An attempt to assess the effects of CAP on environmental quality is provided in Chapter 10.

Introduction

CAP
Chapter 2

Agricultural policy
and the environment
Chapter 3

Review

Environmental
requirements
Chapter 4

Analysis

Market and
price policy
Chapter 5

Other CAP
policies
Chapters 6 to 9

Effects

Environmental
quality
Chapter 10

Conclusions

Major findings
Chapter 11

Figure 1.1 Readers' guide to the report

2. THE COMMON AGRICULTURAL POLICY

2.1 Introduction

This chapter reviews the main objectives of the Common Agricultural Policy (CAP) (Section 2.2). Some of its major elements are summarized in subsequent sections. A distinction is made between market and price policy (Section 2.3), structural policies (Section 2.4), the Accompanying Measures (Section 2.5), and other policy measures under the CAP regime (Section 2.6).

2.2 Objectives of the Common Agricultural Policy

The original objectives of the Common Agricultural Policy are specified in the well-known Article 39 of the 1957 Treaty of Rome. These objectives were described as follows:

- to increase agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimal utilization of the factors of production, in particular labour;
- thus to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture;
- to stabilize markets;
- to ensure stability of supplies;
- to ensure that supplies reach consumers at reasonable prices.

The main reason for government intervention policies was (and still is) considered to be to encourage agricultural productivity so to ensure farmers a satisfactory and equitable standard of living and to stabilize agricultural markets and farmers' incomes. No objectives that relate to the environment and nature are specified in Article 39 of the Treaty of the European Union, nor in other Articles of the separate agricultural section of the Treaty (Articles 38-47). The only place where indirectly reference is made to environmental concerns in relation to agriculture is Article 43. This Article states that the Council may grant authorization to lend support in order to protect farming disadvantaged by structural or natural conditions. This formulation gives room to measures directed to protect and manage the environment, nature and landscape. An important example of this kind of policy to protect the environment and landscape are the agri-environmental measures established under Council Regulation (EEC) 2078/92.

Concerns about the negative effects of agriculture on the environment started at the official EU level in the mid-1980s. The EC's Third Action Programme for the Environment which was published in 1983 stated the need to 'promote the creation of an overall strategy, making environmental policy a part of economic and social development, (resulting) in a greater

awareness of the environmental dimension, notably in the field of agriculture (and) (...) enhance the positive and reduce the negative effects on the environment of agriculture.' (Official Journal of the European Communities, C.46, 17 February 1983). These notions were also reflected in conceptual papers like the 'Green Book on Agricultural Policy'. The Green Paper on the future of CAP proposed that agricultural policy should 'take account of environmental policy, both as regards the control of harmful practices and the promotion of practices friendly to the environment'. See also Baldock and Lowe (1996) for a description of the history of European decision-making processes on agri-environmental measures.

In 1985, Member States were able to provide support to farmers to ensure that agricultural practices are compatible with environmental protection. Aid was provided at that time, for example, to farmers in the UK under the Environmentally Sensitive Areas Scheme. A framework for the use of management agreements in the Netherlands was already laid down in 1975 by a government paper on the relation between agriculture and the conservation of nature and landscape, the so-called Relation Paper (MLV, 1975). Farmers are compensated for their participation in management agreements.

The Single European Act of 1987, which amended the Treaty of Rome, paved the way for a harmonization of agricultural and environmental policies. In this context, Article 130R (2) of the Treaty of the European Union (signed at Maastricht, 7 February 1992) is important because it stipulates that 'environmental protection requirements must be integrated into the definition and implementation of other Community policies'.

Although over the years awareness increased of environmental problems due to farming practice, it did not lead to an explicit integration of environmental considerations into CAP until the issue was recognized to be of main importance in the agricultural policy reform package. In its Reflections paper (COM(91)100 of February 1, 1991), the Commission concluded that there was a need for a fundamental change of CAP (CEC, 1991a). It was recognized that existing price guarantees, through their direct link to production, lead to output growth, adding to already excessive intervention stocks or to already oversupplied world markets. Reference was also given by that time that the built-in incentives to greater intensity and a rise of production, provided by the market and price policy mechanisms, put the environment at increasing risk. Therefore lowering prices should result in less (surplus) production. It should also diminish deterioration of the environment. Less intensive farming practices could be encouraged by direct payments subject to conditionality regarding the intensity of farming and the treatment of inputs. In the Reflection paper the Commission also stressed that the farmer plays an important role in the maintenance and protection of the environment, landscape and nature. Farming is an essential activity in the rural areas of the Community according to the Commission. The Commission emphasized that the farmers' role in the protection of the rural environment and management of the landscape should be recognized more fully and remunerated accordingly. A programme was developed to encourage farmers to use production methods which are less harmful to the environment. This policy and its implications have been formulated in the Agri-Environmental measures of Council Regulation (EEC) 2078/92. The programme included a system of aid to promote environment-friendly management of farmed land.

There are two types of policy instruments by which the EU is trying to achieve its objectives. These are, firstly, measures directed at the organization of markets for various products, and secondly, the so-called structural measures. The main objectives of CAP are traditionally achieved by price support, and therefore very much dependent on production levels of crops and livestock. The system provided incentives towards a rise of production levels. The EU structural policy focuses on the improvement of infrastructure, farm structure and the intensity of farming and therefore is more directed towards production factors than agricultural products. Over time, structural measures have been adjusted in order to improve their efficiency. At the reform in 1988 of the so-called Structural Funds, the agricultural structure policies were integrated with other structural policies. Also, part of the rural development measures are financed by the Structural Funds. These funds are aimed at strengthening regional and rural development in the EU. At the 1992 reform package, some parts of agricultural structure policy have been reformulated in the so-called Accompanying Measures. So at the moment part of the structural measures for agriculture are incorporated and diversified to accompanying measures of the CAP market and price policies.

- CAP market and price support measures;
- Accompanying measures;
- Horizontal socio-structural measures (Objective 5a);
- Regional and rural policy (Objective 1 and 5b);
- Other policies like incentives for alternative crops, quality and label policy, biomass production, farm diversification, etc.

Figure 2.1 Relevant policy measures in CAP

The 1992 CAP reform is aimed among others at improving the competitiveness of EU agriculture, to restore market balance and to stimulate less intensive production methods. Measures were adopted in order to reduce surplus production, reduce price support (together with more targeted direct income support), and improve environmental soundness of agricultural production (CEC, 1993a). The Commission was well aware that the shift in policies could result in an increase of the agricultural budget. The Commission's expenditures on CAP are financed by the European Agricultural Guidance and Guarantee Fund (EAGGF). This Fund consists of two sections: the Guarantee section and the Guidance section. Common expenditure on market and price policy is paid by the Guarantee section and common expenditure on agricultural structural policy by the Guidance section. The Accompanying Measures are part of the Guarantee Section. About 95% of the EAGGF is spent on the Guarantee section, the remaining to be spent on structural policy. These figures were rather stable over time (see e.g. Terluin, 1992). The share of expenditures on structural policy more recently shows an increasing trend. The Guarantee Section of EAGGF amounts to some 36 billion ECU (1994), and the Guidance Section amount to some 3-4 billion ECU (1994).

2.3 Market and price policies

Market and price policy schemes differ among agricultural products and regulations have been subject to change over time. Therefore, a wide variety of policy instruments have been applied since the beginning of the 1960s. In the recent past, two important changes are the quota system which was introduced in 1984 in the dairy sector and the Mac Sharry reform which came into effect in 1993. The basic types of support mechanisms in place before the reform in 1992 of market and price policies were the following:

- intervention of agricultural products, which was supported through a combination of sales at floor prices to a buffer stock agency (intervention buying) and measures taken at the border, ensuring that imports from third countries only enter the Community at prices well above these supported prices, and granting export subsidies (called refunds) where necessary to bring the price of exports down to the price levels on export markets;
- producer subsidies or deficiency payments;
- a flat-rate subsidy based on area harvested or on production level;
- border measures: tariffs and levies, export subsidies (refunds);
- supply control measures: product quotation, set-aside;
- co-responsibility levies (duties on production) and guarantee thresholds (charging producers for part of the costs when production exceeds a prespecified threshold).

Irrespective of the effects of the restrictive price policy and supply control measures, they were insufficient to reduce surpluses, to stabilize expenditures by CAP and to avoid trade disputes. Moreover, a continuation of market and price policies would result in a further intensification of production, with negative effects on the environment and landscape (CEC, 1991a). Therefore a plan aimed at a reform of CAP was launched in 1991 by the EU Commissioner responsible for agriculture, Mr. Ray Mac Sharry. In 1992 the plan was, after some adjustments, accepted. The main lines of the CAP reform are summarized in figure 2.2.

Market regulations for cereals, oilseeds, pulses, tobacco, milk, beef and lamb were most drastically reformed. The most fundamental change of the CAP reform addressed cereals. Intervention prices are to be reduced by around one-third. In order to compensate cereal producers for income losses because of price decreases, a direct payment is provided on a per hectare basis. Large-scale producers (with production levels which may exceed 92 tonnes of cereals equivalents on their land under cereals, oilseeds and protein crops) are only eligible to hectare compensation if they set aside a certain percentage decided each year by the Council of Ministers of their so-called base area. This area includes the average acreage utilized to grow cereals, oilseeds, fodder maize and protein crops in the period 1989-1991. Producers with production levels below 92 tonnes of cereals equivalents are exempted from the obligation to put aside part of their land. For tobacco, the reform introduced quotas for individual producers, their sum being less than the existing EU quota. Only production within the quota is subsidized. Market intervention and export refunds are abandoned.

Arable sector:

- 1) a reduction - in three steps - of about one third in the cereal intervention price, which is to fall by 1995/96 to 100 green ECU per ton. The threshold price will be 155 green ECU per ton;
- 2) elimination of the price support for oilseeds and protein crops;
- 3) compensation through direct area payments based on historical base areas and regional yields, subject to set-aside for such crops grown by all farmers except the relatively small ones with a production level which does not exceed 92 tonnes of cereals equivalent. A certain percentage of set-aside is decided on each year by the Council of Ministers. Fifteen per cent rotational set-aside was introduced in 1993/94. In 1994/95, farmers were given the option of choosing non-rotational set-aside, at 18 or 21%.

Livestock sector:

- 1) in two steps a 2% cut in milk quota, optional to the market situation; 5% reduction of the butter intervention price, also in two steps;
- 2) a 15% reduction in the intervention prices for beef from July 1993, in three steps;
- 3) compensation through direct headage payments (premiums) subject to a maximum stocking rate (two livestock units (LU) per hectare of forage crops by 1996);
- 4) an increase in male bovine and suckler (beef) cow premiums. Male bovine premiums are subject to an individual limit of (2 times) 90 bovine animals per holding, while the ceiling for suckler cows premiums is equal to the number of animals for which a premium was granted in the reference year (1990, 1991 or 1992). Premiums are granted within the limits of regional ceilings which, if exceeded, reduce the number of eligible animals per producer. There are extra headage premiums if a producer reduces the stocking rate below 1.4 LU per hectare of forage crops;
- 5) a reduction in the ceiling for normal beef intervention buying from 750,000 to 350,000 tonnes by 1997;
- 6) individual limits of full ewe premium based on eligible claims made in 1991. Full ewe premiums for no more than 1,000 animals in LFAs, and for 500 animals in other areas.

Accompanying measures:

- 1) an agri-environmental package aimed at more extensive means of production and the use of land for natural resource protection and public leisure;
- 2) aid for forestry investment on agricultural land and management with up to 20 years' compensation for income loss;
- 3) various forms of compensation for early retirement, including lump sum and/or annual payments, for farmers and farm workers aged over 55.

Figure 2.2 Main features of the 1992 CAP reform

The reform proposals were much less radical for animal products than they were for arable crops. A reduction of the milk quota by 2% was announced but to be introduced when the market situation was appropriate. In 1995, it was decided not to cut the quota then or in 1996. Since 1993/94, price support for butter has been reduced by 5%. The intervention price for

beef is to be reduced by 15% within three steps. After a transitional period, farmers may in 1996 apply for premiums for bulls and suckler cows up to a stocking rate of two livestock units per hectare of fodder area. Small scale producers are exempted from the stocking rate requirement. If stocking rates do not exceed 1.4 livestock units per hectare, farmers receive an additional premium. The reform also introduces a measure aimed at curbing the rapid increase in expenditures on sheep, by putting a maximum on the amount of support individual producers are able to receive.

Evaluation of the first two years of the CAP reform shows that the market balance for cereals has improved significantly (CEC, 1995b). Production decreased to around 160 million tonnes in 1994/95, or 6 to 7% less than the average of the three years previous to the reform. In the first two years of the reform, production per hectare was 5 to 7% higher than in previous years. Partly this is because the less productive hectares are set aside. Furthermore, there has been a shift from barley to wheat, the latter having a significantly higher production per hectare. The reduction in protection of cereals, if accompanied by a fall in market prices, could result in a higher demand of cereals for animal feed. Mainly because of the usual cyclical movement, beef production went down slightly, but demand also decreased and at a higher rate. The intervention storage could only be reduced because of increased outlays for export refunds and no intervention buying. Although the first results indicate a better market balance of the products subject to the reform, the question remains whether this situation could be maintained over a longer period of time.

2.4 Structural policies

Structural policy aims at a modern, productive agriculture. One of the objectives of the agricultural structural policy emphasized during the 1958 Stresa Conference is to increase labour and capital productivity in the sector. This should be achieved by improving economic conditions in agriculture. Different from market and price policies, the impact of structural measures lies primarily in the factors of production, like land or labour.

Until the early seventies the structural policy of the Community was mainly based upon the coordination of measures taken by Member States. In 1972 a major initial step towards a common structural policy was made when directives (72/159, 72/160 and 72/161) were adopted by the Council with the main objective to create modern farms capable of providing a fair income and satisfactory working conditions for people involved in agriculture. Selective aids were granted for the modernization and cessation of farms and for vocational training of farmers.

The structural policy was supplemented in 1975 by instituting a special support scheme for less-favoured agricultural areas. The LFA Directive (75/268) was the first common instrument of regional agricultural structure policy. Less Favoured Areas are areas where agriculture is hampered by permanent natural handicaps. The main objective of the LFA Directive is the continuation of farming in those regions and thereby maintaining a minimum level of population or conservation of the countryside. Three types of LFAs can be distinguished, i.e. (i)

mountain areas, (ii) areas in danger of depopulation and where the conservation of the countryside is necessary, and (iii) areas affected by specific handicaps in which farming must be continued in order to conserve the countryside. Member States are authorized to give farmers direct payments in order to support farm income. This income support, which is financed by Member States and partly reimbursed by the EU, consists of compensatory allowances per animal and per hectare.

The regional perspective of structural policy was further developed after the adoption of the LFA Directive. The so-called 'Mediterranean Package' of 1977, directed to regions in Italy and southern France, included special measures with respect to investment programmes for irrigation, forestry and rural infrastructure. In 1979 the concept of 'integrated development programmes' was put forward, integrating agricultural development measures with the development of other activities important to the rural economy. These regional and integration programmes have been included in a reformulated structural policy in 1985 in which measures were taken oriented to strengthen the competitiveness of EU agriculture by improving the quality of production, by improving the tuning between supply and demand, and by preserving the environment (Council Regulation 797/85). One of the new measures was the regulation that farmers in ecologically vulnerable areas could be eligible for compensatory payments, conditional to environment-friendly farming practices. In 1988 the reform of the structural funds was implemented, resulting in a reorganization of agricultural structural policies and an integration of these policies with regional and rural development measures. Efforts to the reform of the Structural Funds of the European Community addressed the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the EAGGF Guidance Section. The aim was to improve the operation of these funds, and to clarify and rationalize their tasks in order to strengthen economic and social cohesion among EU regions. The reform identified five main objectives, with Objective 5 being subdivided into two areas. Rural and agricultural regions are directly affected by three of these objectives:

- Objective 1: Promoting the development and structural adjustments of the less developed regions;
- Objective 5a: Speeding up the adjustments of agricultural structures (i.e. adapting production, processing and marketing structures in agriculture and forestry);
- Objective 5b: Promoting the development of fragile rural areas (i.e. where employment from agriculture accounts for a high proportion of total employment, there is a low level of agricultural income, and a low level of socio-economic development in terms of GDP per capita).

Regulations which govern the Community's Structural Funds were updated in 1992 including certain environmental criteria. The relevant fund for Objective 5a is the EAGGF Guidance Section and for Objectives 1 and 5b in addition the ERDF, the ESF and the European Investment Bank (EIB) related activities can also be used. Measures for the 1993-1997 period which are covered by Objective 1 are financed by the EAGGF-Guidance Section. Objective 1 and 5b correspond to specific regions and Objective 5a applies throughout the European Union.

The available programmes in the framework of Regulation 797/85 allow farmers to conclude a management agreement in an area, previously designated as 'sensitive as regards protection of the environment and natural resources'. All agricultural structural measures were modified with the aim to speed up improvement and modernization of farms within the limits compatible with maintaining the balance of the agricultural markets and safeguarding the environment, while encouraging the diversification of farm activities and improving processing and marketing structures for agricultural products (CEC, 1990). Besides measures already existing (like the LFA-measures) a new set of structural measures was introduced including a land set-aside programme and an income support programme aimed at encouraging farmers aged 55 or over to leave farming. The 1988 voluntary set-aside scheme has been incorporated under the cereal regime of the Mac Sharry reform, while the early retirement scheme has been included in an extended and refined form in the accompanying measures of 1992. The agri-environmental programmes include aid to farmers who undertake to set-aside land 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 (Article 2 (f) of Council Regulation (EEC) 2078/92 on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside).

2.5 Accompanying measures

The accompanying measures, included in the 1992 CAP reform, also are to stimulate the adjustments of the agricultural structure. They are formulated in the agri-environmental measures under Regulation (EEC) 2078/92, the early retirement scheme under Regulation (EEC) 2079/92, and the afforestation scheme under Regulation (EEC) 2080/92. These programmes aim at the achievement of more extensive modes of production, afforestation of agricultural land, conservation of natural resources and using land for public leisure. Moreover, structural improvement is to be accelerated through an enhanced early retirement scheme. The Accompanying Measures are implemented through Member States programmes with 50% of the costs (75% in Objective 1 regions) borne by the CAP budget.

Early retirement schemes include annual payments and lump sum payments for farmers and farm workers aged over 55 years. The 1988 early retirement arrangements have been revised and made more attractive in the 1992 reform. Also the attractiveness of afforestation of agricultural land has been enhanced by higher grants and increased eligibility for aid, as existed premiums were considered to be low (CEC, 1991b, COM(91) 258 final). With the agri-environmental programme an aid scheme is provided to encourage farmers to use production methods with reduced vulnerability to the environment or to conserve the environment and landscape. This programme involves measures for a significant reduction in the use of chemical inputs in crop production. In the livestock sector a reduction of stocking density (mainly sheep and cattle) is sought in areas where damage is being caused by overstocking. Furthermore the programme promotes environment-friendly management of farmed land in order to

conserve or re-establish the diversity and quality of the natural environment, and a system is established to ensure the environmental upkeep of abandoned agricultural land by farmers and non-farmers living in rural areas. Member States are to implement the aid scheme by means of multi-annual zonal programmes. The agri-environmental programme is completed by a provision allowing the set-aside of agricultural land on a long-term basis (20 years) for environmental purposes. Provisions presently allow land entered into the agri-environment set-aside and forestry schemes to count as set-aside under Council Regulation 1765/92.

2.6 Other policy measures

The Common Agricultural Policy also includes other measures which are important in an analysis of their effects on the environment. Council Regulations have been formulated during the past couple of years on organic farming and on quality and labelling of agricultural products.

Organic farming has its roots as a movement in the early decades of the 20th century, although it is what farmers have done down through all the centuries. However, only in the 1980s organic farming developed in most European countries. This development was to respond to the expansion of consumer demand for quality products, to growing awareness of health questions linked to eating habits and to an overall concern throughout society on the state of the environment. Large differences occurred in production methods between countries. Council Regulation 2092/91 on Organic Production of Agricultural Products defines uniform, harmonized rules for operators in all Member States. Furthermore consumers are provided with guarantees concerning the production methods and principles applied on the holdings claiming to be organic farms and concerning processing and marketing practices. Organic products are identified through specific labelling rules intended to guarantee to the consumer origin, preparation, processing and packaging of the product (Baillieux and Scharpe, 1994). In some EU countries (Denmark, the Netherlands and Germany in particular) national aid schemes are available. They take the form of direct support to enable farmers to cope with a conversion period, or by providing extension services and technical assistance to farmers. There is no specific Community aid to organic farming but some of the structural instruments provide substantial support (Baillieux and Scharpe, 1994: 21-23). Support to organic farming is available under the Agri-Environmental Measures (Council Regulation 2078/92), as well as by Regulation 2328/91, Regulation 866/90, as amended by 3669/93 and Regulation 2081/93 and 2085/93. All these Regulations include provisions to support investments into quality agricultural products such as organic products.

Some Council Regulations on quality and labelling of agricultural products also are relevant towards an assessment of CAP and the environment. Council Regulation (EEC) 2081/92 is on the Protection of Geographical Indications and Designations of Origin for Agricultural Products and Foodstuffs. It allows producers to increase their income in return for an effort to improve quality and guarantee production method and origin. It explicitly states that 'the promotion of products having certain characteristics could be of considerable benefit to

the rural economy in particular to less-favoured or remote areas, by improving the incomes of farmers and by retaining the rural population in these areas'. Labelling of products under this regulation depends on the region where these products are produced. Quality aspects of agriculture also are identified in the framework of Council Regulation (EEC) 2082/92 concerning Certificates of Specific Character for Agricultural Products and Foodstuffs. Production of these products is according to prespecified methods or processes, or by making use of traditional raw material.

2.7 Concluding remarks

The Common Agricultural Policy (CAP) includes objectives on market and price policies of agricultural products which apply at Community level. Regional differences however are increasingly recognized. This is reflected by the increasing importance to integrate rural policies with regional targets and environmental requirements with the objectives of CAP. Measures adopted in 1992 were aimed to reduce surplus production, reduce price support, and improve environmental soundness of agricultural production.

The most fundamental change of the CAP reform addressed cereals, oilseeds and protein crops (COP). Intervention prices were to be reduced by about one third. The reform was much less radical for animal production than they were for arable crops.

There is an increasing importance to integrate rural policies with regional targets and environmental requirements with the objectives of CAP. Council Regulation (EEC) 2078/92 (Agri-Environmental Measures) for example is based on programmes formulated at national, regional and local level and aimed towards agricultural production methods which are compatible with the requirements of the protection of the environment and the maintenance of the countryside.

3. RELATIONS BETWEEN PRICE POLICY AND THE ENVIRONMENT

3.1 Introduction

The main objective of this chapter is to identify major linkages among price policy and the environment of the European Union. First, some major issues of concern to the environment of Europe are discussed (Section 3.2). Figures are presented on major issues related to agriculture and the environment in the EU. The second objective of this chapter is to briefly review the available literature on relationships among prices, production and the use of inputs (Section 3.3).

3.2 Issues of environmental concern

Major issues of environmental concern to the EU presently derive from water, soil and air quality, biodiversity, landscape and natural habitats.

People in Germany, the Netherlands and the United Kingdom in the 1960s and 1970s were mainly concerned with landscape and nature conservation, and to a limited extent with agricultural pollution. Main issues in the 1980s were quality of water, soil and air and biodiversity. Agriculture however also affects ecosystems and landscape. In this context there is an increasing awareness of the environmental dimension of landscape and of the linkages among land utilization and quality of the European environment.

There is some empirical evidence that the use of plant protection products poses a threat to the environment (Faasen, 1995). Usage levels of plant protection products in the EU are highest in areas with intensive farming practice, because of the risks of the occurrence of pests and diseases (Brouwer et al., 1994).

Losses to the environment of nitrogen from agriculture include leaching of nitrates to surface and groundwater, emissions of ammonia to the atmosphere, as well as denitrification. High supply levels of animal manure from intensive livestock farming may create problems of water and soil pollution. The quality of drinking water is one of the most important issues of environmental concern in areas of the European Union with a high density of livestock population. Nitrate levels in some groundwaters therefore need to be reduced and eutrophication of surface waters is a particular problem in certain parts of the Union. The Nitrate Directive (Council Directive 676/91) addresses these issues. Also, eutrophication of surface waters needs to be reduced in many regions of the Union. High levels of phosphate and nitrates cause eutrophication of surface waters and affect biodiversity through the depletion of plant and animals, and growth of algae. Emissions of ammonia contribute to acidification of soils and water, and agriculture also contributes to this type of pollution.

The quality of landscape and loss of habitats are important as well. Large quantities of fertile soils are lost due to soil erosion in part of the EU. This is mainly due to inappropriate land use management. Overgrazing is observed in parts of the Union, and will affect the growth, quality and species composition of vegetations, and subsequently lead to habitat loss and reduced biodiversity.

TARGETS UP TO 2000	ACTIONS
Standstill or reduction of nitrate levels in groundwater.	Strict application of the nitrate directive.
Reduced incidence of surface waters with a nitrate content exceeding 50 mg/l. or giving rise to eutrophication of lakes and seas.	Setting of regional emission standards for new livestock units (ammonia) and silos (silage). Reduction programme for phosphate use.
Stabilization or increase of organic material levels in the soil.	Allocation of premiums and other compensation payments to be subject to full compliance with environmental legislation.
Significant reduction of the use of plant protection products per unit of land under production and conversion of farmers to methods of integrated pest control, at least in all areas of importance for nature conservation.	<ul style="list-style-type: none"> - Registration of sales of plant protection products - Registration of use of plant protection products - Control on sale and use of pesticides - Promotion of 'Integrated Control' (in particular training activities) and promotion of bio-agriculture
15% of agricultural area under management contracts.	<ul style="list-style-type: none"> - Programmes for agriculture/environment zones with premiums co-financed by EAGGF - Protection of all endangered domestic animal races
Management plans for all rural areas in danger.	<ul style="list-style-type: none"> - Re-evaluation of license conditions for irrigation and of state aids for drainage schemes - Training of farmers, promotion of exchange visits between regions with comparable environment management situations
Increase of forest plantation, including on agricultural land.	New afforestation and regeneration of existing forest, favouring the most adequate means for the environment (slow growing trees, mixed afforestation).
Improved protection (health and forest-fires).	Further action against forest-fires.

Figure 3.1 Medium term targets up to the year 2000 and actions needed in agriculture
Source: CEC, 1992:37.

The Fifth Environmental Action Programme

Targets are formulated in the Fifth Environmental Action Programme in order to achieve sustainable development of the agricultural sector. In figure 3.1 a list of these targets for the year 2000 and actions needed in relation to agriculture and forestry are given.

No specific targets are included in the Fifth Environmental Action Programme regarding the need for a balanced development of rural areas of the Community, which also meets the sector's productive, social and environmental functions (CEC, 1992:7).

The present state of the environment regarding agriculture is briefly summarized in the remaining part of this section. This will focus on the use of plant protection products, the present state of mineral surplus, soil quality (erosion and overgrazing), landscape (e.g marginalization and abandonment) as well as the present state of habitats and of biodiversity.

The use of plant protection products

The most recent assessment of the annual sales of plant protection products for use in agriculture in EUR 15 adds to slightly over 350 million kg of active ingredients (table 3.1). This is

Table 3.1 Annual sales of plant protection products in EUR 15 for use in agriculture by product group and country (in 1,000 kg of active ingredients)

Country	Year	Herbi- cides	Fungi- cides	Insecti- cides	Nemati- cides	Other	Total
Belgium a)	1992	2,560	3,292	387	857	770	7,866
Denmark	1992	3,525	1,632	200	71	297	5,725
Germany	1990	16,970	10,984	1,525	-	3,667	33,146
Finland	1992	1,007	194	92	-	47	1,340
Greece	1989	3,440	10,280	3,248	250	6,259	23,477
Spain	1990-92	1,750	32,700	2,800	10,000	5,000	52,250
France	1992	27,281	44,786	6,110	1,835	4,697	84,709
Ireland	1992	1,001	663	63	81	264	2,072
Italy	1989	10,600	57,100	11,100	9,500	2,800	91,100
Luxembourg	1991	121	113	10	-	9	253
Netherlands	1992	2,987	4,192	557	6,762	1,423	15,921
Austria	1992	1,826	1,489	143	-	412	3,869
Portugal	1992	1,192	3,932	754	-	239	6,117
Sweden	1994	1,526	317	46	-	137	2,026
United Kingdom	1992	13,039	6,708	1,043	-	3,010	23,800
EUR 15		88,825	178,382	28,078	29,356	29,031	353,672

a) It is considered that half the sales of herbicides are used outside agriculture.

Source: Brouwer, 1995a.

considered to be the best available estimate on the actual use of plant protection products for agriculture in the EU. Italy and France already account for 50% of total sales of plant protection products in the EU. Fungicides cover about half the total sales. The remaining product groups and corresponding shares are herbicides (25%) and nematicides, insecticides and other products (each of them with a share 7-8%).

The amount of plant protection products sold per hectare of land to grow arable crops and permanent crops is less than 3 kg in Denmark, Spain, Ireland and Portugal (table 3.2). Sales are between 3 and 4 kg in Luxembourg and the United Kingdom. It is highest in Belgium (11 kg of active ingredients per hectare) and the Netherlands (17 kg of active ingredients). Sales are around the average of the EU (4.2 kg per hectare) in Germany and France.

Table 3.2 Annual sales of plant protection products in agriculture by product group (in kilogramme of active ingredients per hectare of arable land and land under permanent crops) by Member State

Country	Arable/ permanent crops (x 1,000 ha) a)	Sales by product group (kg/ha)					total
		herbi- cides	fungi- cides	insect- icides	nema- ticides	other	
Belgium b)	737	3.5	4.5	0.5	1.2	1.0	10.7
Denmark	2,558	1.4	0.6	0.1	<0.1	0.1	2.2
Germany	7,492	2.3	1.5	0.2	-	0.5	4.4
Greece	3,912	0.9	2.7	0.8	0.1	1.6	6.0
Spain	20,089	0.1	1.6	0.1	0.5	0.2	2.6
Finland	2,524	0.4	0.1	<0.1	-	<0.1	0.5
France	19,234	1.4	2.3	0.3	0.1	0.2	4.4
Ireland	933	1.1	0.7	0.1	0.1	0.3	2.2
Italy	11,975	0.9	4.8	0.9	0.8	0.2	7.6
Luxembourg	81	1.5	1.4	0.1	-	0.1	3.1
Netherlands	911	3.3	4.6	0.6	7.4	1.6	17.5
Austria	1,524	1.2	1.0	0.1	-	0.3	2.5
Portugal	3,173	0.4	1.2	0.2	-	0.1	1.9
Sweden	2,790	0.5	<0.1	<0.1	-	<0.1	0.7
United Kingdom	6,600	2.0	1.0	0.2	-	0.5	3.6
EUR 15	84,533	1.1	2.1	0.3	0.3	0.3	4.2

a) Arable land also includes voluntary set-aside; b) It is considered that half the sales of herbicides are used outside agriculture. Source: Sales of plant protection products, see table 3.1; arable land and land under permanent crops from FAO.

Source: Brouwer, 1995a.

They are also relatively high in Greece and Italy (6 to 8 kg per hectare). Differences among countries are large, both in terms of (i) the total sales of plant protection products per hectare and (ii) the composition of the type of plant protection products used.

The use of plant protection products in the EU showed a decreasing trend during the past couple of years. Several factors need to be considered in an examination of this trend:

- the role of technological development (i.e. chemical substitution) is likely to be one of the major reasons for such a change. A smaller amount of active ingredients per hectare now suffices to treat plants compared to what was used in the past. However, there is not necessarily any environmental benefit in using less of something that is more powerful. Sales of herbicides to grow cereal crops decreased largely in Denmark because of the substitution among products (c.f. Brouwer et al., 1994: 36);
- climatic and weather conditions could largely affect the use of plant protection products to prevent pests. This may contribute to an interannual variation of the use of agrochemicals. The use of insecticides may be high in regions with high temperatures, and be reduced during a period of lower vulnerability to insects. Sales of nematicides in the Netherlands decreased in 1993 by more than 60% compared to the previous year. One of the most important factors was the bad weather conditions for soil disinfection (high rainfall) in the autumn of that year;
- the reform of CAP might affect the use of plant protection products. There is some empirical evidence that the consumption of plant protection products reduced during the period of de-coupling of income support from the price system. Usage levels of plant protection products decreased during the past couple of years. In cereal production for example, their use decreased on a per hectare basis since 1988 in France (40%), Germany (35%) and parts of the United Kingdom (almost 20%) (Noé et al., 1995). This reduction in usage levels runs parallel to changes in agricultural policy (stabilizers and the Mac Sharry reform) which started around the late 1980s;
- changes in environmental policies and their impact on usage levels of plant protection products. This also includes extension service and research which are targeted on a more rational use of plant protection products (see also Section 4.3.3);
- the impact of the autonomous development of a decrease in utilized agricultural area in the EU. The area of arable crops and permanent crops decreased by only a few percent since 1985. The impact on the use of plant protection products is likely to be rather limited.

Nutrients

The quality of water is one of the most important environmental issues in areas with a high density of livestock population. Nitrate levels of 50 mg/l (EU drinking water standard) and more may be expected in about 25% of the agricultural soils in the EU, particularly in the Netherlands, Denmark, Belgium, Germany, the southern part of the United Kingdom, the Po Valley area in Italy, and western France (RIVM and RIZA, 1991). This is due to either

the high surplus of nitrogen from agriculture or due to vulnerability of the soil to leaching, or a combination of these two phenomena.

Major adjustment processes are required in EU agriculture in order to reduce leaching of minerals and meet the standards of nitrate. This holds especially in regions with a high concentration of livestock production like Belgium, Denmark, Nordrhein-Westfalen (Germany), Bretagne (France), Galicia (Spain), Lombardia (Italy) and the Netherlands.

Mineral balances are tools to provide insight into flows of nitrogen across agriculture. They include input (e.g. manure and fertilizers) as well as output components (e.g. uptake by crops) (Schleef and Kleinhanss, 1994). Nitrogen surplus includes the total amount of nitrogen from mineral fertilizer, animal manure and deposition from the atmosphere, minus the uptake of nitrogen from harvested crops. The relationship between nitrogen surplus and the actual leaching of nitrate is not a direct one, but also depends on climatic and soil conditions. The

Table 3.3 Nitrogen balance (kg N/ha of arable crops and permanent crops) in 1990/91

Country/ region	Deposition from the atmosphere	Fertilizers	Manure production	Uptake	Surplus
Belgium	33	163	196	163	170
Denmark	18	142	109	123	114
Germany	31	128	98	106	121
Nordrhein-Westfalen	38	132	113	107	141
Rheinland-Pfalz	26	119	61	94	94
Greece	7	46	64	53	46
Spain	6	38	40	53	19
Galicia	7	57	166	112	68
Extremadura	7	37	16	51	4
France	17	98	62	85	73
Bretagne	17	108	149	97	133
Limousin	11	19	76	73	10
Ireland	10	60	93	72	63
Italy	12	46	55	78	18
Lombardia	23	87	137	114	92
Sicilia	4	25	25	66	-20
Luxembourg	27	128	128	124	121
Netherlands	36	218	343	173	321
Portugal	4	32	40	57	6
United Kingdom	16	92	68	96	59
England West	20	93	98	100	81
Scotland	7	58	39	65	27
EU-12	16	86	73	82	71

Source: FADN-CCE-DG VI/A-3; adaptation LEI-DLO.

risks of leaching levels of nitrate for example are highest when (i) rainfall is high, (ii) evaporation is low, and (iii) crop demands are low. The identification of nitrogen flows and its major determinants however provide the basic tools towards the understanding of options to reduce surpluses by the agricultural sector and therefore are of crucial importance to policy. The identification of nitrogen surplus and its major determinants is aimed to contribute to the objectives of environmental policies in the EU.

Nitrogen surplus in the EU varies across Member States between 6 kg/ha (Portugal) and 321 kg/ha (the Netherlands) (table 3.3). It is defined as the total supply of nitrogen from inorganic fertilizers, production of animal manure and deposition from the atmosphere, reduced by the uptake of harvested crops and ammonia losses to the atmosphere. Losses of ammonia occur during storage and spreading and are assumed to be 30% of total nitrogen from manure production (Brouwer et al., 1995). Nitrogen surplus in EU-12 is 71 kg/ha.

Relative differences among countries regarding the production of animal manure are bigger than those regarding the input from inorganic fertilizers. The input of fertilizers varies between 32 (Portugal) and 218 kg/ha (the Netherlands). The supply of nitrogen from animal manure shows a larger variation and ranges between 40 (Spain and Portugal) and 343 kg/ha (the Netherlands). Manure production levels exceed the purchase of nitrogen fertilizers in Belgium, Greece, Spain, Ireland, Italy, the Netherlands and Portugal. Purchase of fertilizers of the average of all farms in EU-12 (86 kg/ha) is slightly above the production of nitrogen from manure (73 kg/ha). The assessments provided in table 3.3 do not reflect the situation in regions with intensive greenhouse production. Vegetable crops and vineyards are not considered in the approach used because of the lack of data available on such crops. Also symbiotic nitrogen fixation is not included.

Soil quality and landscape

Water pollution problems which derive from the use of plant protection products and nutrients require major efforts. Actions are proposed in the Fifth Environmental Action Programme. Quality of soils is important as well, and mainly reflects soil erosion and overgrazing. Traditionally landscape was not considered to a large extent and the main environmental items in the past were water, soil, air and biodiversity.

Management of landscape also is of major importance to the European environment. Soil quality and landscape therefore include qualitative aspects as well as more quantitative considerations. Issues of importance related to farming are (i) soil erosion, (ii) overgrazing, (iii) the removal of hedgerows, (iv) the occurrence of forest-fires, as well as (v) marginalization and abandonment of agricultural land. Differences across the Northern and Southern part of the European Union are large. Erosion is to be a major factor of land degradation in large parts of Southern Europe. Also, changes in land use and their subsequent effect on landscape is an issue of environmental concern.

Erosion constitutes one of the most severe environmental problems of agriculture in large parts of Southern Europe. Some examples will be presented of the occurrence of erosion in Spain. Spain has a relatively high risk of desertification through soil erosion. This is partly

due to its soil and climatic conditions. Inadequate agricultural practices are also considered to be a factor of importance for the occurrence of soil erosion (Díaz Álvarez and Almoroux Alonso, 1994). The occurrence of erosion was largely affected by intensification of agriculture in response to deforestation, ploughing of untilled land, burning of pastures and mulch, overgrazing, inadequate tillage practice, use of very heavy machinery, and high usage of herbicides.

Erosion is mainly concentrated in the southeastern part of Spain, including the regions of Andalucía, Murcia, Castilla-La Mancha and Valencia. These regions include approximately 70% of the total area in Spain with severe erosion problems. Erosion is not considered to be a major threat to the landscape in regions of Spain with high precipitation levels, according to the Institute of Ecological Research (Instituto de Investigaciones Ecológicas) of the province of Málaga, Andalucía. Erosion is assessed to be of serious concern in almost 20% of the Spanish territory (Maracco, 1992) (table 3.4). Other estimates reach similar conclusions. Another assessment made on the occurrence of soil erosion in Spain for example, considers that 30% of the Spanish territory presents a clear danger of desertification caused by erosion of the highest level, whereas erosion rates are moderate to high in 40% of the territory (Sancho Hazack, 1983). Governmental statistics on the occurrence of erosion assess 10.8% of the Spanish territory to suffer mildly from erosion. Moreover 27.8% of the area is to be affected by moderate types of erosion and 25% from heavy erosion (MOPU, 1989).

Table 3.4 The occurrence of erosion in Spain

Erosion rate	Size (x 1,000 ha)	Share (%)
Extreme (> 200 tm/ha/year)	1,112	2.2
Very high (100-200 tm/ha/year)	2,561	5.1
High (50-100 tm/ha/year)	5,448	10.9
Medium (12-50 tm/ha/year)	12,923	25.6
Low (5-12 tm/ha/year)	17,309	34.2
Very low (< 6 tm/ha/year)	11,151	22.0
Total	50,544	100.0

Source: ICONA (Instituto para la Conservación de la Naturaleza, Institute for Nature Conservation).

Marginalization is a process where agricultural land becomes less viable due to economic, social, political and environmental factors. Marginalization and subsequent large-scale abandonment of agricultural land may occur in regions with unfavourable natural, economic and social conditions. Farming may become less viable under these conditions. The occurrence of marginalization of agricultural land is described by Baldock and Beaufoy (1993).

Overgrazing is recorded to be a problem in England and Wales. Overgrazing means grazing land with livestock in such numbers that it adversely affects the growth, quality or

species composition of vegetation (other than vegetation normally grazed to destruction) on that land to a significant degree (CCW, 1995). Wales tends to have a relatively high intensity of growing sheep and overgrazing is widespread throughout that region. Overgrazing is also observed in the upland areas of England. The current level of damages to Sites of Special Scientific Interest (SSSI) illustrates the scale of the problem. Approximately 28% of grazed areas are currently being damaged by overgrazing (table 3.5).

Table 3.5 The occurrence of overgrazing in Wales

Total (biological) SSSI area in Wales (ha)	202,521
SSS area managed predominantly by grazing with farm livestock (ha)	128,728
SSSI grazed area currently being damaged by overgrazing (ha)	35,600

Source: CCW, 1995.

Hedges and hedgerows are important features of the countryside in England and Wales. Hedges are valuable for wildlife and are one of the main sources of biological diversity in some landscapes of that country. In England, there has been a 4-9% loss of ponds from 1984 and 1990 (Barr et al., 1994a). Also important is the change of hedgerow length in that country, which was reduced by some 24% during the period 1984-1990 (Barr et al., 1994b). This is partly due to both neglect and the increase in field parcels over time. Both types of losses of the countryside are of concern to the public in the United Kingdom.

Biodiversity

Biological diversity is the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity with species, between species and of ecosystems (Article 2 of the Convention on Biological Diversity).

Semi-natural habitats mainly include semi-natural grasslands, heathland and are maintained by low-input agriculture. They are very important to biodiversity, both flora and fauna. They are often an essential substitute for natural habitats of the species involved. The majority of semi-natural grasslands have disappeared in the lowlands of Northwestern Europe due to intensification of agriculture. Important remnants are however left, especially in France, the Mediterranean countries, the upland areas in the British Islands and in various mountain areas. Regions with semi-natural areas could in total cover around 30 million hectares. A wide variety of wild plant species may flourish in these zones, and constitute part of the natural habitat of birds and mammals. The increasing intensification of agriculture has negatively affected these zones which were historically preserved as semi-natural pasture lands. This constitutes a serious danger for the conservation of biodiversity (Fernández Guillén and Jongman, 1994).

Certain lowland grasslands are very important for breeding birds. Wet grasslands in the Netherlands and surrounding regions, for example, are important for breeding waterbirds. Dry grasslands and extensive arable land in Southern Europe are important for steppe birds.

Large areas of farmed land are essential for migratory birds. These include areas important both for passing and for wintering of birds. For the crane (*Grus grus*) e.g. both the wintering area in Extremadura (up to 60,000 cranes) and the 'steppe stones' between this region and the breeding areas in northern and eastern Europe are both essential. This also applies to other birds.

Large areas of farmed landscape are rich in natural features like hedgerows, plots of woodland, scattered trees, ditches, ponds, etc. Tree-rich landscapes are especially well developed in the (semi-)bocage landscape of the United Kingdom and France, as well as the dehesas and montados of Spain and Portugal. These natural features are important for flora and fauna, including badgers (*Meles meles*) and birds of prey.

Natural features can be removed to a large extent by changing management and through the provision of increasing amounts of nutrients.

The dehesas in Spain provided the required ecological conditions for a great number of plants and animal species. 'Dehesas' essentially is an extensive Mediterranean pastoral system with some extensive arable cultivation and complementary silviculture (Baldock and Beaufoy, 1993). The maintenance of the dehesas is an important task for the European Union, since these agricultural systems constitute the natural habitat for certain flora and fauna practically non-existent in Western Europe (Goriup, 1988). A more intensive use by agriculture of the dehesas and its eventual disappearance will result in serious damages to biodiversity. Between 1970 and 1984, the area covered by the dehesas in Spain decreased from 4.6 to 3.4 million hectares (Euromad, 1992).

Intensification in cereal production areas in the steppe regions of Spain has also produced a decrease in biodiversity. Intensification of agriculture contributed to a major reduction in the population of some rare bird species. A considerable part of these species, as well as a large part of the Iberian butterfly fauna, are distributed through areas which include disturbed or potentially disturbed zones, due to inappropriate farming practices. However, the most serious effects of the CAP implementation are being suffered by the Iberian flora (Valladares, 1993).

The number of plant species in Spain exceeds 7,500, including almost 1,400 endemics. The list of animal species is extensive as a result of the great variety in environmental habitats. These species still include the Iberian lynx (*Lynx pardina*), Imperial eagle (*Aquila adalberti*), brown bear (*Ursus arctos*), wolf (*Canis lupus*), and a large number of invertebrates, particularly butterflies (3,500 species). The number of threatened species is also large. Similar trends also are observed in other Member States.

The number of birds on farmland shows a decreasing trend in the UK. Factors which may contribute to this include (i) the lack of winter food because of the trend towards autumn-grown crops, (ii) the lack of summer food to feed birds, and (iii) loss of nest sites (e.g. uncultivated field margins and hedgerows, small woodlands) (RSPB, 1995). In most European countries between one-third and two-thirds of Important Bird Areas are either threatened or influ-

enced by agricultural practice, according to a report of the Birdlife International European Agriculture Task Force (Birdlife International, 1994).

Spain still has a large number of natural and semi-natural habitats and many traditional forms of agriculture. According to several estimates (Ruiz and González, unpublished) the potential area to be included under special protection or conservation laws in Spain can extend over 20% to 25% of its territory (10-12,5 million hectares) along 2,000 different country sites. However, only 4.4% of the country's territory is nowadays under legal protection. In total there are some 340 protected natural sites which in total cover approximately 2.2 million hectares (Valladaras, 1993). It includes 7.1% in Italy, which is the equivalent of 2.1 million hectares (Povellato, 1996).

In Germany between 30 and 50% of animal species and plant types are threatened with extinction. Agriculture is identified as the main cause in about 70% of these cases (Höll and Von Meyer, 1996). The main reason for the decline of species diversity is the destruction of their natural environment. The cause is not only physical destruction but also substance changes in the earth due to drainage, fertilization and use of plant protection products. According to Povellato (1996) Italy has one of the richest patrimonies of natural resources and biological varieties in Europe. Recent data indicate that about 8% of plant species in Italy are endangered while 30-45% of birds and mammals and 78% of amphibians risk extinction.

Loss of habitats in Spain have been reported by Fernández Guillén and Jongman (1994). Factors which may have contributed to this include commercial afforestation, land ploughing and tilling, together with the disappearance of extensive livestock production. The disappearance of natural forests in Spain is closely linked to the extension of forestry plantations of rapid growth species. Since 1940 for example, 3.7 million hectares have been planted, mainly with Pinus spruce and Eucalyptus spruce causing the elimination of 4 million hectares of native forest. This situation has resulted in the destruction of natural habitats and the disappearance of flora and fauna.

3.3 Prices, production and the use of inputs

Deterioration of the environment and quality of landscape are closely related to the use of chemical inputs such as inorganic fertilizers and plant protection products. CAP is criticized for contributing to a deterioration of the European environment. The general argument in this is that by offering higher prices to the farmers than would be the case without such a support policy, CAP has stimulated the level as well as the intensity of agricultural production. These high prices made it generally worthwhile to use more (variable or non-factor) inputs compared to the case of lower prices. The level at which costs made are just offset by higher yields in that case is higher. This is based on the consideration of decreasing marginal returns of inputs.

The reasoning that higher prices lead to increased use of inputs is a generally recognized principle in economics and is supported by the 'law of diminishing marginal returns'. According to this law, every additional input results in a lower additional output. The marginal product of a variable factor could eventually even diminish when additional units of variable fac-

tors are added to a fixed amount of some other factor. Above a certain level of input use, costs exceed the benefits. Thus, according to basic economics, a farmer will tune his input use to the point where additional costs are equal to increase of benefits. It should be noted, however, that the exact relationships between inputs used and outputs produced in agriculture are still rather unclear. In other words, the production function is unknown, partly because technical relations are not (entirely) known, partly because economic research into the effects of price changes is complicated by the occurrence of inter-sectoral shifts and by increased supplies without extra inputs (technical development) (Vermuë, 1994).

Agricultural policy helped to induce technological change and structural change

The use of chemical inputs in agriculture not only responds to price and income support. Other factors also need to be considered. The prevailing technologies and technological changes are induced by agricultural policy, as well as the structure of farming and structural change. Mean farm size in the United Kingdom for example showed a steady increase after the Second World War, which was a period of wide-reaching support for agriculture. Farm size in that country was rather stable or declining during the period up to the Second World War (Allanson et al., 1994). Factors of importance to the structural change are considered to be the stabilization of prices and increased level of profits. They all contributed to a transformation of agriculture from a labour-intensive industry to a capital-intensive industry.

Technical progress plays an important role in the ideas of De Wit (1992) who doubts whether the law of diminishing marginal returns holds for agricultural production. He believes this is not the case when long-term trends on the relation between yields and the use of inputs are observed. De Wit states that the lowest input level of factors of production per kilogramme of output is achieved at highest possible yields. A minimal input level will be used optimally if other inputs approach their optimum, says the law underlying this theory. From the viewpoint of efficiency, then, it is always worthwhile to achieve (theoretically) highest possible yields, irrespective of the relation between input and output prices. The use of inputs per unit of output produced in that case is minimal. The increase in efficiency is thus a force making production increase considerably (De Wit, 1992). In this reasoning the inputs are considered as a whole, not as separate items. Furthermore, a more efficient use of resources is reached over time, which is due to technical progress. De Wit recognizes that the law of diminishing returns may hold at a given technology and using only one type of input. The strategy followed by farmers to apply chemical inputs is also important in an assessment of the impact of price reduction on input use. Farmers who adopt a strategy to avert risks of harvest loss may apply more inputs than are strictly required. This might be the case in applying plant protection products. The response by farmers to a reduction of prices may differ largely in that case compared to a strategy to follow a curative approach to the application of chemical inputs.

Application of the law of diminishing marginal returns implies that a reduction of output prices may induce a reduction of production and of input use. A decline in production and input use may be achieved by reducing the level of support, since the incentives for farmers to

use intensive production methods with high usage of inputs are weakened. At lower prices, more extensive farming systems may be encouraged and the negative environmental consequences of farming activities could be reduced. The promotion of environmental sound production methods is one of the objectives of the CAP reform. It is however difficult to assess empirically to what extent lower prices would induce a reduction in the use of inputs. Production techniques are connected with present price relations between outputs produced and inputs used. A change in these price relations will take at least some time to have effects on production methods. Other factors than output price levels are important as well, such as the price of land and the farm structure (e.g. cropping plan, stocking density and farm size). Mahé and Rainelli (1987) showed land to be a scarce production factor which contributes to an increase of the price of land and to the intensity of agriculture. Furthermore, input response to price changes may vary across regions. Direct effects of price changes may be reinforced or compensated by the impact of liquidity and security constraints, by shifts of the production function or by reducing the inefficient input use. This makes empirical estimates of response elasticities rather difficult.

Empirical estimates of input-output relations

According to De Haen (1985), empirical evidence supports the hypothesis that policies to support agricultural production and to stabilize producer prices in the EU did contribute to deterioration of the European environment. These elements of agricultural policy induced high levels of chemical inputs which increased rapidly over time in areas with highly specialized agriculture. This is also based on the theoretical investigation of input-output relationships described in this section. A policy to reduce prices of agricultural products in real terms might result in rather modest reductions of fertilizers while the input of specific chemical plant protection products might decline at much lower rates as they also serve the purpose of reducing the instability of yields. However, De Haen finds empirical evidence with respect to the response of input use to price changes to be rather weak for drawing general (policy) conclusions. De Haen also states that, in case output prices were reduced by 20%, much of the input reduction would result from a switch to more extensive crops with a diversified rotation plan, rather than from extensification of crop enterprises within the given production pattern. Only if the rate of price reduction would go up to 40%, the optimal levels of inputs decline even within the given crop rotations (De Haen, 1985:210-211). It should be mentioned that the empirical evidence was developed under different price conditions from the present situation. A decline of input use may have substantial beneficial consequences for the environment, as De Haen shows. A simplified elucidation of the basic interdependence of production intensity and the potential environmental damage can be derived from the typical properties of the production process, namely the progressiveness in input use per unit of output with rising input use. Rising input use results either in higher concentration of input components or their derivatives in output, or in their disappearance elsewhere in the ecosystem. Both effects bear potential environmental risks (De Haen, 1985:200-201).

Dijk et al. (1995) indicate that the CAP reform of the cereal regime may result in a substantial reduction of the use of nitrogen (from fertilizer) and plant protection products in the Netherlands because of lower cereal prices. A reduction of cereal prices will not affect production in a major way and subsequently lead to lower input use. Contrary to this, it is said that a reduction of cereal prices will encourage a decline in the use of inputs, to which farmers are forced because of negative income effects resulting from the price reductions.

An overview, provided by Dijk et al. (1995:24-29), of more recent studies into the relation between yield level and output prices shows that crop yields on a per hectare basis change to a limited extent in response to a reduction of output prices. This is based on the consideration of own price elasticities to be rather low. Based on this literature review and own calculations, Dijk et al. conclude that a substantial reduction of the yield per hectare cannot be realized by a price decrease of cereals. A price reduction of cereals with one third results in a reduction of yields of only a few percent. The use of fertilizer may however be reduced up to levels of 10 to 20%. Higher reduction levels of yields and of the use of inputs can be achieved by increasing costs of chemical inputs. Prices of chemical inputs need to be more than doubled in order to have a substantial effect on the production, but that will be less detrimental to the output per hectare than a (further) decrease of the cereal prices.

Recent studies indicate a strong relationship between input use and the prices of nitrogen and plant protection products. Crops respond largely to the use of both inputs and (higher) prices therefore hardly affect the demand for nitrogen: price elasticities of demand for nitrogen and plant protection products are rather low (Dijk, 1995:27-28). These low price elasticities indicate that the use of fertilizer and plant protection products is profitable to a wide range of price relations. This is because of the physical relation between output and input, in which there are diminishing marginal returns but in which a substantial reduction in the use of inputs could only be achieved, for example by a doubling of the price of inputs. Own-price elasticity of fertilizer demand may be biased downwards due to restrictions on crop substitution which are applied in linear programming models (Rainelli, 1991). Elasticities which derive from econometric figures generally provide higher figures. Also, the long-run fertilizer price elasticity of nitrogen demand will be greater than the short-run elasticity.

Agricultural market and price policies and its impact on the environment

The OECD has done - and still does - much work to analyse linkages between agriculture and the environment. Since 1993 there is a Joint Working Party of the Committee for Agriculture and the Environment Policy Committee (JWP) in which activities of the OECD relating to the interface between agricultural and environmental issues are being considered. Linkages between agriculture and the environment are complex and indirect. As policy intervention in agriculture is widespread and has a long history in almost all OECD countries, agricultural policies are considered to play an important role. A major part of the OECD research work has been carried out in order to identify the critical issues, instruments and indicators that would be needed for the analysis of the impact on the environment of agricultural policies and of farming practice. Changes in policy measures may affect farming practice and use of in-

puts, and subsequently affect the environment. Agricultural policies influence farming practice mainly by changing the relative costs and returns of employing resources in agricultural activities, or by imposing direct restrictions on output and input use. The major linkages between farming practices and the environment can be derived from the effects of farming practices on agricultural land use, water systems and water use efficiency, air quality, the diversity of animal and plant species and the preservation of wildlife habitats and ecosystems, the rural landscape and the rural infrastructure. So far, OECD activities mainly focused on the most likely important linkages for environmental damages, without establishing much empirical evidence for these relationships.

Several OECD documents support the hypothesis that policy intervention in agriculture is a major reason of persistence of environmental problems in agriculture (OECD, 1993; OECD, 1994; OECD, several Restricted Papers). Agricultural policy in OECD Member States is manifest in various forms. It includes support which both raises prices received by farmers for their output and reduces the prices of their inputs. In the OECD studies, it is argued that production of the supported commodity becomes more profitable and attracts resources from non-supported agricultural activities and from outside the sector. This will result in a shift in land use towards the supported commodity, possibly away from agricultural uses for which the land might be more suitable. Moreover, higher prices will encourage use of purchased fertilizers, other agrochemicals and feed. Also, price support affects trade flows and through them, the geographical allocation of production with its environmental impacts. On the other hand, the OECD recognizes that, by transferring income to farmers and increasing the profitability of soil amelioration and other productivity-enhancing investments, price support may help to maintain or improve farm structure and rural infrastructure. The impact on landscape amenities is more ambiguous, as negative effects, such as monotonous crop cover or air pollution from intensive animal husbandry, have to be weighted against the greening effects of irrigation or other landscape changes that might be perceived as adding to the attractiveness of the countryside.

Other possible measures of importance in market and price support policies include support provided to reduce input prices, restrictions on the outputs produced and inputs used, and direct compensatory payments to farmers. All these measures may have environmental effects as well, since they affect farmers' production decisions. The effects on the environment, however, may differ and depend on site-specific conditions, so that even the impact of one measure can be ambiguous. For instance, input subsidies may result in output expansion and a more intensive use of the input subsidized. In this respect, the environmental impact of an input subsidy is similar to a higher output price. However, input subsidies can also be used to influence input use so as to reduce existing pressures on the environment. Output restrictions, aimed at reducing the supply, will, generally speaking, reduce pressure on the environment. However, output restrictions can be enforced in many different ways, having different consequences for the environment. Only if disincentives to raise yields beyond a certain level are strong enough to result in lower use per hectare of fertilizers and plant protection products, a positive environmental effect will be achieved. Furthermore, cross-commodity effects can lead to increases in production of a substitute crop with even more environmentally damaging

characteristics. Quantitative input restrictions can also cause a more intensive use of substitute inputs, and the effects on the environment will only be positive when the restricted inputs are replaced by less polluting ones. Restrictions on land use (such as set-aside) can be more varied in their effects on the environment, because it can be implemented in different ways (more about set-aside and its environmental impacts in the context of the CAP reform in section 5.2). Such a variety of forms also relates to the instrument of direct payments. This also makes it very difficult to assess its environmental effects. Direct payments can be independent of output in various degrees, but all forms may have important consequences for land prices and structural change in agriculture.

From the above it is clear that the effects of different agricultural policy measures and support levels on agricultural practices and the environment remain complex and sometimes ambiguous. The OECD, however, concludes that the overall effect of support for agriculture is likely to have increased the pressure on the environment and led to some environmental degradation and pollution (OECD, RP, (94)99: 10-11). The capitalization of the support into land values and the expansion of land set-aside from agriculture has further increased the incentive to adopt more intensive production methods on the agricultural land used, with sometimes harmful consequences on the environment. A reduction of the price of some agrochemicals relative to the prices of other inputs has reinforced these developments. This conclusion is confirmed by the results of an internal OECD study (referred to in OECD, 1993:120) in which the effects of a 10% cut in the PSE together with a reduction in support for chemical inputs for OECD countries are analysed. The results suggest that for the relatively highly assisted countries (like the EU and the USA) the use of all inputs would be reduced while for countries with relatively low assistance even an increase in use might be expected.

Lowering the agricultural price support to improve the environment?

By stressing the correlation between the (high) level of price support and its (negative) environmental consequences, OECD supports the hypothesis that a reduction of support will lead to the achievement of environmental benefits. This hypothesis is said to be confirmed by experiences in some OECD Member Countries. Evidence from New Zealand on the environmental effects arising from the reduction since 1984 of assistance to agriculture clearly suggests a positive correlation between support levels and the intensity of input use (OECD, 1994:118). However, despite liberalization, specific negative effects remain. Large areas of hill country remain vulnerable to soil erosion and landslides following storms, although the area of intensively cultivated land reduced during the past ten years. In Sweden, environmental considerations played an important role in the reform process which started in 1989. Environmental consequences of market price support were considered to be negative via capitalization into land values. Environmentally harmful intensive production methods and support policies were considered to be correlated in a positive way. It was assumed that increased market orientation by price reduction would lead to positive effects in the short term. Also, positive effects of a price reduction might be achieved in the medium term in a more indirect manner, i.e. through lower land prices and substitution of other factors of production for land.

Empirical evidence for these considerations however are not available yet, because of the short period since the implementation of the (first) reform measures. Moreover, in assessing the environmental impacts of the reform measures since 1989 one has to take into consideration that some programmes aimed at reducing the negative environmental consequences of farming practices were implemented already before the reform process began. Deceleration of the use of fertilizers and plant protection products continued after the reform was implemented: the use of plant protection products fell by 40% between 1988 and 1992; fertilizer consumption showed a decline of around a quarter between 1986 and 1992 (OECD, RP, (94)30). Most of it relates to a fall in input intensity on land remaining under cultivation. No commensurate or indeed any fall in yields has occurred, reflecting a move to eliminate over-use and improve profitability in response to falling prices. Different factors have contributed to the fall of input use including environmental measures. Agricultural policy adjustments are said already to have a positive impact on the environment in Sweden, although this conclusion seems to be rather premature as a thorough analysis would require a much longer time horizon than is available now.

Experiences from New Zealand and Sweden so far do not establish strong evidence of the OECD hypothesis about the linkage between agricultural support and deterioration of the environment. Beaumont and Barnett (1996) however report on risks of abandonment of farming since the reform of agricultural policy in Sweden in 1990. Biodiversity is reduced because the agricultural area becomes available for forest production. Model simulations of agricultural policy reform could support the argument that lower agricultural support leads to improvement of the environment. One such exercise has been done by Tobey and Reinert (1991). They conclude that agricultural policy reform encourages a reduction in the use of fertilizer-intensive production practices. The authors investigate the relationships between agricultural policies, resource use, and environmental quality in the USA through a modelling approach. They find a positive environmental effect of a reduction of the level of price and direct income support programmes. Furthermore, from the simulation of a reduction of land put aside under the Acreage Reduction Program (ARP) they find a reduction in agricultural fertilizer use. ARP is an annual cropland retirement programme designed to reduce total planted acres when national supplies of agricultural commodities are projected to be high. However, the return of ARP land to production would lead to an overall increase in sedimentation and deterioration of the environment. These findings are based on a modelling effort which heavily draws on the assumed elasticity of substitution between land and fertilizers. Tobey and Reinert (1991) recognize that this parameter is crucial to the outcome, but nevertheless conclude that a simultaneous reduction in both support level and ARP tends to reduce the negative environmental externalities for cropland production. However, since their model does not disaggregate the agricultural sector, the modelling results seem to be rather crude.

Conclusions

An assessment of the environmental impacts of a reform of agricultural policy as experienced by New Zealand and Sweden is complicated by the fact that they cannot be isolated from

other policies or events. Lower input use can be attributed to environmental policy or to unfavourable climatic circumstances (drought). There may be other events - economic, social, coming from policies or not - affecting farming practices. A positive correlation is observed in these countries between the high level of support and input use. This however does not mean *per se* that a reduction of agricultural support will lead to an improvement of the environment. As has been reported in other OECD documents, the effects of instruments are sometimes ambiguous, depending among others on the instrument, the features of the commodity and farming sector it is applied to, and local natural circumstances. By stressing the decline of agricultural (price) support in order to improve the environment means that the positive effects (other) agricultural policies might have on rural areas and the environment are being denied. This is, however, a too short-sighted and biased idea of the linkages between agricultural policy and the environment.

Most studies reviewed here argue in favour of further research efforts in the field of linkages between agricultural policy and indicators of environmental quality. Strongly needed in such studies are efforts to disaggregate the agricultural sector in order to better capture the complexity of agricultural commodity programmes and changes in the composition of agricultural production. A disaggregation of the agricultural sector is important in the framework of linkages between agricultural policy and the environment, since some commodities are more harmful to the environment than others (as are agricultural policies, too). So, the approach to study the relation between agricultural policies and environmental issues has to focus on policy instruments and products. Furthermore, the environmental impact of agricultural policy may also differ over time and across regions, due to specific local circumstances (Flichman et al., 1995). This report provides an analysis of the effects of the implementation of different farm policy programmes on farmers' decisions and on the environment in different parts of northern and southern Europe (i.e. France, Spain, Italy, Portugal and the United Kingdom). The analysis allows the measuring of the regional effects of farm policy programmes on the environment, income distribution among farms, as well as crops grown. Results indicate regional differences regarding response by farmers to policy changes and their impact on the environment.

This point of site-specific aspects regarding environmental effects of agricultural policy is also recognized by the work of Just and Antle (1990). These authors have developed a conceptual framework that can be used to analyse the interactions between agricultural and environmental policies and pollution. This framework integrates physical and economic models at a disaggregated level necessary to capture the heterogeneity of the physical environment and the economic behaviour of farmers. The authors observe that existing agricultural and environmental policies can have either positive or negative effects of nonpoint source pollution; to infer an aggregate effect requires data that, unfortunately, currently do not exist. They conclude that 'both agricultural production and environmental impacts depend on highly location specific environmental conditions. Reality is much too complex to allow generalizations about the environmental impacts of agricultural policies. Our analysis points to the kind of data that are needed to make valid inferences. Statistically reliable field-specific production data and environmental data would make possible measurement of key parameters (such as

the correlation between production decisions and environmental attributes of land) that are needed to assess the aggregate relationships between agricultural policy, environmental policy and the environment' (Just and Antle, 1990:201-202). Therefore, in assessing the environmental impact of CAP in subsequent parts of the report, the widest possible attention will be given to local/regional differences of environmental consequences of policy instruments identified per product. Agriculture-environment tradeoffs are investigated to assess the environmental impact of different policies (Antle and Capalbo, 1996). Issues of importance include spatial and temporal variability of agricultural impacts, and the need to integrate disciplinary models and data at a small level of aggregation.

4. LEGISLATION AFFECTING BOTH AGRICULTURE AND ENVIRONMENT

4.1 Introduction

To an increasing extent, environmental measures are included in legislation by Member States; they may derive from agricultural policy or be formulated in the framework of environmental policy. Environmental measures should be interpreted as conditions formulated in agricultural policy or measures to serve environmental objectives. Such conditions should explicitly contribute to the reduction of deterioration of the environment or contribute to the management or maintenance of landscape. Environmental measures in agricultural policy include conditions to farming which derive among others from the set-aside requirements, structural policy and the accompanying measures.

The objective of this chapter is to provide a review of environmental measures which presently affect agriculture in the European Union. The inventory will distinguish between European legislation and national legislation. The present state of the environmental measures in agricultural legislation will be summarized (Section 4.2). Moreover, environmental measures will be classified according to whether they are adopted to restrict the use of inputs, the supply of manure and/or to change land use to the improvement of the environment and landscape. In section 4.3 an overview of environmental policies in Member States affecting agriculture is presented. Emphasis is placed on farming conditions which focus on the issue of nutrients and plant protection products. Important directives are the Council Directive of 12 December 1991 (91/676/EEC) concerning the protection of waters against pollution cause by nitrates from agricultural sources (Official Journal of the European Communities, 1991a) and the Council Directive 91/414 concerning the placing of EEC-accepted plant protection products on the market (Official Journal of the European Communities, 1991b). The present state on the implementation of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora will be briefly summarized as well.

The main legal instruments that the EU possesses to implement policies are directives and regulations. Directives and Council Regulations both are legally binding to Member States. Directives inform Member States of goals and of a time frame for their achievement. The implementation of directives is left to each Member State, thus allowing them to achieve the common goal of unity in ways that recognize the national character of each. Council Regulations are powerful legal mechanisms which establish uniform laws, enforceable throughout the Union. Directives are to a large extent used to the achievement of environmental quality objectives and Council Regulations are generally applied in agricultural policy.

Several Council Regulations already include environmental measures. They are summarized in figure 4.1. A distinction is made between three types of points of action, including use of inputs in agriculture, management of land practice, and land utilization. Regulations on

wine, pigs and dairy do not have specific requirements that farming has to consider, and which are essentially introduced for achieving environmental objectives. Council Regulations which are part of structural policies (also including the LFA Directive and the Structural Funds), the accompanying measures and other policies all include environmental measures.

Council regulation/Directive	Environmental requirement	Point of action
Arable crop	Yes	Land management of set-aside
Wine	No	
Beef (and veal)	Yes	Land management
Sheep	Yes	Land management
Pigs	No	
Dairy	No	
LFA	Yes	Landscape
Structure efficiency	Yes	Input use, landscape
Structural Funds	Yes	Input use, landscape
Agri-environmental programme	Yes	Input use, landscape
Forestry regulation	Yes	Land use
Early retirement	Yes	Land use, landscape
Organic farming	Yes	Input reduction
Nitrate Directive (Council Directive 91/676/EEC)	Yes	Use and treatment of inputs
Placing of plant protection products (Council Directive 91/414/EEC)	Yes	Authorization and use of plant protection products
Habitats Directive (Council Directive 92/43)	Yes	Biodiversity

Figure 4.1 Overview of Council Regulations and Directives considered and environmental requirements identified

Note: 1. Environmental requirement relates to the action required by the farmer in order to be eligible for state support; 2. See Appendix B for full titles and numbers of the regulations and directives. Arguments, concerns and conditions mentioned at the adoption of the regulations and directives are also described in the Appendix in more detail in order to make clear if and how environmental requirements are included.

4.2 Environmental requirements in the framework of agricultural policy

4.2.1 Introduction

In the pre-Mac Sharry period, the common organization of the market for CAP products was strongly related to the efforts to achieve the objectives as formulated in Article 39 of the 1957

Treaty of Rome. Market and price policies were the main instruments to support farming in order to increase agricultural productivity, to ensure a fair standard of living for the agricultural community, to stabilize markets, to ensure stability of supplies and to ensure that supplies reach consumers at reasonable prices. In principle, farmers were free to decide which commodities to produce. Production levels were not limited. Sugar production was originally the only exception to this rule with quotation of production as a core element of its common market organization. In the 1980s the potentially unrestrained increase of agricultural production came to an end by the introduction of the milkquota and the 'stabilization scheme' for cereals. The 1992 CAP reform has regulated production to a great extent for almost all products. This is to be achieved among others by setting conditions for compensation, by limitation of production rights and compulsory set aside. In some of the regulations concerning the common organization of the market for CAP products, environmental conditions for state support have been introduced.

4.2.2 Market organizations for agricultural products

Cereals, oilseeds and protein crops

The basic regulation 120/67 of the cereal regime covers the common internal pricing system and the system of the regulation of trade with third countries. This regulation was succeeded by Regulation 2727/75 which was, in turn, succeeded by Regulations 1765/92 and 1766/92. There it is said that the new support system for producers of certain arable crops is established 'in order to ensure better market balance' and must lead to a better competitive position of the European Union. No reference is made explicitly to environmental concerns for being a reason to change the cereal regime. The objective of a better market balance is achieved by the lowering of institutional prices, which are compensated by direct payments. To be eligible for the compensatory payments under the so-called 'general scheme', producers must set-aside a predetermined percentage of their arable area. Furthermore, 'the land set aside would have to be cared for so as to meet certain minimum environmental standards'. Minimum environmental standards which need to be met on land which is put aside however are not elaborated in these two regulations.

Environmental objectives are formulated in Commission Regulation 762/94 of 6 April 1994. As it is formulated there, the set-aside scheme is primarily meant to control production. Some conditions or provisions are imposed regarding maintenance and use of the areas set-aside. These provisions are laid down because of environmental reasons (Article 3(3)). Measures shall be applied to ensure the protection of the environment. These measures may concern a green cover. As an alternative to set-aside, non-food crops can be grown. Bound to certain requirements the producers' obligation to put land aside may be transferred to another producer in the same Member State. Member States may submit plans to the European Commission permitting transfers of set-aside obligations between producers within a 20 km radius, and/or within areas where specific environmental objectives are sought.

To get compensatory payments for land set-aside, it is obligatory to fulfill the conditions which are specified at the national level. Member States can decide the penalties 'which are appropriate and proportional to the seriousness of the environmental consequences of not observing the said measures.' All measures to protect the environment in relation to set-aside land are agreed upon at the Member State level.

Wine

Under the wine regime, producers are protected by means of stable prices, by measures aiming at maintaining a balance of the market, and by restrictions on imports from third countries. Consumers are protected by the establishment of proper quality control. A basic aim of the regime is to ensure supplies for the consumer at reasonable prices and quality. Internal market support consists mainly of private storage aid for table wines or distillation of wines or by-products. For production management reasons, the regime also contains strict rules on replanting and new planting of vineyards. In the proposal for the reform of the common market organization for wine the Commission introduced regional programmes for adjustment of wine production. These programmes include maintenance and reconstruction of vineyards which are seen as being valuable for reasons of landscape. Furthermore the Commission proposed to integrate uprooting measures with accompanying measures like afforestation of agricultural land and measures to protect the environment. No decision has been made on the reform proposals, so far.

Beef

The basic regulation (805/68) includes a system of price support which is aimed to keep Community market prices as close as possible to an agreed common price level. The main support mechanisms are internal price support measures such as support buying and private storage, premium payments, import measures and export refunds. The structural imbalance between the supply and demand on the Community market is said to be the argument for reforming the common organization of the beef market in 1992. A compensation for lowering the intervention price for beef is granted in the form of premiums. This compensation is subject to a limit on the number of eligible male animals per farm and the stocking intensity, in order to encourage extensive production methods, or at least to prevent that reorientation is reflected in an increase in overall production. Although support by premiums is subject to a certain degree of intensity of production, no reference is made explicitly to an environmental clause in this regulation. However, Member States may apply appropriate environmental measures which correspond to the specific situation of the land managed for the production of male bovine animals or suckler cows qualifying for the premium (Article 4a in 3611/93, amending 805/68). Penalties may provide for a reduction or even cancellation of the benefits accruing from the premium schemes.

Sheep

Council Regulation 3013/89 includes details of all aspects of the sheepmeat regime. From 1993 an individual limit has been introduced on the number of claims that a producer can make on the annual ewe premium. Limits have been based on the number of eligible claims made in respect to 1991. The payment of ewe premium is not subject to any stocking density criteria under the sheep regime. The number of ewes upon which premium is claimed however is relevant when determining stocking density levels for receiving compensation payments like the beef special premium and the suckler cow premiums. As in the case of beef, the sheep regulation consists of an Article (5 quinquies) which states that Member States may apply appropriate environmental conditions to compensatory payments. These measures correspond to the specific situation of the land used for the production of sheep and goats eligible for the premium.

Pigs

The basic regulation is CR 2759/75, in which main mechanisms used to support the market for pigmeat are outlined (public support buying measures, private storage aids and export refunds). Pigmeat was treated as a 'cereal-based' product: this results in there being close links between the cereals and pigmeat regimes. Nowadays there are tariffs on pigmeat.

Dairy

The principle underlying the common dairy policy is the management of the markets for dairy products in order to secure product prices that permit milkproducers to obtain the target price for milk. To face the problem of permanent oversupply, two methods have been used to date to balance the market through the management of supply: measures aiming at reducing the number of cows (non-marketing and herd conversion schemes, suckler cow premium), and measures to reduce the milk deliveries (co-responsibility levy, milk quotas).

4.2.3 Structural policies

Less Favoured Areas (LFA)

The LFA Directive (75/268/EEC) is adopted to ensure the continued conservation of the countryside by supporting farming practices in mountain areas and in certain other less-favoured areas. Member States are authorized to introduce the special system of aids to encourage farming and to raise incomes in these areas (Article 1). Member States may lay down additional conditions for granting compensatory allowances. This includes conditions which encourage the use of practices compatible with the need to safeguard the environment and preserve the countryside. Compensatory allowances are granted per hectare or per livestock unit. Aid is restricted to 1.4 livestock units (LU) per hectare of forage area per holding and a farmer

can apply for a maximum amount limited to the equivalents of 120 units per holding whether LU or area units (ha). Since the codification of the different elements of the agricultural structural policy in 1991, the rules for payments to LFAs are incorporated in Regulation 2328/91 (art. 17-20).

Structure efficiency

Council Regulation (EEC) No 2328/91 of 15 July 1991 on improving the efficiency of the agricultural structures has the objective (among others) 'to contribute to the safeguarding of the environment and the preservation of the countryside, including the long-term conservation of natural farming resources'. The EAGGF Guidance Section provides co-financing for national aid schemes on (among others) measures relating to investments aimed at preserving and improving the natural environment. These investments should not entail an increase in production. Title II on extensification of production and Title VII dealing with aid in environmentally sensitive areas were repealed with the adoption of CR 2078/92. Forestry measures on agricultural holdings, provided for in Title VIII, have been replaced by CR 2080/92. With CR 2843/94 the Council amended CR 2328/91 by offering Member States more flexibility and freedom in determining ways to achieve their stated goals.

Structural Funds

At the reform of the Structural Funds (2052/88) the section 'Guidance' of the EAGGF was integrated with the European Social Fund and the European Regional Development Fund. The agricultural sector can be supported by co-financing projects executed under objective 1, 5a and 5b. Objective 5a measures are oriented to accelerate adjustment of agricultural structures. These measures regroup various measures mostly taken over from legislation existing before the reform of the Structural Funds and include those of the LFA directive and of the improvement of the structural efficiency. Under objective 1 and 5b regional measures are co-financed by the Fund. The projects under these two objectives are to promote the development of regions whose development is lagging behind (objective 1) and to encourage rural development (objective 5b). Within the programmes, one of the priorities is maintenance and improvement of the environment. One of the categories of assistance for the EAGGF Guidance Section (Regulation 4256/88) in Objective 5a is to the protection and preservation of the environment. Similarly, in Objectives 5b and 1 regions it is towards the development of rural areas (preservation of the countryside and the environment, rural and tourist infrastructures, and development of forestry activities). Conditions on the implementation of Objective 5a regions are adopted by Member States themselves and, as a result, they vary widely in scope. In respect of Objectives 1 and 5b Member States submit a regional development plan also including an indication to be made of assistance under the different funds.

Member States have many possibilities to designate plans and programmes focussing on specific local and regional problems. The programmes developed have to be submitted for approval and co-financing to the Commission. As required by the Regulations, the Council

support framework (CSF) indicates that competent environmental authorities will be involved in the management of the CSF and of the operational programme (OP). In 1993 the Council approved 6 new regulations to manage the Structural Funds for the period 1994-1999. It includes a budget of ECU 141 billion for this six-year period, which is approximately a third of the total budget of the European Union. Development plans for Objectives 1 and 5b must in future include an appraisal of the environmental situation of the region concerned and an evaluation of the environmental impact of the strategy and operations planned, in accordance with the principles of sustainable development and in agreement with the provisions of Community law in force. The intensification of ex-post and ex-ante evaluation with special regard to the environmental impact of the programmes is central in the approach. The consideration of environmental objectives in the programming documents is now compulsory.

4.2.4 Accompanying measures

Agri-environmental measures

Accompanying measures as formulated in CR 2078/92 are adopted because 'measures to reduce agricultural production in the Community must have a beneficial impact on the environment'. Therefore, an aid scheme has been introduced to encourage farmers to introduce or continue farming practices compatible with the increasing demand of protection of the environment and natural resources and upkeep of the landscape and the countryside. For instance, farmers are eligible for compensation when they reduce the use of inputs, or change to more extensive forms of production. The agri-environmental measures are elaborated at national, regional and local level.

Forestry regulation

A Community aid scheme for forestry measures in agriculture is instituted as an accompaniment to the Community's policy for controlling agricultural production as it may 'contribute towards forms of countryside management more compatible with environmental balance'. Afforestation as an alternative use of agricultural land is promoted by stimulating the development of forestry activities on farms. Member States shall implement the aid scheme by means of national or regional multi-annual programmes which set out in particular (among others) the conditions for granting aid, and the measures taken to evaluate and monitor environmental impact and compatibility with land use criteria.

Early Retirement

The early retirement scheme, already introduced in 1972, was reinforced in 1992 in the context of the Mac Sharry package. Farmers aged over 55 years can get a premium or a supplementary pension when they decide to stop and apply for this scheme. The measure is to stimulate older farmers to leave the sector in order to encourage the adjustment of agricultural

structures. Land from farmers who leave business has to be used by other neighbouring holdings in order to improve economic viability of these holdings. Land may also be used for non-agricultural purposes compatible with requirements for improvement and maintenance of the environment. The scheme has an environmental clause as land transferred to other farmers is to be used in a way that it serves the environment (Article 6.4 and 6.5). This has been introduced to prevent farmers from abandoning their land after retirement.

4.2.5 Other CAP(-related) policy

Organic Farming

Organic farming is stimulated because 'this type of production may contribute towards the attainment of a better balance between supply of, and demand for, agricultural products, the protection of the environment and the conservation of the countryside'. Plant protection products, detergents, fertilizers, and soil conditioners allowed in the organic production method are precisely defined in an Annex to Council Regulation (EEC) 2092/91.

4.3 Environmental policies affecting agriculture

4.3.1 Introduction

Awareness of environmental deterioration has led to the adoption of environmental regulations. They are aimed among others to reduce the pollution of soils, water and air from minerals (nitrogen and phosphorus) and plant protection products. Environmental policies in the Member States largely changed during the past decade, broadening the perspective of policy from a reduction of point-source pollution towards the inclusion of policy targets on non-point source pollution. The Single European Act, which became effective on July 1 1988, stipulates that the Community should consider environmental implications in adopting policy. It paved the way for a harmonization of agricultural and environmental policies.

4.3.2 Nutrients

A Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources was issued by the Council in December 1991 (91/676/EEC). This Directive is under the responsibility of the Directorate-General Environment, Nuclear Safety and Civil Protection (DG XI). Policies are being formulated in several Member States in order to reduce pollution of groundwater (nitrates), surface water (eutrophication by excessive use of nitrogen and phosphate fertilizers) and the atmosphere (emissions of ammonia) (see also Rude and Frederiksen, 1994). Directive 91/676 includes regulations on how to handle manure and fertilizers in zones which are identified to be vulnerable to the leaching of nitrate. A number of Member States so far identified such zones. A main element of the Directive is that the

application of animal manure in vulnerable zones should not exceed 170 kg of nitrogen per ha. This standard should be met at farm level by the year 2003. Two four-year periods are identified in the Nitrate Directive, during which a gradual reduction needs to be achieved on the application of nitrogen from livestock manure. By the end of the first period (which lasts from 1995 until 1999) a maximum of 210 kg of nitrogen from manure may be applied. The application of nitrogen from livestock manure is to be reduced gradually during the second four years period, until the level of 170 kg is achieved by the year 2003. Codes of good agricultural practice need to be formulated by Member States in order to contribute to the achievement of objectives in the Nitrate Directive. Such Codes should comprise the following items, in so far as they are relevant (Council Directive 91/676/EEC, Annex (ii), concerning the protection of waters against pollution caused by nitrates from agricultural sources):

- periods of the year when the application of fertilizer is inappropriate;
- the land application of fertilizer to steeply sloping ground;
- the land application of fertilizer to water-saturated, flooded, frozen or snow-covered ground;
- the land application of fertilizer near water courses;
- the capacity and construction of storage vessels for livestock manure;
- procedures for the land application, including rate and uniformity of spreading, of both chemical fertilizer and animal manure, that will maintain nutrient losses to water at an acceptable level.

Member States also shall establish action programmes concerning designated vulnerable zones. The measures in the action programme (Annex (iii) of the Directive) must include rules relating to:

- periods when the land application of certain types of fertilizers is prohibited;
- the capacity of storage vessels for livestock manure; this capacity must exceed that required for storage throughout the longest period during which land application in the vulnerable zones is prohibited, except where it can be demonstrated to the competent authority that any quantity of manure in excess of the actual storage capacity will be disposed of in a manner which will not cause harm to the environment;
- limitation of the land application of fertilizers, consistent with good agricultural practice and taking into account the characteristics of the vulnerable zones concerned (e.g. soil, climate, cropping practice).

National nitrate policies are reviewed for 7 Member States (Rude and Frederiksen, 1994). Compliance to limits on the application of animal manure, which are part of the Nitrate Directive, will affect agriculture in a number of regions with intensive livestock production.

The protection of surface water and groundwater has been a major priority in the Community since the mid-Seventies. It is mainly to ensure that drinking water is safe for human consumption, as reflected by the adoption in 1991 of Council Directive 91/676 concerning the protection of waters against pollution caused by nitrates from agricultural sources. Environmental regulations are formulated by Member States in order to meet these objectives (figure 4.2).

Belgium

Environmental policy in Belgium has shifted away from federal competence towards being the main responsibility of the authorities in Flanders, Wallonia and the Brussels region. Emphasis is given here to the policies in the Flanders region because policies to address nitrates are much more acute there than they are in the other regions. The most important components of nitrate policy in the region of Flanders include (i) standards to apply minerals from organic and inorganic sources, (ii) restrictions on the application of animal manure, (iii) the obligation to prepare mineral balance accounts and (iv) taxation of the mineral surplus. Also of importance is the requirement for livestock producers to have an environmental license. Newly built animal housing require 6 months manure storage capacity.

Strict rules on the application of animal manure apply to regions which are vulnerable, either due to the use of groundwater resources for human consumption or from an environmental point of view (e.g. water protection areas, nitrate sensitive areas, areas with phosphate saturated soils). Livestock producers in Wallonia are subject to the domestic waste water regime in case their pollution load is below 45 pollution units (0.04 pollution units per year for chicken and 10 pollution units per year per dairy cow). They are subject to the industrial waste water regime in other cases.

Denmark

The framework of nitrate policies in Denmark derives from the Aquatic Environment Action Programme (1987) with targets to reduce emissions of nitrogen, phosphorous and organic matter to the environment as well as from the Action Plan for a Sustainable Agricultural Development (1991). The most important elements of these programmes are (i) termination of run-off and leaching from storage of liquid and solid manure, (ii) regulations that require sufficient capacity to store animal manure, (iii) expanding the environmental approval of large-scale livestock production units, (iv) restrictions on the maximum amount of nitrogen in animal manure which may be applied on a per hectare basis, (v) restrictions on spreading of animal manure, (vi) compulsory preparation of fertilizer management plans and fertilizer balance sheets for all farms with at least 10 hectares of agricultural land, (vii) regulations on land utilization which require autumn crop cover to take up nitrogen after harvesting. A grant scheme provides capital assistance to cover up to 40% of the construction costs of waste storage facilities. Since 1988 the minimum capacity for storage of animal manure has been 6-9 months, with the longer period applicable to more northerly or environmentally sensitive areas.

Austria

Concepts of good agricultural practice regarding groundwater resources are defined in the Water Act (WRG.BGBI 215/1959 idF 252/1990). It includes a maximum amount of mineral fertilizers to be applied on the field. A license is required if livestock production exceeds 3.5 Austrian Livestock Units per hectare (3.5 DGVE/ha).

A levy was imposed on mineral fertilizers during the period 1986-1994, which however was abolished after that time for reasons of competitiveness when Austria entered the European Union.

Figure 4.2 Policies to address nitrates in groundwater and in surface water (figure continues on next page)

Germany

Fertilizer Act (Düngemittelgesetz) is to achieve use of fertilizers according to good technical practice;

The drafted version of the Fertilizer Application Ordinance (Düngemittel-Anwendungsverordnung) is to respond to the Nitrate Directive. It includes restrictions on the maximum amount of animal manure which may be applied, restrictions on fertilizer applications; restrictions on spreading of animal manure, and a compulsory preparation of fertilizer balance sheets. This law passed Parliament before the end of 1995. Application of animal manure should not exceed 170 and 200 kg N/ha on arable land or grassland, respectively. Up to 20% of total nitrogen from manure could be subtracted for unavoidable losses of ammonia during spreading. Records are required regarding nitrogen balances on an annual basis and regarding phosphate and potassium they are required on a tri-annual basis.

The Waste Act (Abfallgesetz) includes regulation of heavy metals content in sewage sludge and soil, and of application of slurry or stable manure.

Pollution Protection Act (Bundes-Immissionsschutzgesetz from 1990) prescribes that preventive measures be taken during the production process, among others to minimize emissions of ammonia.

The minimum storage capacity required is 6 months.

Spain

Point source pollution from intensive livestock production is regulated by the water law and the regulation on Hydraulic Property, as well as by Royal Decree 484/1995. This Decree includes measures to regulate and control effluents. It includes a system of financial support to develop and comply with the plans. This Royal Decree is also to meet the requirements of the Nitrate Directive. Codes of Good Agricultural Practice are still being worked out. It is to be the basis for more specific programmes which are directed towards the zones vulnerable to leaching of nitrate. Regional governments will identify zones vulnerable for leaching.

Regulation 6/93 of Cataluna requires pig producers to develop capacity to store manure for a period of at least four months. Management plans are developed to improve manure management in this region.

France

National policies on nitrates largely focus on advisory schemes. Also, Codes of Good Agricultural Practice are formulated at the national level, through the efforts of the Standing Committee for the Study of Nitrate (CORPEN) and the Mission Eaux Nitrates. Nitrate policies in Bretagne are based on the Installations Classées pour la protection de l'Environnement (Act on Classified Installations for Environmental Protection). It includes requirements on environmental approval for large livestock farms, regulation on the establishment of adequate storage capacity, restrictions on the application of animal manure, as well as restrictions on spreading of animal manure, and the preparation of nitrogen balance sheets. Presently, it only applies to new holdings; it will apply to all holdings as of 1999.

Figure 4.2 (Continuation)
(figure continues on next page)

Italy

Policies on the pollution of agriculture from nitrates derive from the Act to Control Water Pollution (Act 319/76 of Merli), which was first formulated in 1976. Farmers may discharge manure into surface water after treatment, or they may dispose of it to a public sewage treatment plant. Another option is to apply animal manure on the field according to hygienic rules set down by Local Health Authorities. Waste water discharges from commercial farms are subject to a charge (fixed amount plus an amount related to water consumption and costs of the sewerage and treatment services rendered).

More specific programmes have been formulated in the regions with major problems on nitrates in water in the Po Valley area. An Action Programme was formulated in 1989 to stimulate environmentally sound farming practice, based on voluntary measures. Measures include reduction of the amount of rinse water used in stables, processing of animal manure, and the establishment of measures to increase the capacity to store animal manure.

Codes of Good Agricultural Practice have been formulated in response to the Nitrate Directive. Expenditures on waste facilities are eligible for tax reduction.

Netherlands

Manure policy is based on various stages. The present third stage aims at a further tightening of standards to apply animal manure. Farms with a stocking density which exceeds 2.5 Livestock Units per hectare need to keep records of the way they apply their minerals, as of the year 1998. These farmers should show they apply their animal manure in an environmentally sound manner. This limit will be reduced to 2 Livestock Units per hectare as of 2002. Farmers are charged to pay a levy in case their acceptable losses of nitrogen and phosphorus do exceed certain standards which also change over time. Environmental standards on minerals and ammonia change during the next 15 years (according to the *Integrale Notitie Mest- en Ammoniakbeleid*).

Objectives to reduce emissions of ammonia derive from the Plan to Reduce Ammonia Emissions from Agriculture. The objective is to reduce these emissions by at least 50% by the year 2000 compared to the situation in 1980.

Portugal

Council Directive 91/676 still is to be regulated in Portugal. Some studies were conducted in order to identify vulnerable zones. A national plan to reduce pollution from nitrates was not adopted yet.

United Kingdom

The Pilot Nitrate Sensitive Areas (NSA) Scheme provided information on practical applications that farmers can take to reduce levels of nitrate leaching. MAFF has subsequently introduced a scheme consisting of 32 NSAs under the EU Agri-environment Regulation (2078/92). In return for payments farmers in ten NSAs selected have entered into a voluntary five-year agreement with MAFF to change their farming practices, in ways going beyond 'good agricultural practice', in order to reduce nitrate leaching.

The Control of Pollution Regulation 1991 set minimum standards for the construction of new or improved farm waste stores. They can apply to existing stores if they pose significant risk of pollution. Capacity to store animal manure has to be at least 4 months.

Figure 4.2 (Continuation)

Source: Rude and Frederiksen, 1994 for Belgium, Denmark, Germany, France, Italy, the Netherlands and the United Kingdom; Simonsen (1996) for other countries.

4.3.3 Plant protection products

In a way similar to nutrients, policies also are formulated in several Member States towards reducing the impact of usage of plant protection products (figure 4.3).

Directive 91/414 concerning the placing of plant protection products on the market will play a major role in the development to authorization of plant protection products and use in the Community. It is a co-responsibility of the Directorate-General Agriculture (DG VI) and the Directorate-General Environment, Nuclear Safety and Civil Protection (DG XI). The basic principles of this directive include the following: (i) development of a Community list of accepted active substances, (ii) review programme for existing active substances, (iii) authorization by Member States of individual plant protection products, which for new active substances or reviewed active substances may only contain those included on the positive list (with uniform principles to be the common criteria), (iv) mutual recognition, and (v) harmonized rules on classification, packaging and labelling. Directive 91/414 concentrates on the placing of plant protection products on the market. However, it also sets a number of basic principles with regard to the use of plant protection products which the Member States have to develop. Member States must prescribe that plant protection products must be used in accordance with the principles of good plant protection practice, in accordance with the conditions of the authorization and specified on the label, and whenever possible, in accordance with the principles of integrated pest control.

Member States presently respond to the adoption of the Uniform Principles in national legislation. The inclusion of specified reduction targets presently is limited to Denmark, Sweden and the Netherlands.

Belgium

There is a general policy objective to reduce use and emissions of plant protection products. No goals are quantified yet.

Denmark

A reduction plan was agreed upon in 1986, entitled Action Plan to Reduce Pesticide Application. It includes a plan to reduce amounts of active ingredients used by 25% by the year 1990 and a further 25% by 1997 compared to the period 1981-1985. Also, it is to reduce the number of treatments to apply plant protection products by 25% by the year 1990 and a further 25% by the year 1997.

A tax on sales of plant protection products is planned by the authorities in an attempt to reduce usage by 50% by the year 1997. Tax rates are up to 27% (insecticides), 13% for herbicides and fungicides; 3% for other plant protection products.

Figure 4.3 Policies towards usage and treatment of plant protection products
(figure continues on next page)

Finland

There is a general law (Torjunta-ainelaki, L 327/69) with rules on the allowance of plant protection products on the market. It puts conditions on the use, import, storage and transport of plant protection products. The Water Protection Law is a general law with implications on agricultural practice. It for example has requirements on the field margins required for production of crops.

France

There is no reduction programme. Emphasis is given to the introduction of Good Agricultural Practice, and to take measures to reduce risks of using plant protection products.

Germany

Focus is on restrictions in using plant protection products, as well as on banning specific compounds. Plant Protection Act (Pflanzenschutzgesetz) in Germany was amended in 1986 to consider stricter provisions for registration of plant protection products, and to allow their use according to 'Good Technical Practices'.

The Plant Protection Special Knowledge Ordinance (Pflanzenschutz-Sachkundeverordnung) includes regulation of the technical skills in use of plant protection products.

The Ordinance on the Use of Plant Protection Products (Pflanzenschutz-Anwendungsverordnung) includes regulation on the use of active ingredients.

The Ordinance on Pesticides (Änderung der Pflanzenschutzmittelverordnung) requires compulsory testing of plant protection equipment.

The Bee Protection Ordinance (Bienenschutzverordnung) includes restrictions of use which are a risk for bees.

The Water Resources Management Act (Wasserhaushaltsgesetzes) includes regulation of the use of plant protection products in protected water collection areas.

Greece

So far, the only policies which have been developed are those regarding the admission of plant protection products.

Spain

Emphasis is given in policy towards the occurrence of pesticides in food. The Spanish government has set no policy objectives to reduce use of plant protection products. Policy focuses on stringent environmental protection and risk reduction, adoption of IPM, reduction in the occurrence of residues in food, and increased operator safety and risk reduction. The potential for and evidence of the occurrence of pollution by plant protection products, did increase the opportunities for integrated pest management (IPM) as a strategy for a more rational use of plant protection products. The achievement of a more rational use of plant protection products was also implemented through the creation of Farmers Associations for Integrated Treatments in Agriculture (ATRIAS). Their objectives are to promote IPM through the provision of training to farmers, monitoring and technical advice. Efforts of ATRIAS are financed by MAPA (Ministerio de Agricultura, Pesca y Alimentación). A programme to promote integrated pest control is established at national level through specific farmers associations and subsidies are established for technical assistance, managerial costs of the association and for goods and machinery.

Figure 4.3 (Continuation)
(figure continues on next page)

Italy

The 1987 'National Integrated Control and Protection Plan' aims to reduce use of plant protection products by some 30-50%. This is to be reached by (i) management and control of the use of plant protection products, (ii) the provision of incentives to production methods which are compatible with the environment and health; (iii) increase use of alternative control systems; and (iv) promotion of quality of products from the Italian market.

Netherlands

The Multi-Year Crop Protection Plan of government in the Netherlands includes a long-term, multi-objective oriented approach (reduce usage levels, emissions to the environment and dependence on the use of plant protection products) is aimed at a reduction in usage of plant protection products across all agricultural sectors and a more sustainable form of agriculture in the Netherlands. These objectives will be achieved through an overall reduction in the use of plant protection products by the year 2000 of 50% compared to the period 1984-1988; a reduction of emission of plant protection products to the environment; and a reduction of the dependence on the use of chemical plant protection products. In addition to existing instruments, emphasis is given to research, extension, education and fiscal incentives.

Sweden

In 1985, the Swedish government mandated a 50% reduction in usage of plant protection products by 1990. It is part of the Programme to Reduce the Risks Connected with the Use of Plant Protection Products. The reference point was based on the average of total sales (in kg of active ingredients) between 1981 and 1985. This reduction was achieved by 1990. A further reduction of risks and another 50% reduction of use of plant protection products was announced in 1990 in the framework of a new food policy. Measures to reduce use include (i) risk-benefit analysis, (ii) voluntary tests of sprayers in operation, (iii) research and development on weed and pests, (iv) integrated crop protection, forecast and warning of pests, (v) advisory services for the reduced use of herbicides, (vi) research on the effects of unsprayed zones on flora and fauna, and (vii) charges on herbicides.

United Kingdom

Policy in the United Kingdom is aimed at minimizing the use of plant protection products. No explicit reduction goals have been formulated, but the Control of Pesticides Regulations 1986 require action to ensure that such products are used safely. The Approval of Pesticides is required before a product can be advertised, sold, supplied or used. They must satisfy strict standards which are laid down in the Food and Environment Protection Act.

Figure 4.3 (Continuation)

4.3.4 Natural habitats, fauna and flora

Nature Conservation policy of the European Union is laid down in the Habitats Directive and the Birds Directive. The conservation of plant and animals, as well as habitats and ecosystems, is arranged for by these Directives.

The main objective of Council Directive 92/43 of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) is 'to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora of Community interest'. Measures shall take into account economic, social, cultural and regional requirements and regional and local characteristics. In particular, it covers two main areas, i.e. the conservation of natural habitats and habitats of species, and the protection of species. Member States are prohibited 'the possession, transport, trade or exchange, and offering for sale or for exchange of specimens captured in the wild' (Articles 12.2 and 13.1(b)).

The Directive also calls on Member States to encourage the management of features of the landscape which are of major importance for wild fauna and flora, especially in respect to of the migration, dispersal and genetic exchange of wild species, including, for example, rivers and riverbanks, ponds and small woods.

Member States need to communicate a list of sites to be designated as protected areas constituting the Natura 2000 network. It is a coherent network of special areas of conservation and includes the Special Protection Areas (SPAs) classified under the Birds Directive (79/409/EEC) and the Special Areas of Conservation (SACs) to be designated under the Habitats Directive. The implementation of the Habitats Directive is reviewed by the World Wild Fund for Nature (WWF, 1995).

4.3.5 Some other environmental directives

The European Commission recently presented a proposal for a Directive to amend Directive 85/337 (EEC) on the assessment of the effects of certain public and private projects on the environment. The amendments would considerably increase the number of impact assessments required compared to the 1985 Directive. The annex lists the projects for which an impact assessment is compulsory (Annex 1) and those for which it is not compulsory. Certain criteria however must be respected if the Member State decides not to require an assessment. Regarding agriculture, Annex 1 now includes facilities for the intensive rearing of poultry or pigs with more than 85,000 places for broilers, 60,000 places for hens; 3,000 places for production pigs (over 30 kg); or 900 places for sows. Annex 2 presently lists 50 types of projects in the areas of agriculture, forestry, aquaculture, extractive industries, energy, production and treatment of metals, mineral industries, chemicals, textiles, leather, wood, paper, rubber, infrastructure projects, tourism and entertainment. Annex 2 includes projects (i) for the restructuring of rural land holdings, (ii) for the use of uncultivated land or semi-natural areas for intensive agricultural purposes; (iii) water management for agriculture, including irrigation and land drainage projects; (iv) initial afforestation and deforestation for the purposes of conversion to another type of land use; (v) intensive livestock installations (not included in Annex 1).

Community guidelines on State aid for environmental protection are included in Framework 94/C 72/03. The main types of aid are divided into three broad categories including (i) investment aid, (ii) horizontal support measures, and (iii) operating aid:

- investment incentives, possibly associated with regulation or voluntary agreements. The objective of investment incentives in this sphere is to gradually raise the quality of the environment;
- aid for horizontal support measures. Measures are designed to help find solutions to environmental problems and to disseminate knowledge about such solutions so that they are applied more widely;
- operating aid in the form of grants, relief from environmental taxes or charges, and aid for the purchase of environmentally friendly products. The introduction of environmental taxes and charges may involve state aid because some firms may not be able to stand the extra costs and require temporary relief. Such relief is operating aid.

These guidelines apply to aid in all sectors governed by the EC Treaty, including those subject to specific Community rules on State aid (such as agriculture and fisheries). In the agricultural sector the guidelines do not apply to the field covered by Council Regulation (EEC) 2078/92.

A common position was adopted by the Council on 27 November 1995 with a view to adopt a Council Directive concerning integrated pollution prevention and control (Official Journal of the European Communities, 25.3.96) (96/C 87/02). The purpose of this Directive is to achieve integrated prevention and control of pollution arising from the activities listed in Annex 1. It applies to certain installations of energy industries, production and processing of metals, mineral industry, chemical industry, waste management and other activities. Regarding agricultural activities the Directive is applicable to installations for the intensive rearing of poultry and pigs with more than (i) 40,000 places for poultry; (ii) 2,000 places for production pigs (over 30 kg), or (iii) 750 places for sows. This Directive lays down measures designed to reduce emissions in the air, water and land from the activities listed in Annex 1, including measures concerning waste, in order to achieve a high level of environmental protection.

4.4 Concluding remarks

Environmental issues are better recognized in CAP than they were in the past. Environmental clauses presently are included in Council Regulations on products like arable crops (set-aside of land), beef and sheep. No environmental clauses are explicitly included in measures to produce wine, pigs and dairy. Environmental clauses presently allow Member States to set conditions for payment of compensation. Environmental requirements in market and price policies are included in the Arable Crop Scheme (Regulation (EEC) 1765/92). Also, Member States are allowed to put payment conditions in order to encourage the use of practices which is compatible to the need to safeguard the environment and preserve the countryside. Such environmental conditions are presently added to the livestock schemes, including the Council Regulation on beef market organization, the Council Regulation on sheep, as well as to the Less Favoured Area Scheme. The inclusion of environmental requirements in the beef and sheep regimes presently is limited to the United Kingdom.

The present state of the environment requires strong efforts by Member States in meeting targets. Several directives have been formulated in the EU to meet quality standards of water, such as the Nitrate Directive, and the proposal for a Directive on the Ecological Quality of Water (COM 93 680). The implementation of such Directives is left to Member States. This allows them to achieve the common goal of unity in a way that recognizes the national character.

5. EFFECT OF MARKET AND PRICE POLICIES ON THE ENVIRONMENT AND LANDSCAPE: AN ANALYSIS OF AGRICULTURAL PRODUCTS

5.1 Introduction

In this chapter, environmental effects of market and price policies are analysed according to agricultural products. Also, attention will be paid to differences in impact of policies between regions within the EU. Focus will be on the CAP market and price policies as applied since the 1992 reform. Agricultural policy reform involves a shift away from commodity-based producer price support and output subsidies towards instruments that are less directly related to output produced and inputs used. Policy changes lead to changes in relative prices between commodities, regions and countries, farm inputs and outputs, agriculture and other economic sectors, and may result in changes in the levels, composition and location of production, and in farming practices and farm structure. Economic benefits may result from a better allocation of resources on the production of agricultural commodities. Environmental benefits could similarly be achieved by reducing the intensity of production, including lower usages of fertilizers and other agrochemicals. Both should contribute towards more environmentally sound farming practices. However, positive environmental effects of policy changes for one product and/or for one region may be ruled out by less beneficial consequences of these policy changes for other products and regions.

This chapter will focus on cereals (Section 5.2), beef (Section 5.3), grapes (Section 5.4), sheep (Section 5.5), pigs (Section 5.6) and dairy (Section 5.7).

5.2 Cereals

5.2.1 Effects of CAP price and direct income support

The cereal regime has been affected most radically by the reform measures (see section 2.3) as support prices have decreased by roughly one third between 1992/93 and 1995/96. Compensatory payments for price reductions have been offered. Large-scale producers of cereals, oil-seeds, fodder maize and protein crops are only eligible to direct payments if they set aside part of their land. Environmental effects may come from changes in price support and from the obligation to put land aside.

According to Folmer et al. (1995:201), the CAP reform of the cereal regime may have a positive effect on the environment. There are several arguments for this consideration. One obvious reason is that land set-aside will not be farmed in an intensive way. Secondly, the authors expect that a reduction of output prices together with the provision of compensatory payments on a per hectare basis will lead to less intensive production techniques. A third ef-

fect may result from rebalancing, whereby cereals used as animal feed becomes cheaper. This reduction of cereal prices could replace cereal substitutes and, for that reason, partly eliminate the competitive advantage of specialized pig farms in the vicinity of seaports where the substitutes can enter the Union. Concentration of pig production increased in the past in areas that have good access to large harbours (e.g. Rotterdam, Antwerp, Ghent, Hamburg and Brest) for the supply of material to produce feeding stuffs at low costs, and are close to the main urban centres of Europe (Brouwer and Godeschalk, 1993). In Bretagne a relatively small harbour (Lorient) is even more important for the import of soya than Brest is. An indirect effect of a reduction of cereal prices could be a reduction of pigs and poultry production in such regions with large amounts of excess of manure. Folmer et al. (1995), however, point out that any positive effects on the environment of a reduction of cereal prices may be very small as long as animal numbers remain projected to increase in the years to come. Such a trend is the case according to their projections regarding the impact of the CAP reform on pig production. Also, a shift of production may be harmful to the environment in areas with insufficient capacity to absorb the pollution (Folmer et al., 1995:202). Cereal demand for animal feed increased in 1993/94 by at least 5 million tonnes, due to both a cereal price drop in the EU and rather high soya meal prices. Animal feed cereals consumption was assessed to be around 87 million tonnes which is slightly below consumption levels during the mid-1980s (Lugenot, 1995). The higher demand of cereals to feed animals is still below calculations made by the European Commission. The European Commission assumes an extra 12 million tonnes of cereal use for animal feed by the year 2000/1. Burrell (1995) considers that this target can only be met if livestock numbers increase significantly and/or cereal prices are reduced below the levels set by the CAP reform for the year 1995/96.

Dourmad et al. (1995) provide an investigation on the impact of CAP reform on regimes to feed pigs. A price reduction of cereals is in favour of lower protein content in diets, and subsequently lower nitrogen excretion from livestock. The average protein content of diets of fattening pigs in Bretagne, for example, was reduced by some 1 to 1.5 percent units at the end of 1993 compared to the beginning of the same year. This corresponds to a reduction of nitrogen content of pig manure of 0.2 to 0.4 kg N per animal.

The study of Dijk et al. (1995) analyses the impact on input use of changes in the price relation between outputs and inputs. They also examine implications of such a change in price relations on yield, as well as on the environment. The analysis of Dijk et al. (1995) focuses on the reduction of cereals prices and its consequences for the use of nitrogen from chemical fertilizers and on plant protection products. A distinction is made between two regions in the Netherlands. Furthermore, the effects in the cereals sector were studied for their consequences - by reducing prices for feed concentrates - for the use of nitrogen, green fodder and feed concentrates in the dairy sector. Also the influence of cutting milk quota on the use of inputs and its consequences for the environment is analysed in this study. The study has been carried out with farm level data available from the farm accountancy data network in the Netherlands.

According to calculations based on estimated production functions, a reduction of cereal prices by some 30% could result into a decrease of the use of nitrogen of 11% as well as a reduction of use of plant protection products by some 38%. As a result, cereal production will

only decrease by 6% 1). From this study one may conclude that a price reduction of cereals probably has a significant impact on the use of inputs and subsequently on the environment, while the effects on production level are moderate. Preliminary results from a Danish study confirm the profound impact cereal price reductions will have on the use of fertilizers and chemicals as calculated by Dijk et al. for the Netherlands (SJI, 1995).

The study of Dijk et al. provides elements towards a positive effect on the environment of the reform of CAP. Some side remarks need to be made:

- first of all, it has to be noticed that the study throws no light on the direct relation between the level of nitrogen used by agriculture and their effect on quality of the environment. A reduction of nitrogen used does not necessarily imply an improvement of environmental quality as it are losses to the environment which would account for that. Leaching levels of nitrate to groundwater resources do not only depend on animal manure applications. The risks are highest when rainfall is high, evaporation is low, and crop demands are low. This implies that vulnerability is highest in the autumn and winter period. Treatment and application of minerals from organic and inorganic sources are crucial in that respect;
- moreover, some assumptions made in this study limit its general validity. For instance, the fact that changes in the tillage plan of the farmer are not considered. However, as a response to changes in price relations, farmers may diversify their production. If this shift happens towards products which make more intensive use of inorganic fertilizers and plant protection products, diversification does not favour the environment.

Rainelli and Bonnieux (1995) indicate that diversification induced by declining cereal prices has already had some negative environmental consequences in some regions of France. They report that cereal farmers suffer a net decrease in their revenue because the reduction of cereal prices is not completely compensated by direct payments. Moreover, set-aside schemes lead to idle production capacity with unemployed capital (machinery) and labour. Because of that, cereal farmers are diversifying their farming system towards other products which happen to be vegetables, horticulture and fruits, products making more intensive use of agro-chemicals than cereals. For example, in the Landes, where cereals and maize dominate, carrots production has largely increased. In 1992 the carrot area was limited to 850 ha and in 1994 it reached 2,000 ha, bringing the Landes to the country's second place (after Manche: 3,300 ha in 1994) in carrot production. In the same way, in the Nord, the potato area increased significantly. According to Rainelli and Bonnieux (1995), the expansion in fruit and vegetable production in some regions leads to an intensification and an increase in use of fertilizers and plant protection products in those areas. This brings them to conclude that diversification does not necessarily favour the environment in regions specialised in cereals. Rainelli and Bonnieux observe too, that in some other regions the carrot and potato areas decrease, but they do not indicate what products are replacing these two. To give an overall view of the consequences of cereal

1) This is assessed for the Southwestern part of the country. In the Northern region the price decrease results in a 6% reduction of nitrogen use and 2% lower production levels.

price changes for production diversification and subsequently for the use of agro-chemicals, one should also take into account what happens in regions where cereal production does not dominate the arable crop sector.

Diversification may be induced by changing relative price relationships but also other factors, like farm structure and biophysical conditions are important. Differences among France and the Netherlands in cropping plan to grow cereals are interesting to notice in this respect. In the Netherlands, growing cereals is part of a narrow cropping plan with a large share of sugar beet and potatoes. The possibility to replace cereals by other crops are limited in that country. The production structure in the Paris basin differs because of its emphasis on highly specialist cereal production. The replacement of cereals by vegetables is relatively easy from an agronomic point of view. A price decline may affect the production and reduce the input use but it may have structural effects as well, including diversification of farming practice and changes in cropping plan. The net effect of price changes on the use of inputs then results from a combination of changes of production levels and in production shifts (because of changes in the cropping plan). Changes in output prices as well as of direct income support are possibly to affect use of inputs. A reduction of output prices may affect short-term decisions and therefore provide an incentive towards a more rational use of inputs. The net effect of a reduction of output prices and direct income support is to affect decision making by farmers which exceed the present production period and includes responses in investments and structural changes in agriculture.

There is some empirical evidence that the consumption of plant protection products to grow cereals decreased during the past couple of years. In France, for example, the use of plant protection products declined on a per hectare basis by 40% since 1988, while in Germany (35%) and the United Kingdom (almost 20%) the reduction was notable, too (Noé et al., 1995). This reduction in usage levels runs parallel to changes in agricultural policy (stabilizers and the Mac Sharry reform) which started around the late 1980s. It is an open question whether parallel developments between changes in agricultural policy and in use of plant protection products can be interpreted as a causal relationship. Set-aside and a lower relative profitability of plant protection products in arable crops might be the main effects of the Mac Sharry reform for the use of plant protection products to grow such crops.

There may be many factors which affect this trend of reducing usage levels of plant protection products. One important factor to be mentioned relates to the reform of CAP, already started in the 1980s. The stabilizer package for arable commodities reduced production growth and introduced the set-aside scheme. Moreover, a restrictive price policy led to real price decreases. Another factor in influencing the sales of plant protection products is that contents of the active ingredients change so that a farmer needs less kilograms to protect crops against pests. Furthermore, the growing awareness of farmers of the negative environmental effects of excessive use of these products has affected the use of agrochemicals. In some Member States, public dissatisfaction about agriculture contributing to environmental pollution led to the adoption of programmes in which targets are set to reduce the use of plant protection products by agriculture. In Denmark, for instance, the Pesticide Action Programme is in force since 1987 with its targets towards 1997 to reduce the use in active substances signifi-

cantly. All farmers must keep records of their use of plant protection products and their spraying equipment is subject to control. Such a bookkeeping system is mainly used as a management tool to support farmers in identifying the scope for reduction in using plant protection products. Furthermore, farmers have to undertake compulsory education in the correct use of plant protection products. This programme has contributed to the fall in the total use in terms of the active ingredients for agricultural purposes by around 40% in 1993 with respect to the level of the 1981-85 period (Environmental Protection Agency (EPA), 1995). The reduction in the amount of active ingredients of plant protection products used is said to be primarily due to new compounds which require significantly lower dosages per treatment compared to the compounds used in the past (Voltzmann, 1994:8). Differences among compounds on their toxicity may be considerable. Therefore, *a priori no* conclusions with respect to environmental effects can be drawn from the fact that farmers use less plant protection products in terms of active ingredients.

It turns out to be very difficult to assess reduction levels of chemical inputs in response to the reduction of cereal prices. This is due to the farmers' decisions which depend on the marginal productivity of the agro-chemicals used. To know the marginal productivity, one needs to have knowledge of the production functions on a disaggregated level. Such information is only very scarcely available. A direction from which the environmental effects of the price reduction of cereals can be examined, is to provide farm specific information on specialist cereal farms. In table 5.1, a regional distribution of specialist cereal farms is presented. Indicators presented are the costs per hectare of using plant protection products, as well as the share of costs of using plant protection products per 100 ECU of total output. Both indicators may provide elements towards an analysis of changes in output price of cereals and the possible effects on the use of chemical inputs (e.g. plant protection products). The incentive to reduce expenditures on plant protection products is likely to be highest in case they cover a considerable share in total output from farming, assuming that the marginal productivity is lower when more inputs are used.

Utilized agricultural area of specialist cereal farms in EUR 12 on average amounts to 39 hectare, of which 65% is used for cereals (excluding rice and durum), 8% for oilseeds and pulse crops and 15% for forage crops. Costs of plant protection products are 52 ECU per hectare of utilized agricultural land, which covers about 6% of the output value.

Costs of plant protection products on a per hectare basis are highest in France, Ireland and United Kingdom. They are below the average of EUR 12 in Greece, Spain, Italy and Portugal. Difference among regions are also high. In France and in the UK, costs of plant protection products are a relatively high share of output returns. With lower cereal prices, cereal farmers in both countries have a strong incentive to reduce their costs of plant protection products. Also in Ireland and some regions of Germany the reduction of the cereal prices may be an incentive to reduce expenditures on plant protection products. This is due to the relatively high share of costs of these intermediate products in total output from agriculture. The share of costs of plant protection products in total output however is low (less than 5%) at specialist cereal farms in Greece, Spain and Italy.

Table 5.1 Structure of specialist cereal farms and costs of plant protection products in 1990/91

Country/region	Farms represented (x 1,000)	Farm size (ha UAA)	Cropping plan (% of UAA)		Cost of plant protection products	
			Cereals (excl. of rice and durum)	Oilseeds and pulse crops	(ECU/ha)	Share of output (%)
Denmark	2	25	81	13	63	6
Germany	7	31	77	12	83	7
Greece	31	13	44	1	24	3
Spain	102	51	71	5	9	2
France	35	68	68	18	117	10
Ile de France	3	91	75	20	125	11
Champagne-Ardenne	2	78	69	22	129	12
Picardie	2	66	72	16	156	13
Centre	11	80	61	21	134	11
Bourgogne	2	78	65	24	124	12
Ireland	4	35	74	1	100	9
Italy	102	15	35	1	43	4
Piemonte	12	17	50	2	106	6
Portugal	10	40	44	5	30	6
United Kingdom	15	123	71	9	96	9
England East	8	125	75	11	114	10
EUR 12	319	39	65	8	52	6

Source: FADN-CCE-DG VI/A-3; adaptation LEI-DLO.

Note: Belgium, Luxembourg and the Netherlands are not included as the number of farms in the sample is smaller than 15.

In reality the price adjustments of cereals are significantly affected by the agri-monetary changes since 1993. Farmers in countries with a devaluating currency experienced (real) producer prices to go up in national currency although CAP reform implied a decrease of the prices in ECU. So, in most recent years cereal producers in the Spain, Italy and the United Kingdom were faced with an increase of cereal prices, if measured in national currencies. Such a price trend may have discouraged them to further reduce the use of plant protection products in most recent years.

Sales of plant protection products have also been affected in some countries by extreme weather conditions. Severe drought periods in Spain have contributed to a remarkable extensification of agricultural practices. This trend included lower usages of plant protection products in 1993 (Varela-Ortega and Sumpsi, 1995: 30).

Lower prices may have complex implications for the agricultural system. Response by farmers to a reduction of prices depend on their ability to achieve cost savings in various parts of production. Costs could be reduced by hiring less labour or increase specialization. Lower prices for cereals may change the price ratio with other products and therefore change the cropping pattern. Besides consequences for the use of plant protection products, this may have effects on other inputs used, like water. Water resources are one of the most critical environmental issues in South European countries, especially in Spain. An increase of water extraction for irrigation purposes seriously affects preservation of wetlands and a subsequent threat to irrigation of maize. Lower prices are expected to change cropping plan so that water will be allocated to less water demanding crops. On irrigated lands in Spain, this means a shift from maize to oilseeds (Varela-Ortega and Sumpsi, 1995:32).

5.2.2 Effects of set-aside

The set-aside scheme was introduced in 1988 as a voluntary instrument, mainly intended to reduce oversupply of cereals in the Union. In the 1992 reform the scheme was reformulated and expanded. One important feature of the 1992 scheme is the conditionality to manage the land set-aside to ensure the protection of the environment.

The 1988 set-aside scheme was not very effective in reducing production levels as only a small number of cereal farmers participated in the programme and those who participated put aside land with low marginal productivity (see for instance Robinson, 1991 for experiences in the UK). The 1992 set-aside scheme will likely have a broader impact, both on production and the environment as large-scale producers need to put aside part of their land in order to be eligible for compensatory payments. The set-aside requirements refer to the so-called base area, the area of arable land (including the area of cereals, oilseeds and protein crops) eligible for the arable payments scheme. This area is set and based on the average of 1989, 1990 and 1991, mainly for budgetary reasons. Fixation of the base area, however, also has favourable effects on the environment, as it prevents large-scale reversion of extensive grassland towards growing arable crops. This trend towards increasing acreage of arable crops was observed in the UK during the 1970s because of relatively high prices to grow cereals. Fixation of the base area may subsequently also imply that regions with intensive production methods and high yields remain on that level. Extensification effects of set-aside therefore are likely to be limited. Table 5.2 shows the areas set-aside in the Member States for the years 1993/94 and 1994/95.

In the year 1993/94, the total area set aside was 6.3 million hectares, while the area under cultivation of cereals, oilseeds and protein crops was 43.3 million hectares (CEC 1995a: Annex 3). Of the area set-aside, 4.6 million hectares correspond to rotational set-aside (the only form of market set-aside in 1993/94) and 1.65 million correspond to the old five-year set-aside, a scheme under Regulation 2328/91. This last scheme has now expired. Then in 1994/95, there was according to the estimates of the Commission a steep increase in the area set-aside in all Member States, resulting in a total area set-aside of 7.3 million hectares (table 5.2).

Table 5.2 Base area and area set-aside in EU Member States, 1993/94 and 1994/95 (in 1,000 ha)

	1993/94	1994/95
Base area	48,830	49,030
of which area with set-aside requirements	29,930	33,300
Rotational set-aside	4,614	3,737
Non-rotational set-aside	0	1,674
Total market set-aside	4,614	5,411
Voluntary set-aside	-	600
Old scheme (5 year set-aside)	1,649	1,296
Total set-aside	6,263	7,307

Source: CEC (1995a): Annex 3 and 6.

The area set aside in that year is largest in France, Germany, Spain and - at some distance - Italy and the United Kingdom (table 5.3). These countries have the biggest holdings and/or largest areas of cereals, oilseeds and protein crops. In this 1994/95 estimate, an area set aside under the old scheme of 1.3 million hectares is included. Half of the 'old five year' set aside can be found in Italy while half of the voluntary set-aside is observed in Spain. The area set-aside under the new 1992 scheme is estimated to be 6.0 million hectares, including 3.7 million hectares under the rotational system and 2.3 million hectares under the non-rotational and voluntary set-aside. Out of this latter area, it is estimated that 1.2 million hectares replaced the 0.88 million hectares of rotational set-aside, 0.6 million hectares correspond to the increase in the area for which an aid was requested under the general scheme and 0.6 million hectares were voluntary set-aside (of which half of it took place in Spain).

Because of agronomic reasons, traditional fallow is common in most Southern European countries. A national regulation in Spain establishes traditional fallow index by region. Farmers are obliged to respect these rules. Furthermore, traditional fallow in Spain is excluded from compensatory payments. The total area under set-aside increased by about 1 million hectares of which about 0.5 million hectares were taken out of the 1993/94 cultivated area and another 0.5 million hectares were added from land planted to crops other than cereals, oilseeds and protein crops. The European Commission notes that a significant part of land remains outside the scheme and expects that 'with the increase of the aid in 1995/96 and with better information in some regions there will be an increase in the areas for which an aid is requested' (CEC, 1995a:7). The Council have now taken the decision to set the set-aside rate at 10%, and in addition they have decided on a single rate for both rotational and non-rotational set-aside for the crop year 1995/96. Such a reduction would largely affect the areas for which aid is requested.

Table 5.3 Area set-aside in EU Member States, 1994/95 (x 1,000 ha)

	B/L	DK	D	EL	ES	FR	IR	IT	NL	PT	UK	EU 12
Base area	522	2,018	10,156	1,492	9,220	13,526	346	5,801	437	1,054	4,461	49,033
Cultivated area a)	509	1,738	8,753	1,351	8,343	11,900	275	4,951	426	783	3,802	42,830
Total Set-aside	29	271	1,616	18	1,417	2,123	36	961	28	67	741	7,307
Set-aside area												
Rotational b)	22	119	692	18	996	1,068	38	210	12	67	497	3,737
Non-rotational	5	147	703	0	66	767	-	40	2	-	158	1,674
Total market set-aside	27	266	1,395	18	1,062	1,735	38	250	14	67	655	5,411
Voluntary	1	n.a.	n.a.	0	287	98	-	n.a.	n.a.	-	n.a.	600
Old scheme (5 year)	1	6	221	0	68	190	0	711	14	0	86	1,296

a) Total area under cereals, oilseeds, linseed, protein crops and silage; b) for Ireland and Portugal, the figure refers to total other than 5 year set-aside.

Source: CEC (1995a), Annex 6.

The new Arable Support Scheme, which combines reduced price support in rules on set-aside, applies to all Member States. Individual Member States, however, have been left to decide in detail what management practices are to be required, encouraged or banned on set-aside land. In this context, Member States 'shall take the necessary measures to remind applicants of the need to respect existing environmental legislation' (EU Regulation 1765/92, Article 10).

Member States also 'shall apply appropriate measures which correspond to the specific situation of the land set aside so as to ensure the protection of the environment' (EU Regulation 2293/92, Article 10).

Environmental effects of non-food set-aside

Land which is put aside, may require small amounts of agrochemicals. The non-food use option for set-aside may however imply that the intensity of farming practice would not be reduced to a large extent compared to present conditions. There is, however, an increasing interest to participate into voluntary schemes to reduce the intensity of farming practice. In order to protect water against pollution, rapeseed growers in France, for example, have proposed a code of good agricultural practice. It is proposed to sow as soon as possible after harvest, in order to favour crop growth during the autumn period and diminish leaching of nitrates. The date of application of nitrogen is delayed as far as possible (after mid-January) and the total dosage needs to be applied in at least two parts. A survey was conducted in 1993 on the uptake by farmers of this code of good agricultural practices. This survey included 4,000 plots and 13,000 ha of rapeseed. The code was not applied in a correct manner on less than 4% of the plots. Nevertheless 80% of the plots received between 140 and 240 kg of nitrogen. These

amounts were too high in about a quarter of the number of cases, compared to yields achieved and therefore to the level of nitrogen uptake (Figarol, 1993).

The set-aside scheme resulting from the CAP reform is rather unpopular in France. This is due to cultural and economic reasons. Agriculture is characterized in that country by a long-standing modernization process which started after the second World War. It was aimed to increase efficiency with structural reform and modernization processes. This has enabled French agriculture to capture an increased share of the EU market and to become a major agricultural world exporter. The obligation to set-aside a noticeable share of the most productive farms was seen, and is always seen, as a backward evolution. Fear about a reduction of the production capacity explains the interest of the French farmers for the option of keeping set-aside land in production rather than leaving it idle. Article 7-4 of Regulation 1765/92 defines eligibility as 'products not primarily intended for human or animal consumption' and detailed rules on that are laid down in Council Regulations 334/93 and 2595/93. Eligible crops are primarily cereals, oilseeds and protein crops. In addition to bio-fuels, other end product like various chemicals plastics and paper are eligible under certain conditions.

The control system for the scheme is based on the requirement for the farmer to sign a contract, either with the first industrial processor or with a trader who is obliged to sell on to the processor of the pre-defined end product. Payment of the area compensation, which is precisely the same amount as compensation under the set-aside scheme, could be made before the material is processed. In 1993, total non-food use set-aside area in France reached 73,000 ha. Diester rapeseed occupied more than 50% of total non-food set-aside in France. In 1994, the total non-food use set-aside area already increased to about 280,000 ha, the main part being sown with rapeseed. Fayolle (1994) expects the planting of rapeseed to reach 400,000 ha in 1996. This development is accompanied by an increase of the capacity from the processing plants. The capacity for bio-ethanol is projected to reach a level 450,000 hl in 1996. An additional difficulty of the non-food use option of set-aside might be the uncertainty in long-term supply to processing industry. So far, the production of bio-ethanol from cereals and sugar beet is not profitable at farm level without additional support through subsidies or deduction of tax payments. This also holds for the production of bio-fuel from rapeseed. Sourie and Hautcolas (1994) show that wheat is economically the best non-food crop for farmers. In fact, the non-food use set-aside is viable only if tax concessions are granted. A reduction of taxes can only be done by Member States to support pilot projects.

A clear position on the non-food use option of set-aside is not possible yet. The use of chemical inputs may increase with the non-food option. Moreover, the increase of rapeseed production on land which is part of the set-aside scheme may affect the landscape. An increase of homogeneity of the countryside may reduce visual attractiveness of the landscape. The non-food option for set-aside may also affect the mosaic of crops and semi-natural habitats, and subsequently to reduce the spatial heterogeneity of landscape. Because the occurrence of different habitat patches generally encourages overall diversity of species in such an area, a concentration of rapeseed production reduces biodiversity and movements between habitats.

Rotational versus non-rotational set-aside

Farmers have two options under the 1992 set-aside scheme: rotational and non-rotational. The rotational set-aside specifies that each year a different piece of land must be kept aside for a period of at least seven months. This period starts on December 15 at the earliest and ends August 15 at the latest. Non-rotational set-aside allows producers to fallow their least productive land on a multi-annual basis. In the first two years of the reform, the non-rotational rate was higher than the rotational rate (see also figure 2.2), but the difference has been abolished in 1995/96. For 1995/96 the rotational and non-rotational set-aside rates are the same, i.e. 10%.

Potential environmental benefits from the set-aside scheme are related to the use of chemical inputs, treatment of animal manure, land use, and flora and fauna. Obviously, fewer chemical inputs will be used on land which is put aside, compared to the case when it remains under production. However, the net effect of the set-aside policy and a price reduction of cereals on chemical use may be less certain. Effects depend, among others, on what will happen with input use on the area remaining under cultivation and the way it is being managed. A farmer may opt for higher yields per hectare to compensate lower output prices and therefore he may decide to increase his input use. This is however no economic behaviour of the farmer, both from a theoretical point of view (see section 3.3) as well as based on empirical evidence (see section 5.2.1). During the past couple of years, farmers have been recommended to reduce the intensity of production.

Farmers have to maintain set-aside land by establishing a green cover. Obviously, fallow land left bare may easily erode, and subsequently the future productivity potential of the available land resource may be reduced. So, such a requirement of preventing soil erosion can be considered to be environmentally sound land management. Besides that, green cover has two additional environmental benefits: it 'alleviates topsoil runoff pollution as the vegetative crop helps hold the pollutants (nitrate and phosphate) in the soil' and it 'helps to counteract nitrate leaching into underground water resources' (Williamson, 1993:66). However, some of these benefits may be lost when farmers are allowed to dispose manure on green covered land set-aside. Moreover, allowing farmers to produce industrial crops on land set-aside with fertilizers and plant protection products applications will negate environmental benefits from idling the land. Therefore, concessions provided for in the set-aside regulation may limit the potential environmental benefits. The requirement to establish a green cover on land which is put aside may also affect water consumption in regions with large periods of drought (e.g. Spain).

According to Williamson, non-rotational set-aside provides more consistent benefits than rotational, mainly related to the achievement of soil conservation benefits. Under the rotational option, farmers must prepare the set-aside land for production the next year which could require additional inputs, particularly herbicides. When farmers rotate their land which is put aside, it may prove difficult to establish an effective green cover. If the green cover fails to fill in before the first significant rainfall, the farmer risks considerable erosion damage to the set-aside land (Williamson, 1993:66). Non-rotational set-aside is also the better choice for counteracting runoff and leaching problems. Other benefits of non-rotational set-aside are

mentioned by Hawke and Kovaleva (1994) who stress that the agreement to set aside land on a semi-permanent basis (for at least 5 years) allows for the restoration of greater variety of habitats than is possible under rotational set-aside. Such a system of the set-aside scheme would also contribute to build up local populations of plants and animals, and so is, in general, better for wildlife.

Cereal producers in the EU may apply either for a rotational or a non-rotational system of set-aside since 1994. As shown in table 5.3, non-rotational set-aside is relatively most applied in Denmark and Germany. When including the land set-aside under the old scheme, in both countries about 55-60% of the total set-aside area in 1994/95 is land set aside on a permanent basis, i.e for at least 5 years. In France, non-rotational set-aside seems to be attractive to the farmers too, while in Greece this form is not applied for at all. Looking at the total area set-aside for whole EU-12, rotational and non-rotational set-aside is applied almost to the same extent. So, it seems that both forms of set-aside are equally attractive on the EU level, although major differences remain between Member States.

A number of reasons need to be considered in understanding differences between Member States regarding the application rates for one form or the other. Crucial to the farmers is the balance of costs and benefits of the measure. An important factor influencing a farmer's decision deals with the homogeneity of the quality of his land. A farmer may find it more attractive to choose the non-rotational form in case major differences arise across parcels in land productivity. The obligation to put land aside could be met by reserving land with lowest productivity for a period of at least five years. Production decline in that case is likely to be less than in the case of rotational fallow. A second reason is the cropping plan. If a farmer has an intensive cropping plan where the same crop returns once every three or four years at the same field, he will opt for rotational set-aside. As he opts for non-rotational set-aside under these circumstances, he will decrease the production of all crops in his cropping plan equally and will lose the average gross margin instead of the marginal. The latter will be much lower than the former. Thirdly, Member States may encourage non-rotational set-aside by paying additional grants to upkeep land set aside in this form and improve the environmental conditions of the land. Such measures will only be applied in case of non-rotational set-aside because land left fallow for some time gives opportunities to restore or build up a variety of flora and fauna. A recent review of the 1992 CAP arable reform reports on the provision of winter feeding and nesting habitats for farmland birds in the United Kingdom in response to the increase of set-aside (Rayment, 1995). The author concludes that implementation of the non-rotational set-aside option is more beneficial to the environment than the rotational option. However, environmental benefits of the set-aside scheme depends heavily on the way the areas are managed.

The implementation of set aside in Member States should be according to the lines formulated in Commission Regulation 762/94. This Commission Regulation includes detailed rules for the application of Council Regulation 1765/92 with regard to the set-aside scheme. Member States should apply appropriate environmental measures which correspond to the specific situation of the land set aside. These measures may also concern a green cover. Although formulated as an option to choose, all Member States have taken over the requirement to cover the set-aside land with grasses and the like (although there are circumstances under

which a green cover is not required). Management rules for set-aside, however, differ between Member States, for instance with respect to restrictions on the application of plant protection products, fertilizers, and manures. In Denmark, it is not allowed to apply plant protection products, fertilizers and animal manure and irrigate the land set aside (Schou, 1995). In the United Kingdom, it is allowed to apply slurry, manure or organic waste to set-aside land from a farmer's own holding. Also, some types of herbicides may be used on set-aside land. A selective use of herbicides is permitted in order to encourage farmers not to cut their green cover. In the past, no herbicides were allowed to be used. Farmers then cut their green cover, which gave problems to the nesting of birds. In general, a farmer may not apply any manure or organic waste on guaranteed set-aside land (MAFF, 1994). This restriction could make non-rotational set-aside less attractive to the British farmer than rotational set-aside. A summary of management restrictions on set-aside in Denmark, France, Germany and the United Kingdom is provided in figure 5.1.

In early 1994, the set-aside regulation was amended (CR 231/94) to include new decisions of the Council on this topic. Two possibilities are offered in the amendment which can improve the environmental effects of the scheme. Firstly, Member States may prescribe a lower set-aside limit for a specific reason with respect to their agriculture such as protection of the environment or the risk of excessive reduction of farming in certain areas (Article 7.6). Secondly, a producer may transfer a set-aside requirement to another producer in the same Member State (Article 7.8). Transfers are restricted by a 20 km radius around the farm except if set-aside is transferred to an area for which specific environmental objectives are sought. In Denmark, for instance, a farmer may transfer his set-aside obligation to someone situated in an environmentally sensitive agricultural (ESA) area pointed out by the local authorities. To what extent these options are made use of is currently still unknown.

Denmark:	None allowed until following October 20. The application of fertilizers is allowed after 15 July, in case set-aside is to be followed by winter-crop.
France:	Selective and non-selective use of herbicides is allowed. Chemicals are allowed to be used after 15 July if set-aside is followed by winter crop.
Germany:	None allowed during set-aside period. Chemicals are allowed to be used after 15 July if set-aside is followed by winter crop.
United Kingdom:	Non-residual herbicides are allowed provided that, before 15 April, the green cover is not destroyed (except if replacing cover). Thus spot applications, the use of wick applicators or the use of non-residual herbicides that leave the majority of cover intact are allowed before that date. After 15 April, no restriction on the use of herbicides.

Figure 5.1 Management rules on chemical use of set-aside land in Denmark, France, Germany and the United Kingdom

Source: Ansell and Vincent, 1994:12,13.

5.2.3 Concluding remarks

Some concluding remarks on the impact of market and price policies of cereals on the environment and landscape are presented in the following:

- the potential impact of 1992 reform of the cereal regime on the environment and landscape comes from changes in price support and from the set-aside regulation. Lower prices may induce farmers to reduce their use of fertilizers and plant protection products. However, farmers may change their cropping plan towards products more intensively using agro-chemicals (fruit, vegetables, potatoes). On the other hand, experiences in Spain show that, because of a decline in cereal prices, the production pattern on irrigated lands changes so that water is increasingly used for crops with lower water demand. The conclusion is that lower prices have complex implications for the agricultural system and environmental benefits at one aspect may be offset by others. Differences across Member States are largely due to different farming systems and biophysical conditions;
- the set-aside scheme can be applied in a rotational and a non-rotational basis. Farm specific features, like soil productivity and cropping plan, affect the farmer's decision to opt for one form or the other. Of both options, the non-rotational form appears to have a more favourable impact on the environment and landscape. A greater diversity of plant species is likely to develop, and this will subsequently support a greater variety of fauna. The management rules on the treatment of land which is put aside are, however, crucial to the environmental impact of both forms of the set-aside scheme;
- the area eligible for the arable payment scheme was limited to the area of arable crops used in hew period 1989-1991. This condition, which was introduced by the European Commission for budgetary reasons, also had a positive effect on the environment as it prevents farmers to revert extensive grassland towards arable land. On the other hand, fixation of the base area may also imply that regions with intensive production methods and high yields remain on that level.

5.3 Beef

The animal sectors including beef, sheep and dairy are of major importance to nature conservation, as they manage most of the areas with high nature values. They may maintain viability of extensive farming systems and subsequently to prevent abandonment of agricultural land.

The common organization of the market for beef has been reformed because of the structural imbalance between supply and demand on the Common market. A compensation for lower support prices for beef is granted in the form of premiums, subject to a limit on the number of eligible male animals. Furthermore, the special premium for beef producers and the premium for maintaining suckler cow herds continue. Therefore, the schemes are adapted to the new situation by redefining the conditions of compensation. Conditions of major importance include a restriction on the total number of animals eligible for the premiums and a limit

on stocking density of the holding. Because 'the reorientation of the premiums should not be reflected in an increase in overall production, (...) the number of animals eligible for premiums should be limited by applying regional and individual ceilings respectively to be determined in accordance with reference years' (Council Regulation (EEC) 2066/92). The same regulation also states that in order to 'encourage extensive production, the grant of such premiums should be subject to compliance with a maximum stocking density on the holding, and an additional amount should be granted to producers who do not exceed a minimum stocking rate'.

Although support by premiums is subject to a certain degree of intensity of production, no explicit reference is made within the regulation to this to be an environmental clause. Member States presently are authorized to restrict provision of the beef premium to those farmers who comply with certain environmental rules. Yet, as it might promise to be attractive for farmers to reduce their stocking rate, the regulation may have a beneficial environmental effect when less animals are held per hectare. This can be achieved by increasing the area of land to grow forage crops, to reduce the number of animals or a combination of the two. Theoretically, the farmer will, however, only consider reducing the number of animals if marginal costs for the last animal cannot be covered. Whether there is a tendency to less intensive farming systems among others depends on the economic performance of the individual holding. This is affected by many factors, such as the structure of the farm and the entrepreneurship of the farmer. We will go into some more detail on the structure of the farms potentially eligible for these premiums under the beef regime.

Table 5.4 provides an overview of structural characteristics of farms with fattening bulls and suckler cows in EU Member States and regions. Compensation under the beef reform scheme is limited to a maximum of two livestock units (LU) per hectare of forage crops. In determining the livestock units all animals are counted for which grants are applied for, plus the number of dairy cows on the farm. There are four types of premium for beef producers, depending on animal type:

- the special beef premium for young male cattle: 90 ECU per animal from 1995, with a maximum of two times a premium per animal;
- the suckler cow premium: 120 ECU per animal from 1995 under the additional condition that milk production on the farm does not exceed 120,000 kg per year;
- the young calves processing premium: 100 ECU per animal;
- the extensive livestock premium: extra premium for male cattle and suckler cows of 30 ECU per animal if the stocking rate is less than 1.4 LU/ha.

In EUR 12, total livestock density on holdings with fattening bulls and suckler cows is 1.7 LU/ha of forage crops (table 5.4). Looking at the livestock eligible for support under the beef scheme (i.e. dairy cows, suckler cows, male cattle and ewes, so excluding pigs and poultry) density per hectare of forage crops is only 0.9 LU. So, generally speaking, the average EU holding with beef and suckler cows is eligible for the premiums under this scheme. However, on 283,000 holdings - 22% of all represented farms - stocking rate exceeds 2 LU/ha forage

crops. Stocking density of livestock eligible for support on that group of farms on average is 3.1 LU/ha. Dairy cows dominate on these relative intensive farm holdings.

Country as well as regional differences within the EU Member States are significant. Livestock density on farms with beef and suckler cows is highest in Greece (7.2). Stocking rate also exceeds 2 LU/ha of forage crops in Belgium, Denmark, Germany and the Netherlands. Only in Greece, the average livestock density on holdings with fattening bulls and suckler cows exceeds the limit of two when looking at the animal types which are eligible for support. In this country, part (28%) of the represented holdings with fattening bulls and suckler cows may adjust their stocking density because lower beef prices are compensated only up to 2 LU/ha. In Italy and Portugal, this refers to somewhat more than 70%. Regions in these countries most likely to be affected are Macedonia (Greece), Galicia (Spain) and Central North (Portugal). In Italy, there are three regions (Lombardia, Veneto and Campania) where the potential impact may also be high because of a relatively high share of holdings with stocking density exceeding 2 LU/ha. In all regions of other Member States, the share of holdings which exceed the threshold of two livestock units eligible for support per hectare is (much) lower than in the four Southern Member States mentioned above.

The use of common grazing land is not accounted for under the definition of utilized agricultural area and this type of land use is important in Greece, as well as in parts of Spain, Italy and the United Kingdom. For example, total surface in Greece of grazing land or permanent pastures amounts to 5.1 million hectares. Some 60% of that land is considered to be owned by state. The inclusion of this notion in the definition of livestock density would imply that the density of livestock population gets much lower than in the statistics presented in table 5.4.

The decision of the individual farmer to reduce stocking density because of lower beef prices and grants eligible under the beef premium is being made by the consideration of the pros and cons of the adjustment. Most important is the levelling out of prices with (marginal) costs of production. Assuming that the more intensive farmer has higher marginal costs in absolute terms than the less intensive farmer, implies that an agricultural holding with a high stocking density is more affected by a reduction of prices than the less intensive one. The table shows that the most intensive producers are situated in Portugal, Spain, Italy and Greece. On national level, in all other Member States farms with a density exceeding 2 LU eligible for support per ha forage are below 3 LU/ha. This could mean that the most intensive farms in the Southern Member States will adjust most rapidly and most considerably, while in other countries there will be hardly any changes in intensity. An exception to this might be farms in Southern Europe which are of the feed-lot type. The share of home-grown feed is negligible at such farms. Marginal costs per animal therefore do not differ much from the average costs at such farms.

However, a holding with beef and suckler cows often consists of more than these two kinds of animals. Such a farmer may also have revenues from milk, sheepmeat and wool, while this farm structure affects cost structure, too. This all means that in assessing whether farmers would reduce the stocking rate, it is necessary to undertake a careful analysis into the economics of the business relating to beef, suckler and dairy cows as well as to sheep on the

Table 5.4 Structure and livestock density on farms with fattening bulls and suckler cows

Country/region	Number of farms represented (x 1,000)	Density per hectare forage crops		Farms with density > 2 LU per ha forage crops a)			share in livestock population (%)		
		total livestock	livestock eligible for support	number of farms represented (x 1,000)	density per ha forage crops		male cattle	suckler cows	dairy cows
					total livestock	livestock eligible for support			
Belgium	34	3.5	1.6	10	5.8	2.6	18	15	67
Denmark	27	4.2	1.7	9	6.9	2.7	8	9	83
Germany	154	2.7	1.2	15	5.4	2.6	42	1	57
Greece	37	7.2	5.1	28	10.3	7.4	10	45	32
Macedonia Thraki	22	7.9	5.6	18	10.0	7.2	12	26	53
Spain	99	1.3	.9	44	7.1	4.6	2	53	34
Galicia	58	3.0	1.7	31	5.8	3.9	0	55	38
France	248	1.6	.9	10	6.1	2.8	53	16	30
Ireland	123	1.3	.8	1	2.7	2.2	39	3	50
Italy	217	1.6	1.1	71	5.1	3.5	22	9	66
Piemonte	34	2.2	1.5	12	4.8	3.4	24	15	60
Lombardia	12	3.1	2.0	8	5.4	3.6	15	1	84
Veneto	10	2.7	1.8	8	5.9	4.0	31		69
Campania	34	2.8	1.9	18	5.7	4.0	19	19	59
Luxembourg	2	1.9	1.0
Netherlands	22	3.2	1.7	7	4.5	2.3	2		97
Portugal	182	.9	.5	79	7.2	4.6	28	30	40
Norte-Centro	145	1.3	.8	71	7.3	4.8	30	31	38
United Kingdom	100	1.3	.8	7	4.0	2.4	27	4	63
EUR 12	1,244	1.7	.9	283	5.4	3.1	22	16	59

a) livestock eligible for support are suckler cows, male cattle and ewes. Total livestock refers to livestock eligible for support, plus dairy cows, pigs and poultry.

Source: FADN-CCE-DG VI/A-3; adaptation LEI-DLO, data 1990/91.

farms. Without further detailed farm level information, the (potential) impact of the reform of the beef regime on livestock density is very hard to assess.

Experiences in Member States with the scheme so far indicate the relative inattractiveness of the premium to the farmer and the ineffectiveness of the measure to reduce livestock density. The measure is said to be rather complex in nature and to the farmer, it is rather difficult to assess its benefits. Furthermore, farmers in countries with a currency devaluating against the ECU were not affected at all by the institutional beef price decline. On the contrary, beef producers in all Southern EU countries experienced an increase of real prices in their national currency. Such a trend did not encourage them to reduce their stocking density in order to be eligible for the beef premium. And last but not least, dairy cows dominate the holdings with beef and suckler cows. As long as milk production is considered to be rather attractive, dairy cows will not be disposed of easily. The milk quota regulation is effective in stabilizing the milk production while production per cow increases. Therefore, less cows are needed to produce the quota. But because most producers seem to have no other attractive alternative than to use their land for cattle (Agra Europe, 12 August 1994:M/3), the resulting excess production capacity in the livestock sector happens to be allocated to a great extent to non-dairy cattle. This explains the relatively upkeep of this activity despite declining real prices.

The prices received by producers are influenced by the exchange rates used when target prices and premium levels are translated from ECU into national currencies. The impact of changes in the agri-monetary system on other policies therefore must be taken into account. The price reduction of beef might be compensated by the devaluation of national currencies, and their subsequent effect on the ratio with the ECU. Devaluation of national currencies might result into an increase of farm income rather than a decrease as a result of the CAP reform.

It is concluded that the reform of the beef market organization will likely have no strong effect on livestock density in the EU. The threshold on stocking density of 2 LU/ha is primarily used for budgetary reasons in order to limit concentration of livestock production and the level of support. An indirect effect of incomplete compensation by direct payments of lower beef prices could be a reduction of the number of animals per hectare. This could happen mainly at holdings specialized in beef production. But in general, because of the domination of dairy cows in the livestock, the beef prices are of too little relevance for farms economics to induce extensification of livestock production. Moreover, in some countries institutional beef price reductions were not affecting prices received by farmers in national currency because of devaluating exchange rates. Therefore, the consequences for the environment and landscape are considered to be rather small. This is also because there is no direct relationship between the premium paid and the requirement to reduce livestock density, although there could be one in the case of a stocking density below 1.4 LU/ha. Only the UK implemented rules on overgrazing which go into this direction. In the UK, the EC special beef premium and suckler cow premium regulations have been amended. They provide that Community premiums may be withheld in respect of a number of animals in excess of a number which has been notified to the producer as being the number which may be grazed and maintained on a parcel

of land which is considered to be overgrazed. According to this amendment overgrazing means 'grazing land with livestock in such numbers as adversely to affect the growth, quality or species composition of vegetation on that land to a significant degree'. This amendment has come into force only since 1st January 1995. Therefore, nothing can be said at this stage about its effects on extensification and quality of the environment and landscape.

5.4 Grapes for wine

Wine policy of the EU is presently under discussion because of oversupply. Main line in several Commission proposals made since mid-1994 are the introduction of a quotation system to restrict production. The uproot of vineyards - already encouraged by a premium which is coupled at restrictions to plant new branches - is considered to be an important measure to keep production in line. Disagreement among the most important wine producers in the Union has resulted in postponing the reform of the wine policy. Therefore, the basic regulation of the wine market organization of 1987 (EC 822/87) is still in force. Regulation 1442/88 includes rules for granting premiums to farmers who give up wine production in vineyard areas. The Accompanying Measures are being used in Portugal to preserve the Douro Valley slopes where Port wine is produced.

According to Council Regulation (EEC) 1442/88 a wine farmer can apply for an uproot premium. Member States may provide conditions for such grants. Such conditions refer to the identification of areas where production of grapes should be reduced. Member States also have the possibility to preserve areas for growing wine. The only condition in the Regulation which possibly will affect the environment and landscape is to compensate farmers on the uprooting of growing wine. The level of the compensation refers to production per hectare, costs for uprooting, and income lost. It is not allowed to uproot wine branches in all areas. In Austria for example, the provision of a premium on uproot of wine is restricted to areas with a slope of less than 26%. On land with slopes of more than 26% a farmer gets no uproot premium, but he could get compensated for maintaining his production of grapes. Other countries have more or less the same approach but may use other limits. Germany for instance uses 30% as a limit. In the German Rhine area (Rheinland-Pfalz) a farmer gets no premium when he wants to stop growing wine. For environmental reasons a farmer is not encouraged to uproot his yard, but if he wants he is free to do so. In Austria it is not allowed to uproot vineyards on steep slopes as they are considered to be environmental sensitive areas. However, Spain forbids the uproot in certain areas (like in the region Rubera del Duero), not because it is to serve environmental objectives but because of the high quality of the wine produced. In this way the present EU wine market organization and the application by Member States regulate to a high extent where to grow wine. Furthermore, the Accompanying Measures (Regulation 2078/92) allow for the compensation farmers if they preserve the area and grow traditional types of wine.

Since the uproot premium is in force, the wine area has declined by 460,000 ha, which is around 10% of total wine area in the EU. Adoption by farmers to uproot wine is relatively

high in the regions La Mancha (Spain), Sicily (Italy), Languedoc (France) and in Greece. Such a decline in land utilized to grow grapes affects usage of chemical inputs. In addition to this effect it may also affect landscape by means of an increasing vulnerability to soil erosion in case the land is not used agriculturally. No assessments have been made so far regarding the impact of the market organization for wine on the environment and landscape.

5.5 Sheep

Sheep production is an important sector for nature. Low-intensity livestock farming has created large areas of semi-natural grassland, scrubland, heather moorland and other grazed habitats of nature conservation value (Beaufoy et al., 1994).

Since 1980 there is a common market organization for sheep. The core element of that policy includes a ewe premium which compensates farmers for calculated income losses. The regulation has been rather complex as the Community was divided into several regions. Each region had its own compensation level. In Great Britain, the system at work was even different compared to other countries (since it included a variable slaughter premium). Since the CAP reform of 1993 the regime is the same for each Member State. A restriction has been introduced on the number of claims that a producer can make on the annual ewe premium. Limits have been based on the number of eligible claims made in respect to 1991. A full premium is being paid up to a maximum of 1,000 animals per producer in Less Favoured Areas, and up to 500 animals in other areas. Above these numbers, 50% of the full premium will be paid. Holdings with sheep in LFAs are also subject to a fixed premium (of 5.5 ECU in 1992) per animal which is part of measures beneficial to rural areas. The payment of the premium is not subject to any stocking density criteria, but the number of ewes upon which premium is claimed is relevant when determining stock density levels for beef special premium and suckler cow premiums claims. Also, the Ministry of Agriculture in the UK has implemented provisions to prevent overgrazing in the Sheep Annual Premium, which is a headage payment.

Since the introduction of the ewe premium the sheep flock in EU-12 has increased by more than 10% in the second half of the 1980s. This was partly due to the quotation in 1984 of milk production. In the Netherlands for example, total sheep population more than doubled during the period between 1984 and 1993. In France, Greece and Italy the number of sheep slightly decreased. More than half of the total sheep population in the EU is located in the United Kingdom and Spain. A limited number of farmers (less than 10%) will be affected in these two countries by the quotation of the ewe premium because their flock exceeds limits to receive a full premium. Most impacts of the measure on the limited premium payments are to be expected in the UK. Northern Ireland is the only region in the UK where all farms with sheep are eligible for full compensation; in the other regions of the island there are holdings with a number of sheep exceeding the limits set (see table 5.5).

The impact of the upper limit to the compensation of ewe premium is indeed considerable in the UK. From all 65,000 farmers represented, 4,500 (7%) are not receiving a ewe premium for all their animals. Furthermore, the farmers in the UK can be affected by the rules

Table 5.5 Structure characteristics of farms with sheep

Country/region	Number of farms represented (x 1,000)	Average number of ewes per farm	Share farms eligible for full compensation
Belgium	.7	26	100
Denmark	5.3	14	100
Germany	7.5	38	100
Greece	85.8	73	100
Spain	85.7	175	98
Aragon	10.3	259	95
Castilla-Leon	19.9	284	96
Castilla-La Mancha	7.8	294	99
France	58.5	125	100
Ireland	46.6	69	100
Italy	91.7	71	100
Netherlands	15.1	32	100
Portugal	73.6	34	100
United Kingdom	65.1	269	93
England North	12.7	261	94
England East	6.4	277	83
England West	14.1	220	95
Wales	12.4	389	91
Scotland	11.9	309	94
Northern Ireland	7.6	111	100
EUR 12	535.7	110	99

Source: FADN-CCE-DG VI/A-3; adaptation LEI-DLO.

concerning overgrazing of land which might restrict the premiums received too. Similar to the premium of the beef regime, rules on overgrazing are also implemented in England and Wales. The competent authority who assesses the land to be overgrazed, may notify a farmer of the maximum number of sheep which may be grazed and maintained on that parcel during that year. In case of overgrazing no premium will be paid on any number of sheep grazed and maintained on the land to which it relates in excess of the maximum number of sheep specified. The system of ewe premiums have led to overgrazing, but probably also to maintaining extensive farming practices, especially where the advantages prevail over disadvantages.

5.6 Pigs

Pig production hardly receives any protection under CAP, and direct effects of CAP on the environment therefore are likely to be limited in that sector. Indirect effects of CAP however are considered to be rather important in this sector, i.e. through the use of feed concentrates. The use of cereals produced in the European Union has become more attractive under CAP reform compared to the use of imported feed concentrates. This may have an impact on the location and intensity of animal production in the European Union, especially with regard to pig and poultry production. A more balanced use of minerals in the agricultural sector might result.

In general pig production in the European Union contributes to huge environmental problems in several Member States. Nevertheless, it is also important to stress that in the 'montados' and 'dehesas' systems in Portugal and Spain grazing systems with black pigs have high environmental importance. As mentioned already in section 5.2.1, the devastating environmental effects of the highly concentrated intensive pig production in the EU may be reduced by the rebalancing of costs for feed grains and cereals substitutes, like protein cakes and meals, tapioca, maize gluten feed, and so on. Because of the CAP, internally produced feed grains were expensive compared with imported substitutes, and livestock farmers have replaced feed grains for these substitutes. This process has stimulated the development of specialized livestock farmers especially in the vicinity of ports where these substitutes enter the Common market. Intensive production was concentrated in areas with cost advantages for the supply of material to produce feeding stuffs at low costs, and are close to the major urban centres of Europe. Economies of scale were achieved as well. A high concentration of animals does however change the concentration of the production of manure. Consequently, in these areas manure has become an environmentally damaging waste product, instead of being considered a valuable nutrient to plant growth.

Germany, France, the Netherlands and Spain have the largest share of final pig production in the EU (CEC, 1994). On a country level pig production is most concentrated in the Netherlands, Denmark and Belgium, three small countries with a relatively high share in final pig production (Brouwer and Godeschalk, 1993). In addition to these three countries some other areas in the large Member States have a large share in national pig production: Niedersachsen (Germany), Bretagne (France), Lombardia (Italy), the area of Yorkshire and Humberside (UK) and Catalune (Spain). In all these regions manure supply generates considerable problems with respect to water quality. Manure problems related to a high concentration of animals may also occur in other regions, even if the share of that region in total national production is relatively small. Local problems may arise when pig production is concentrated on a small area. In table 5.6 an overview is given of the structure of specialist granivores holdings (specialist pigs and/or poultry farms).

In EUR 12 only 1% of all holdings represented by the Farm Accountancy Data Network (FADN) are specialist granivore farms (pigs and poultry). On average, stocking density of these holdings is 20.5 livestock units per ha of Utilized Agricultural Area (UAA). The average size of these holdings is 10.9 ha of utilized agricultural area. Of this area 54% is under cereals.

Table 5.6 Characteristics of specialist granivores holdings in the EU

Country/ region	Number of farms represented (x 1,000)	Animal density (LU/ha UAA)	Utilised Agricultural Area (ha)	Share of cereals (excl. rice) in total UAA (%)	Share of home-grown cereals in total costs of feed concentrates (%)	Share of output cereals in output pigs and poultry (%)
Belgium	3.6	45.9	4.8	40	1	1
Denmark	4.7	6.5	31.6	72	15	12
Germany	4.3	5.5	16.4	70	16	10
Niedersachsen	2.1	5.5	14.9	65	8	9
Greece	.9	86.9	1.0	31	0	0
Spain	15.9	23.5	5.6	55	1	2
Aragon	3.0	12.8	7.5	42		3
Cataluna	3.9	34.3	5.2	40	1	1
Castilla-Leon	3.7	12.9	10.5	81	1	4
France	8.8	13.6	20.7	52	4	6
Pays de la Loire	.9	24.6	20.6	33	2	2
Bretagne	5.2	11.1	22.2	60	5	6
Italy	4.9	60.8	7.7	79	4	5
Netherlands	9.7	57.6	4.6	8	0	0
Portugal	3.2	12.5	6.8	2	0	0
Lisboa-Vale do Tejo	2.5	19.8	4.2	0	0	0
United Kingdom	4.3	31.1	10.8	30	2	1
England North	1.4	37.1	12.6	27	1	1
England East	1.6	37.9	6.5	47	2	1
England West	.9	23.6	12.6	32	3	2
EUR 12	60.7	20.5	10.9	54	3	4

Source: FADN-CCE-DG VI/A-3; adaptation LEI-DLO.

Specialist granivores holdings use home-grown cereals only to a very limited extent, although the share of cereals in UAA is rather significant in most countries, with the exception of the Netherlands and Portugal. Only in Denmark and Germany home-grown cereals account for a considerable percentage in total costs for feed concentrates. Such a low share of cereals in total costs of feed concentrates indicate that it is conceivable that farmers change the composition of the feed for pigs and poultry from substitutes to cereals in case of relative price changes between the two in favour of cereals. A shift in feed composition would result in an increase of the share of cereals from the European Union, and a reduction of the share of imported cereal substitutes. The first means a better position for EU cereal producers while the latter results into less imported nutrients which could reduce the excess nutrient supply at least at EU level.

There are wide differences in the intensity rate of farms between Member States and regions. Stocking density of specialist granivores are highest in Greece, Italy, the Netherlands and Belgium. Specialist granivores holdings in Denmark and Germany have a rather low stocking density due to a relatively large size of utilized agricultural area. This area is mainly utilized for home-grown cereals, which implies that in both countries manure from livestock could be dispersed rather easily at the own holding at the acreages used for cereals. Such a general view might give rise to the idea that on the country level environmental problems connected with excess manure supply may be considered to be rather unimportant. At regional levels, however, the problems can however be rather pressing, because of excess of animal manure produced which needs to be applied elsewhere.

So far, the consequences of changes in CAP for the level and location of pig production are rather inconclusive. In 1993, there was an increase in EU production of 4% while in 1994 the production slightly decreased. As yet, there is no shift in concentration of the pig production from the most important production regions to be observed. The producers who mainly rely on imported cereal substitutes also benefit from a price reduction of cereals, as prices for substitutes move in line with those of cereals. Furthermore, pig production is rather inert as it is part of an agribusiness complex with supply and processing industries situated in or near the region of pig production. Therefore, it is not to be expected that in the short run pig production will move from concentration regions because of changes in relative feed component prices. Still, more cereals will be used in feed as, in general, cost advantages of cereal substitutes will be reduced when internal EU cereal prices show a further decline (see e.g. Folmer et al., 1995:206). Cereal substitutes may only remain attractive for farmers which are located around harbours where the substitutes enter the Union. Such developments will affect the competitiveness and the level of production in certain regions in the EU in favour of those who already largely rely on cereals for feed. Therefore, on the mid- and longer-term relative price changes in feed components may have a major impact on the relative concentration of pig production in the EU. Pig producers in countries like Denmark and France will benefit from the relative abundance of cereals nearby supplied, while pig holdings in Belgium and the Netherlands have a disadvantage in this respect (see for instance De Groot et al., 1994).

5.7 Dairy

Since 1984, milk production has been subject to quota. The amount of milk produced beyond a certain quota is charged a superlevy equal to 115% of the target price. This prevents farmers from producing much more than their quota. As production per cow increases, fewer cows are needed to fill the quota and so EU dairy herd decreased over the years. Furthermore, the quota has been reduced several times since it was introduced. Compared to the level of 1984, milk quotas were almost 10% less in 1994. Such a reduction did also contribute to the shrinking of the dairy herd. The number of milk cows in the EU has been reduced by around 20% since the introduction of the quota system and according to Folmer et al. (1995:206) the decline is projected to be slightly more than 10% in the period 1995-2005. Differences in the decrease of

the herd between countries can be attributed largely to differences with respect to an increase in production per cow.

The introduction of the milk quota system stopped the expansion of the dairy sector. Although at the end of the 1970s a restrictive price policy was announced and a premium for suckler cows was introduced, these measures did not result in a production decline. Contrary to this, milk production increased largely during 1982 and 1983. It was therefore decided to introduce a quota system in 1984. Only in very limited cases the milk production exceeded the quota. Therefore, it can be concluded that penalizing excess production has been effectively limiting total milk production in the EU towards the guaranteed level set by the quota.

According to Dijk et al. (1995), the impact of changing prices for concentrates and nitrogen on dairy production and on surpluses of nitrogen and phosphorous are limited. However, the impact of a reduction of milk quota is much higher. A combination of lower prices of feed concentrates, higher prices for nitrogen and a reduction of milk quota would contribute most to a reduction of mineral surpluses.

The implications of dairy policy for the environment and nature values can be deduced along the lines of changes in the structure of the sector. The dairy herd has declined considerably since 1984 due to increased production per cow and reduction of quota. However, figures on livestock population per holding show a slight increase of the number of dairy cows in most countries of the EU. This means that the introduction of the milk quotation did not result in fewer intensive dairy holdings. First of all this has to do with the reduction of the total number of dairy farms in the EU; less dairy cows are distributed among less holdings. In several Member States, transfer of milk quota also requires an increase of utilized agricultural area in order to prevent an increase of stocking density. Another important aspect is the transfer of milk quota and land from those who closed down their dairy holding. The possibility to transfer quota from one farmer to another did provide an incentive to increase concentration of the dairy sector. Farm size on average showed an increasing trend, both in terms of number of animals as well as in terms of the area of land used agriculturally. Furthermore, a large number of dairy farms changed to other activities like sheep or beef, using their idle production capacity when they had to dispose of dairy cows. The result was that stocking density of the farm did not change much although the dairy herd shranked. It decreased in most areas of Europe, but the share of other cattle in total livestock population increased in most regions at the expense of the share of dairy (table 5.7). The consideration of stocking density to remain rather constant over time apparently supported to avoid abandonment of agricultural land.

Stocking density of dairy farms shows a reduction since 1984 in a few countries (e.g. Belgium, Germany, Italy and the Netherlands). Participation by farmers in management agreements increased in the Netherlands after 1984 in response to the milk quota. The milk quota system encouraged a shift in the United Kingdom from hay making to silage making, which led to increased risk of pollution from silage effluents.

Farm management changed during this period from output expansion to input costs reduction. Such a shift in management could also have other effects on the environment, for instance because an improvement was achieved in the treatment of minerals. Nitrogen surplus at grazing livestock farms in the Netherlands for example reduced since 1986 almost 20%

Table 5.7 *Stocking density of dairy farms in the EU (LU grazing livestock per hectare forage crops)*

Country/region	Stocking density			Share of dairy (%)		Share of other cattle	
	1984	1987	1990	1984	1990	1984	1990
Belgium	2.46	2.30	2.22	58	59	34	35
Denmark	2.98	2.86	2.93	52	56	42	40
Germany	2.08	1.90	1.86	56	55	38	41
Niedersachsen	2.00	1.76	1.76	52	50	39	45
Greece	6.04	3.25	4.46	67	76	32	25
Spain	.	1.82	2.06	.	78	.	19
Galicia	.	2.09	1.95	.	79	.	18
France	1.54	1.39	1.41	62	63	35	35
Bretagne	1.86	1.79	1.61	65	65	29	31
Ireland	1.48	1.41	1.49	60	53	37	42
Italy	2.23	1.96	1.86	65	70	34	29
Lombardia	3.03	2.90	2.51	61	67	39	33
Emilia- Romagna	2.20	1.82	1.95	66	71	34	29
Luxembourg	1.97	1.76	1.74	53	50	44	48
Netherlands	3.08	2.64	2.66	61	56	23	27
Portugal	.	1.45	1.56	.	74	.	24
United Kingdom	1.98	1.94	1.95	61	61	31	32
England West	2.04	1.97	2.02	64	64	29	30
EUR 12	.	1.78	1.80	.	60	.	35

Source: FADN 1984/85, 1987/88, 1990/91; adaptation LEI-DLO.

(Poppe et al., 1995). This was mainly achieved by lower use of chemical fertilizers. On the other hand, the landscape could have been affected by the concentration of dairy production.

Production was achieved at a smaller number of farms. Farmers were encouraged to leave the sector because they could sell their milk quota and land to those who were able to pay a good price for it. Small-scale farmers rapidly turned into holdings too small for continuing business when quota decline was announced several times. Land and part of the herd were sold to other farmers in the region, and most retired farmers together with their family left the rural area. Especially in France, a lot of small-scale dairy farms disappeared since the introduction of the quota system. In an analysis on the effects of CAP reform for the milk sector in Spain, it is said that the reduction of milk quota contributed to the abandonment of this traditional use of mountain pasture areas with the subsequent negative consequences for environment and nature (Varela-Ortega and Sumpsi, 1995:33). On the other hand, the policy may also have contributed to the viability of more marginal, extensive dairy farms with high natural values. However, relatively high milk prices may have led to a more intensive land use than without this policy in certain areas.

5.8 Concluding remarks

The reform in 1992 of the arable sector will likely have a positive effect on the environment and landscape since more extensive production methods are introduced. Yield increases of cereals during the early nineties are lower than in the middle of the eighties. Also, there is some empirical evidence that the reform of the Arable Crops Scheme stimulated a reduction in use of plant protection products. A reference area was introduced, such that the area which is eligible for the arable payments scheme is limited to the area of arable crops and temporary grass used by December 31, 1991. This condition has a positive effect on the environment as it prevents farmers to revert extensive grassland towards arable crops. Also, conditions are formulated in several Member States to the management of land which is put aside.

Extensification of livestock production in response to the reform of the beef and sheep regimes has been limited so far. Experiences in Member States with the scheme indicate the relative inattractiveness of the premium to the farmer and the ineffectiveness of the measure to reduce livestock density. Also, the reduction of livestock prices did not reduce stocking density during the past couple of years because different trends were observed outside agriculture (e.g. monetary changes in some national currency). Price of feed concentrates declined as well. The calculation of stocking density does not necessarily fit to the actual livestock population. Certain animals (e.g. heifers) are excluded from the calculations to assess livestock population which is eligible for compensation.

The extensification effects of the reform of the sheep regime is considered to be limited, because a large share of the farms remain within limits put in the Sheep Regime and therefore are eligible for full compensation.

The wine area declined by around 10% since the introduction of the grubbing-up scheme (Council Regulation (EEC) 1442/88) in 1988. This may affect landscape by means of an increasing vulnerability to soil erosion in case land is not used agriculturally. No assessments have been made yet regarding the effects of the market organization for wine on the environment and landscape.

Pig production may benefit from lower cereal prices in response to the arable crop reform. Environmental effects could come from changes in allocation and concentration of pig production because of changes in relative cost advantages between EU regions. These consequences have been limited so far. Environmental policies on the treatment and production of animal manure are formulated in several countries, which is to affect future disposal of slurry to a large extent. The future location of pig production is largely affected by environmental policy in several countries (e.g. the Netherlands, Belgium, Denmark, parts of Germany and of France).

After the introduction in 1984 of the milk quota system, farm size on average showed an increasing trend, both in terms of the number of animals and the area of land used agriculturally. The system of milk quota may have stimulated extensification of dairy production, because of the autonomous increase of productivity. This is observed in the northern part of Europe. Abandonment could also increase in response to the milk quota system, because production could be achieved at a smaller number of farms. Small-scale farmers may give up produc-

tion by selling their quota and leaving the countryside. Abandonment of agricultural land could result. It increased, in response to the reduction of milk quota, on the traditional used mountain pasture land in Spain.

Stocking density of dairy farms slightly reduced in the EUR 12 since the mid-1980s. The impact of milk quota on extensification depends on quota transfer arrangements. Transfer of quota to other holdings may also require buying of land, which counteracts intensification of milk production. Structural adjustments in dairy production are important as well. The share of other cattle increased at dairy farms, and production of sheep increased in parts of Europe in response to the limits put to national milk production. A shift in farm management has occurred in response to the quota system, from output increase towards a reduction of expenditures on input. An improvement in treatment of minerals observed in dairy holdings may have had a positive effect on the environment.

6. EFFECTS OF LFA ON THE ENVIRONMENT AND LANDSCAPE

The LFA scheme is oriented to allow for continuation of farming in less-favoured areas by ensuring a minimum level of population or by conservation of the countryside. Part VI (Articles 17 to 20) of Regulation 2328/91 is devoted to Less Favoured Areas (LFA). It is linked to Regulation 797/85 on improving the efficiency of agricultural structures and to follow-up on the implementation in 1975 of Directive 75/268 on mountain and hill farming in certain less-favoured areas (LFA Directive). The objectives of Articles 17 to 20 of Regulation (EEC) 2328/91 on the use of agricultural practices compatible with the requirement for safeguarding the environment and preserving the countryside are to compensate farmers for the difficulties caused by natural conditions.

Three types of areas are distinguished:

1. Mountain areas characterized by a considerable limitation of the possibilities for using the land and an appreciable increase in the cost of working it, due to (Article 3.3 of Directive 75/268):
 - a) either the existence, because of latitude or north latitude, of very difficult climatic conditions of which the effect is substantially to shorten the growing season; or
 - b) at a lower altitude, the presence of slopes too steep for the use of machinery or requiring the use of expensive special equipment; or
 - c) the combination of these two factors, where the handicap of each taken separately is less acute, provided that this combination gives rise to a handicap equivalent to that caused by the situation referred to in the first two indentations.

2. LFA in danger of depopulation and where the conservation of the countryside is necessary, shall be made up of farming areas which are homogeneous from the point of view of natural production conditions and must simultaneously exhibit all the following characteristics (Article 3.4 of Directive 75/268):
 - a) the presence of fertile land, unsuitable for cultivation or intensification, with a limited potential which cannot be increased except at excessive cost, and mainly suitable for extensive livestock farming;
 - b) because of the low productivity of the environment, farm results which are appreciably lower than the average as far as the main indices characterizing the economic situation in agriculture are concerned;
 - c) either a low or dwindling population predominantly dependent on agricultural activity, and the accelerated decline of which would jeopardize the viability of the area concerned and its continued habitation.

3. Equal to these LFA are small areas affected by specific handicaps in which farming must be continued in order to conserve the countryside and to preserve the tourist potential of the area in order to protect the coastline. It is not allowed for any Member State to exceed 4% of the area of the state concerned (Article 3.5 of Directive 75/268).

These three types of areas represent approximately 56% of total UAA of the European Communities. In EUR 15, some 61% of all less-favoured areas are under Article 3.4; 35% derive from Article 3.3 and only 4% is devoted to small areas which are affected by special handicaps (Article 3.5) (table 6.1). Often, type three areas have an interest from an environmental point of view since they include areas with specific handicaps (small area, poor water supply, periodic flooding, etc.) where agricultural activity should be continued in order to maintain the countryside. All LFAs of the Netherlands result from Article 3.5, and they are part of policy on the relation between agriculture and the conservation of nature and landscape (the so-called Relation Paper, MLV (1975)). The share of less-favoured areas in total UAA increased between 1975 from 33% (EUR 10) to 56% in 1995 (EUR 15) (table 6.2).

Because production costs are higher and productivity poor, farmers in less-favoured areas may receive specific support in the following ways:

- (a) a compensatory allowance per animal and/or per hectare to offset natural handicaps (up to ECU 180 per LU in the most difficult areas);
- (b) investment aid at a rate up to 10% (12.5% in the case of young farmers) higher than elsewhere for individual modernization projects;
- (c) aid for collective investment, including the improvement of grassland and rough grazing;
- (d) a more favourable market organization premium for sheepmeat: the full ewe premium is granted to the first 1,000 animals in less-favoured areas as opposed to the first 500 animals elsewhere. This provision will cease to apply after 1995;
- (e) the possibility of additional quotas or reserves specific to less-favoured areas under the market organizations:
 - for sheep, goats and cattle. The Council has established additional reserves of 1% of the reference quantities for the ewe and suckler cow premiums intended especially for less-favoured areas;
 - in the dairy sector, the Member States may grant special reference quantities;
- (f) the market organization include specific complementary premiums for less-favoured areas (e.g. the 'countryside' premium in the organizations for sheepmeat and goatmeat amounting to about ECU 6.6 per ewe);
- (g) supplementary national aid authorized by the Commission under Articles 92, 93 and 94 of the Treaty and Article 142 (support for northernmost regions) of the Act of Accession.

Measures which are not specific to the less-favoured areas but which are generally directed towards them include:

- (a) Agri-environmental measures under Regulation (EEC) 2078/92, which may be paid alongside the compensatory allowances and include:
- aid for continuation of extensive farming;
 - aid for breeds under threat;
 - aid for the growing of vegetables particularly well adapted to local conditions.
- (b) Direct aid under the market organizations, including:
- complementary aid for extensive farming (beef/veal);
 - national complementary aid and aid to Objective 1 regions (beef/veal);
 - aid for transhumant flocks and herds.
- (c) Measures to promote rural development under Objectives 1, 5b and 6 of the Structural Funds (many less-favoured agricultural areas are eligible under one of these regional objectives).

Table 6.1 Utilized agricultural area (in 1,000 ha) in the meaning of Directive EEC 75/268 (mid-1995) by Member State

Country	UAA in less-favoured areas			UAA total		Share LFA in total UAA (%)
	Art 3.3	Art 3.4	Art 3.5	in LFA	total	
Belgium	-	273	-	273	1,357	20.1
Denmark	-	-	-	0	2,770	0.0
Germany	337	7,888	199	8,424	17,015	49.5
Greece	3,914	964	402	5,280	6,408	82.5
Spain	7,503	11,343	700	19,546	26,330	74.2
France	5,284	7,809	804	13,897	30,011	46.3
Ireland	-	3,456	12	3,468	4,892	70.9
Italy	5,218	3,405	218	8,841	16,496	53.6
Luxembourg	-	122	3	124	127	98.0
Netherlands	-	-	111	111	2,011	5.5
Portugal	1,227	2,056	150	3,433	3,998	86.9
United Kingdom	-	8,341	1	8,342	18,668	44.7
EUR 12	23,483	45,657	2,599	71,738	130,071	55.2
Austria	2,047	208	164	2,419	3,524	68.6
Finland	1,407	536	220	2,164	2,549	84.9
Sweden	526	1,011	333	1,869	3,634	51.4
EUR 15	27,463	47,412	3,316	78,190	139,780	55.9
(share of total)	35.1%	60.6%	4.2%			

Source: European Commission, Directorate-General VI-F.II.1.

The annual payment of a compensatory allowance is the main instrument for providing support under this scheme. The granting of the compensatory allowance is limited to a maximum animal density rate of 1.4 livestock units per hectare of area under fodder crops. Member States are free to fix the amount of allowances between a minimum of ECU 20.3 per LU or per hectare and a maximum of ECU 150 per LU and per hectare (up to ECU 180 per LU in the most difficult areas). The allowances may be modified in relation to the seriousness of the natural handicaps, the economic situation of the farms, the income of the recipient, or agricultural practices compatible with the protection of the environment. The amount per farm eligible for co-financing by the European Union in respect of the payment of a compensatory allowance is set at a financial maximum equivalent to 120 units per farm, where the first 60 units are co-financed totally and the remaining units at a level of 50% only.

Table 6.2 Growth of less-favoured areas within the meaning of Directive EEC/75/268 by Member State (in 1,000 ha)

Country	1975	1986	1990	1992	1995
Belgium	360	314	314	279	273
Denmark	-	-	-	-	-
Germany	3,940	6,211	6,535	9,426	8,424
Greece	-	7,269	7,246	7,246	5,280
Spain	-	17,038	17,203	19,546	19,546
France	9,747	12,140	14,189	14,186	13,897
Ireland	3,600	3,879	3,309	4,075	3,468
Italy	6,210	8,464	8,736	8,841	8,841
Luxembourg	134	133	133	125	124
Netherlands	14	19	48	111	111
Portugal	-	3,312	3,312	3,433	3,433
United Kingdom	7,664	9,859	9,859	8,342	8,342
EUR 10	31,649				
EUR 12		66,697	70,884	75,610	71,738
Austria					2,419
Finland					2,164
Sweden					1,869
EUR 15					78,190

Source: European Commission, Directorate-General VI-F.II.1.

As a rule, compensatory allowances and investment aid are part-finance by the Community at a rate of 25%. This rises to 50% in some regions eligible under Objectives 1 and 61), to 65% in Ireland and the new German Länder and to 70% in Spain and Portugal; and 75% in Greece and Italy. The allowances paid in 1994 in total amount to 1.38 billion ECU, which also includes the national contributions to the compensation. The amount paid per holding ranges between less than 500 ECU (Spain and Portugal) and more than 4,000 ECU (Luxembourg and the United Kingdom). The allowance per livestock unit is lowest (36 ECU/LU) in Spain and highest (113 ECU/LU) in Luxembourg (table 6.3). About one quarter of all farms located in LFA in the EU receive compensation under the LFA scheme. Participation rates in the southern Member States are below that in the northern Member States, primarily because about half of all LFA holdings in these countries do not meet the criterion of farm size to exceed a minimum of 3 hectares (two hectares in the Mezzogiorno, the French overseas departments, Greece and Spain, one hectare in Portugal and 0.5 hectares in Madeira) (Terluin et al., 1993). This is especially the case in Italy where 29% of the farms are less than one hectare in size.

Table 6.3 *The application of Directive (EEC) 75/268 on agriculture in mountain areas and in certain less-favoured areas (1994)*

Country	Compensatory allowances granted for LFAs			Share of holdings with compensation (% of total)
	Number of holdings	Amount paid per holding (ECU)	Allowance per LU (ECU/LU)	
Belgium	6,873	1,329	86	8
Denmark	n.a.	n.a.	n.a.	0
Germany	231,275	2,163	93	35
Greece a)	190,262	521	61	22
Spain	183,561	447	36	12
France a)	139,435	2,127	70	15
Ireland	105,619	1,575	88	62
Italy b)	39,056	689	57	1
Luxembourg	2,515	4,437	113	63
Netherlands	3,901	884	104	3
Portugal	89,510	410	54	15
United Kingdom	60,912	2,419	47	25
EUR 12	1,052,919	1,310	67	13

a) Provisional data for the year 1994; b) Not complete.

Source: CEC, DG VI-F-II.1.

- 1) The 'cold' areas of northern Europe, which are treated in a similar way to mountain and hill areas because of their agricultural and climatic conditions, are dealt with under Objective 6.

Only 9% of the agricultural holdings in Italy which are eligible for compensatory allowances are granted compensation. Contrary to this, this figure is 98% in the Netherlands. This is due to the fact that the LFA-scheme is only applied to part of the area in case large areas are under Objective 5a. The LFA-scheme is only applied on very limited areas in the Netherlands, primarily to serve environmental objectives. Almost all holdings in such regions receive compensatory allowances. Contrary to this, Objective 5a is applied in large areas of Italy. Support to farmers however is also channeled through other instruments including Objective 1 and 5b.

All the less-favoured areas within the Community are characterized by their more extensive use of land and labour as production factor and covers extensive livestock farming. This implies low levels of inputs used and related stocking densities. The LFAs have low levels of full-time farmers, although the opposite situation could well arise (e.g. in Greece) in view of the development problems experienced by other sectors in the regional economy, which excludes the possibility of finding outside work (CEC, 1993b:14). The importance of meadows and permanent pastures is much greater in LFAs than in normal areas in northern Member States, which serves to explain why the LFAs are characterized by extensive livestock farming. The presence of permanent crops is very marked in the Mediterranean countries, in particular vines and olives. The use of land in relation to the types of areas are less marked here because of the variability of the agricultural systems (CEC, 1993b:20).

There are three countries with around 200 thousand beneficiaries (i.e. Germany, Greece and Spain), and three countries with around 100 thousand beneficiaries (i.e. France, Ireland and Portugal) (table 6.3). Only 1% of agricultural holdings in Italy are granted compensatory allowances. Contrary to this, the share of holdings granted compensatory allowances in total number of holdings in Greece and Spain are 22% and 12%. The share of beneficiary holdings is highest in Luxembourg (63%) and Ireland (62%). Total expenditures at national level in 1994 were highest in Germany (500 million ECU), France (297 million ECU) and Ireland (166 million ECU), while in Spain expenditures under this scheme (82 million ECU in 1994) were low compared to other Member States. An assessment of the effects of the LFA scheme on the environment and landscape is mainly based on an illustration of the implementation of the scheme in Germany, Spain, France, Ireland and the United Kingdom. The present situation in these countries will be described in the following.

Germany

In total some 50% of total utilized agricultural area is part of the Less Favoured Area scheme. It ranges between less than 30% in Hamburg and Sachsen-Anhalt and more than 70% in Brandenburg (75%) and the region of Berlin (100%) (table 6.4).

Emphasis is given in Germany to the Article 3.4 regions. The areas selected for inclusion in the LFA-scheme in categories of Article 3.3 and 3.5 are very small. There are in total some 230 thousand beneficiaries in 1993. Compensatory allowances in the former BRD amount to an average of 3,150 DM (1,625 ECU) per farm. Compensatory allowances are much higher in the new Bundesländer. In total some 10 thousand beneficiaries on average received some 30,700 DM (15,850 ECU) per holding.

Table 6.4 LFA areas in Germany by region

Region	Size (x 1,000 ha)	Share of UAA (%)	Type of LFA (x 1,000 ha)		
			Art 3.3	Art 3.4	Art 3.5
Schleswig-Holstein	429.1	39.3	.	395.4	33.7
Hamburg	4.1	26.4	.	.	4.1
Niedersachsen	1,561.3	57.0	.	1,519.0	42.3
Bremen	5.6	53.3	.	5.6	.
Nordrhein-Westfalen	399.1	24.5	7.1	368.3	23.7
Hessen	401.1	51.9	.	398.8	2.3
Rheinland-Pfalz	468.7	64.1	.	445.0	23.7
Baden-Württemberg	915.7	60.2	119.1	773.8	22.8
Bayern	2,118.7	61.1	241.2	1,873.7	3.8
Saarland	43.3	64.1	.	10.9	32.4
Berlin	6.3	100.0	.	4.9	1.4
Brandenburg	1,194.1	75.6	.	1,185.6	8.5
Mecklenburg-Vorp.	826.8	52.8	.	826.8	.
Sachsen	353.0	32.3	1.9	351.1	.
Sachsen-Anhalt	269.1	19.5	.	269.1	.
Thüringen	430.0	45.5	.	430.0	.
Total	9,426.0	50.6	369.3	8,858.0	198.7

Source: Bundesministerium für Ernährung, Landwirtschaft und Forsten (1994).

Some 84% of grazing livestock farms in Germany receive compensation under the LFA scheme. Family farm income of farms in LFA regions are below income in other regions, but differences reduced during the past couple of years (Bundesministerium für Ernährung, Landwirtschaft und Forsten, 1995).

Spain

The LFA Scheme was implemented in Spain after 1986. During the first couple of years, the measure included compensation for farmers in mountain areas with a considerable limitation for using the land because of natural handicaps (Article 3.3). In 1989, this measure was extended to areas susceptible to decline of population and a 'need for nature conservation' (Article 3.4). Environmental conditions have been added more recently to the scheme. In 1993, criteria were established with priority given towards zones of natural areas which are affected by specific limitations. Land coverage under the third category of the LFA regulation is still of limited importance as it only covers 0.3% of total LFA area in Spain. Nevertheless, it is important to point out that the compensatory allowances for these areas doubled. In total 19 million hectares in Spain are qualified as LFA, which represent 74% of utilized agricultural area

and coincide in many cases with wide natural areas highly dependent on traditional farming activities. Approximately 7.4 million hectares are in mountain areas (Article 3.3). Some 1.5 million hectares are Article 3.5 LFA. More than half of the Article 3.5 LFA are in the regions of Galicia and Murcia (table 6.5).

Table 6.5 LFA areas in Spain by region in 1990

Region	Total (x 1,000 ha)	Type of LFA (x 1,000 ha)		
		Art. 3.3	Art. 3.4	Art. 3.5
Andalucia	3,042.8	1,802.7	1,067.3	172.8
Aragon	1,736.7	795.1	718.3	223.3
Asturias	303.9	298.2	-	5.7
Baleare	89.1	29.3	-	59.8
I. Canarias	101.2	74.4	-	26.8
Cantabria	157.2	157.2	-	-
Castilla-La Mancha	3,846.0	1,105.6	2,740.4	-
Castilla Y Leon	4,140.9	1,311.8	2,820.8	8.3
Cataluna	585.3	416.2	103.1	66.0
Valencia	433.6	171.6	137.7	124.3
Extremadura	2,560.6	263.1	2,297.5	-
Galicia	773.1	270.1	1.5	501.5
Madrid	94.3	88.4	5.7	0.2
Murcia	582.6	143.0	62.8	376.8
Navarra	387.2	239.8	147.4	-
Pais Vasco	176.1	165.0	9.3	1.8
Rioja	49.8	49.8	-	-
Ceuta Y Melilla	0.3	-	-	0.3
Total	19,060.7	7,381.3	10,111.8	1,567.6

Source: European Commission, Directorate-General VI-F.II.1.

The total number of holdings with compensatory allowances granted for less-favoured areas increased since 1986 to a total of 200,000 in 1992. More recently, it decreased by some 6%, which was partly due to the serious drought. This severe drought reduced farming practice, particularly in marginal areas with low yields and part-time farming (MAPA, 1993). Compensation per farm is extremely low, compared to that in other Member States (see table 6.3). It also covers a relatively small share of family farm income. The share of total direct subsidies in agricultural income of less-favoured areas in Spain is low (13%) compared to an average of the EU of 22%. The share of LFA support in family farm income is even lower, and represents only around 3% and 5%, successively for depopulated and mountain areas. This com-

pensation is considered to be marginal and of secondary interest to the farmer (Varela-Ortega and Sumpsi, 1995).

Spanish regulation on the LFA scheme provides higher compensatory payments for farmers in mountain areas (Article 3.3) than for farmers located in areas with risk of depopulation (Article 3.4). It needs to be mentioned that from an environmental point of view the areas under Articles 3.3 and 3.4 are relevant. Nevertheless, in the above-mentioned study it is concluded that differences between LFAs aids in mountain areas and in depopulated areas do not compensate for the differences existing between incomes of farmers in each of those areas. It only compensates for 5.2% of the income difference between both areas. Despite the compensatory payments received, family farm income in mountain LFA remains substantially below that in Article 3.4 LFA.

Positive effects of the LFA scheme have been reported in some areas, especially in certain marginal areas with very low net incomes. The compensation may play a significant role in such conditions. In these cases, it is not questioned that keeping certain extensive agricultural practices will bring benefits for nature conservation (Peco and Suarez, 1993). On the other hand, it also has been reported that this measure encourages livestock transhumance since farmers from non-LFA-areas have their livestock grazing 90 days in mountain areas in order to get the subsidy. Nevertheless, it is pointed out that this is observed only on a relatively small scale (Baldock and Beaufoy, 1993).

France

Most of the LFAs in Spain and France are eligible under Objective 5b. The areas which are part of the LFA scheme of France include the whole or large part of the following regions (table 6.6):

- Auvergne and Limousin in the Massif Central;
- Midi-Pyrénées in the south-western part of the country;
- Franche-Comté, including the mountain areas of the Jura;
- Corse with its mountains;
- Rhône-Alpes, with three regions which are designated as LFAs, including Savoie, Haute-Savoie, and Loire in the Massif Central.
- Provence-Alpes-Côtes d'Azur, with two regions which are designated as LFAs, including Alpes de Haute-Provence and Haute-Alpes.

Also, a major part of Indre (Centre), Nièvre (Bourgogne), Voges (Lorraine), Dordogne (Aquitaine) and Lozère (Languedoc) have been designated as LFAs. Annual allowances to compensate farmers may be paid as headage payments through Regulation 2066/92 (concerning bovines) and Regulation 2069/92 (concerning sheep and goats). Farms without livestock may also be eligible for compensation, and compensation could be paid on a per hectare basis as well. Also, farms in LFAs of France may receive additional capital grants for plans to improve agriculture. Investments to start non-farming activities at the farm (tourism and craft) are eligible for compensation.

Table 6.6 LFA areas in France by region in 1990

Region	Total (x 1,000 ha)	Type of LFA (x 1,000 ha)		
		Art. 3.3	Art. 3.4	Art. 3.5
Alsace	50.0	30.1	19.9	-
Aquitaine	966.9	94.3	872.6	-
Auvergne	1,409.1	955.9	453.2	-
Basse Normandie	325.9	0.0	325.9	-
Bourgogne	1,184.6	49.3	1,135.3	-
Bretagne	4.1	0.0	4.1	-
Centre	997.6	0.0	997.6	-
Champagne Ardenne	194.2	0.0	194.2	-
Corse	104.8	104.8	0.0	-
Franche Comté	657.5	182.5	475.0	-
Haute Normandie	0.0	0.0	0.0	-
Ile de France	0.0	0.0	0.0	-
Languedoc Rousillon	552.8	417.9	134.9	-
Limousin	884.2	249.7	634.5	-
Lorraine	496.1	29.0	467.2	-
Midi Pyrénées	2,316.9	723.7	1,593.3	-
Nord Pas de Calais	0.0	0.0	0.0	-
Pays de la Loire	114.9	0.0	114.9	-
Picardie	0.0	0.0	0.0	-
Poitou Charente	812.3	0.0	812.3	-
Provence Alpes-Côte d'Azur	337.6	287.2	50.3	-
Rhone Alpes	1,071.0	833.9	237.1	-
Terres Communes	1,239.0	1,239.0	0.0	-
Total	13,7220.0	5,197.3	8,522.4	-

Source: European Commission, Directorate-General VI-F.II.1.

The impact of the LFA scheme on the environment and landscape can be divided into three categories:

- first, regions with severe physical constraint (altitude, steep slopes), but with sufficient levels of precipitation. Farming in these regions include grazing of rough grassland and of meadows. The predominant farming types are dairy and beef. This type of LFAs include the Massif Central, the northern part of the Alpes and the Jura (Franche-Comté);
- second, regions with lower altitude, including permanent pasture and meadows. Farming in these regions include beef and suckler cows. This type of LFA is observed in Nièvre, Bourgogne and Limousin;

- third, regions with dry grassland and rough grazing, including specific types of the Mediterranean scrub, such as the 'maquis' on acid soils and 'garrigue' on calcereous soils. Farming systems in these regions mainly include sheep (meat and/or milk). Typical dry mountain areas are located in the southern part of the Alpes and on the Island of Corse.

A common feature of these three types of LFAs is their low intensity of farming systems. In particular in the south, low intensity livestock farming is characterized by extensive use of semi-natural vegetation. The application of mineral fertilizers is very limited if at all. Grazing and burning (mainly on the island of Corse) are the only means to manage the land. Such low intensity farming systems are of high nature value because of their importance in conserving habitats and wildlife communities. Also, they are crucial to the maintenance of landscape.

Headage and area payments could largely contribute to the maintenance of low intensity farming in many regions. The statistical service of the Ministry of Agriculture in France made an estimation of the impact of the reform of CAP on Gross Operating Surplus per farm (Blogowski and Boyer, in Rainelli and Bonnieux, 1995). This indicator shows highest increase in LFA areas, and it may exceed 10% in mountain areas such as the Massif Central and the Pyrénées. A substantial increase of Gross Operating Surplus (+16%) is observed in the region of Limousin. This region is characterized by low intensity livestock systems which are representative of mountain LFAs. The increase of Gross Operating Surplus in that region is assessed to be highest in mixed bovine farming system (+33%), ovine system (+22%), beef system (+17%) and dairy system (+9%).

Ireland

In Ireland the areas selected for inclusion in the LFA-Scheme mainly are in the category of Article 3.4 of Directive 75/268. The share of LFA now amounts to 71% of total UAA. The Compensatory Allowances Scheme was evaluated on behalf of the Department of Agriculture, Food and Forestry in 1995.

As far as the environment and landscape are concerned, the Compensatory Allowance Scheme has both positive and negative features. The scheme can be said to contribute to the conservation of the countryside by preserving farming practice which is valued by society. On the other hand the scheme is considered to contribute to the increase in sheep numbers since 1980 and the subsequent damage due to overgrazing. Sheep population decreased by some 20% during the period between 1970 and 1980. Sheep population however increased by some 170% since 1980 after the introduction of the sheepmeat regime. Sheep numbers have declined after 1991.

Surveys conducted in Ireland have shown that high stocking densities in upland heather, moor and blanket bog have led to disappearance of heather, sedges, moorgrass and mosses and deprives wildlife of food and cover (Sheehy Skeffington and Bleasdale, 1991). A Supplementary Measure was introduced under the Rural Environment Protection Scheme (REPS) which is governed by Council Regulation (EEC) 2078/92.

United Kingdom

The Hill Livestock (Compensatory Allowances) Regulations 1994 (HLCA) comply with Council Regulation (EEC) 75/268 on mountain and hill farming and farming in less-favoured areas. The Regulations provide payment of an annual compensatory allowance for cattle and sheep on land located in a less-favoured farming area. The Regulations apply to Great Britain. Separate but similar Regulations apply in Great Britain. Direct payments also are available from Council Regulation (EEC) 2328/91. These payments are important as well. Overgrazing of heather moorland and rough grazing by sheep and their subsequent effect on the depletion of heather cause increasing concern in the United Kingdom.

Changes in CAP after 1992 allow Member States to introduce environmental conditions to the livestock schemes. This also applies to the HLCA Scheme in England and Wales. Environmental conditions were already formulated in the Netherlands in 1975 through the so-called Relation Paper (*Nota relatie tussen landbouw en natuur- en landschapbehoud*). Payments under HLCA presently are not paid in case a farmer causes significant damage to landscape because of overgrazing. The problem which however remains is the premium which is paid under HLCA. This premium was below the premium paid under the Sheep Annual Premium (SAP), the Suckler Cow Premium (SCP) and Beef Special Premium (BSP). It was therefore proposed also to attach environmental conditions to the SAP, SCP and BSP. Amendments in agricultural policy described above were made in 1994. So far, the UK is the only country which has implemented environmental conditions to payments under the regimes of sheep and beef. It is presently also observed that farmers start buying land in order to keep livestock below the level of 1.4 livestock units per hectare.

The former Nature Conservancy Council (1991) of the United Kingdom proposed that stocking rates in upland mountain areas be restricted to 1.5 ewes per hectare of forage area in order to reduce loss of habitats from overgrazing. Support measures like the Less Favoured Areas scheme which includes headage-based payments for sheep and cattle are considered to encourage an increase of stocking density.

According to estimates provided in Baldock and Mitchell (1995) a limited number of farmers were not able to comply with the overgrazing conditions under the HLCA to reduce stocking density. In that report, a total of 15 farmers in England have chosen not to reduce their livestock population and therefore were not compensated under the HLCA scheme.

Concluding remarks

The objective of the EU LFA policy is to ensure a minimum level of population on the countryside, or to conserve the countryside. Abandonment of farming activities provide a serious risk to nature conservation in many areas which are part of the LFA scheme. For instance in Spain several authors have mentioned the loss of biodiversity due to changes in the traditional land uses (De Pablo, 1993), decline of 'dehesas' due to abandonment of traditional practices (Chapman, 1992) and erosion caused by abandonment of tree plantations in terraces in hill areas of very steep slopes (Díaz Álvarez and Almoroux Alonso, 1994). The LFA scheme, as

part of CAP, has however not allowed the exodus from agricultural in these areas to be stemmed (CEC, 1993a: 17). On a national level it appears that in most countries the decline of the agricultural workforce in LFAs has been even higher than in other areas. The tendency observed is, however, obscured by the differences in classification of the areas due to expansion of the LFA-area over time. Still, one could conclude that LFA measures were not effective in preventing the abandonment of the less-favoured areas for agriculture. At the same time, the LFA scheme can not be considered as a sufficient instrument to avoid depopulation. This is due to the infrastructural deficiency of the LFA scheme. An integrated plan for rural development considering for instance investments in communications, health and education could be a necessary additional action to prevent abandonment in rural areas with natural handicaps. Marginalization of agricultural land is increasing in many LFAs, which is likely to lead to future abandonment. Marginalization of LFAs often occurs because of the relatively low levels of farm income or the lack of successors of the present farmers or a combination of these two. Financial support provided to farmers for investments made in tourism and craft industry on a farm are useful instruments to the development of supplementary activities by farmers. The standard of living of farmers could be improved in this way.

A positive effect of the LFA policy on nature is to maintain a viable agricultural structure. Negative effects may however also arise in case the intensity of farming practice exceeds certain thresholds. Even though the relationship between intensification of agriculture and nature conservation is not well understood yet, consensus exists for the conclusion that species diversity reduces with increasing intensification. Density of stocking population and grazing patterns are of particular importance in this respect. Traditional management practice, such as late harvesting of meadows and arable crops, or the shepherding and seasonal movements of livestock create favourable conditions for grassland flora and nesting of birds. Fertilizer use and overgrazing may lead to an impoverishment of sward diversity and even to soil erosion in Mediterranean regions. From this point of view, investment supports that lead to a higher degree of mechanization with efficient methods of harvesting or favouring irrigation may have negative impacts on the environment. Stocking density limits to obtain compensatory allowances (0.2 livestock units per hectare in mountain areas with altitude over 1200 meter, and one livestock unit per hectare of forage crops in the other LFAs) may in particular circumstances involve an intensification of grassland management. Such possible negative effects could be prevented by the implementation of certain environmental priorities as, for example, a more restrictive selection of the areas according to their ecological value or environmental conditions to LFA payments. Such priorities and conditions are set in national LFA schemes only to a very limited extent, making the apparent benefits of this scheme for nature conservation rather small.

Different strategies are used by Member States by implementing the LFA-Scheme. It was already mentioned before that major differences exist on the allowances paid per hectare or per livestock unit. The budget of compensatory allowances for LFA regions is distributed through the Member States. Member States do have the possibility since 1989 to put environmental conditions to the payment of compensatory allowances. Limits included refer to a stocking density of 1.4 livestock units per hectare. Such presently are incorporated in the Hill

Livestock Compensatory Allowances in the United Kingdom. From an ecological point of view, this is a rather crude indicator since it is applied under different biophysical conditions.

7. EFFECTS OF AGRICULTURAL STRUCTURE POLICIES ON THE ENVIRONMENT AND LANDSCAPE

7.1 Introduction

Structural policies aim to modernize farming and subsequently to increase farm productivity. Structural policy does have many elements, such as government funding for research and development, extension, training and education and investment in rural infrastructure. They may also include measures that reduce impediments to adjustment in the farm sector (e.g. early retirement scheme) and efforts to develop alternative sources of income (e.g. widening the range of commodities produced, development of farm tourism). These measures increase farm productivity by either enhancing the productive capacity of resources or by better diversifying the activities to which these resources are put. The environmental effects of structural measures can be positive or negative depending on whether they induce an increase of environment-friendly production methods or focus on short-term economic gains, at the expense of environmental resource management. It also has to be noticed that such productivity-increasing measures are designed and implemented in the context of existing support policies. They are therefore also influenced by such policies and will to some extent reflect their environmental orientation. Support to projects on research and development in some countries for example, more recently shows a shift in moving away from an increase of productivity towards sustainability-enhancing production methods. Such a trend is in line with the overall increase in attention paid to the environment.

Structural policies are related to farm employment, farm size and structure. The impact on the environment of changes in farm size and structure is very difficult to assess. There is considerable disagreement as to whether one particular set of farm structures, in terms of a mix of farms of different size and type, is any more beneficial to the environment than any other set (OECD, 1994:122). Some consider that small family farms and part-time farmers are inherently more concerned than larger farm business with conserving and enhancing the environmental quality. Others maintain that there is no logical reason or empirical evidence that small farms are any better placed to deliver environmental benefits than any other size of farm. *Analyses made so far on the relationship between farm size and deterioration of the environment are rather limited.* Nieberg (1994) for example made an investigation at farm level on correlation between farm size (in hectare) and expenditures made on nutrients and plant protection products. The expenditure of fertilizers and of plant protection products across farms in Niedersachsen for example hardly shows any correlation with farm size. The same investigation however shows major differences across regions in their expenditures on fertilizers and on plant protection products. Structural change could be a key element of linkages between structural policies and the environment. Structural change in agriculture is one of the major forces behind landscape change, such as loss of landscape features.

The relation between structural policy measures on the one hand and modernization and productivity growth is not always as clear as suggested here. Structural policy does also consist of measures oriented to prevent or restrict negative consequences coming from market and price policies. Intensive production methods for example are discouraged through the provision of premiums to farmers who apply more environment-friendly farming practice. Policy measures may also keep labour in the sector, resulting in lower productivity increase as could be the case otherwise. This is for instance the case with the CAP LFA-regulation in which is stated explicitly that occupation of the countryside by farmers is needed to conserve the countryside. Direct income support is therefore given, and includes compensatory allowances per animal and per hectare.

7.2 Structural policies by horizontal measures other than LFA policy

The horizontal structural measures apply to the whole Union and are measures to improve the production, processing and sales of agricultural and forestry products. The Council approved Regulation 2843/94 amending 2328/91 on the structural efficiency measures. This amendment offers more flexibility to Member States in achieving the objectives at hand, increases flexibility to support actions to safeguard the environment, increase animal welfare and to setting up young farmers. The Council decided to strengthen the environmental elements in the support measures for investments on the holding. Before the amendment was introduced, Member States could only apply for co-financing by the European Commission when investments were to contribute to increase farm income. According to the new regulation, options are improved to get support by the Commission on environmental investments. Such investments (like for example on increasing manure storage capacity or improvements into manure spreading facilities) may significantly reduce pressure on the environment. Present knowledge about how the possible options within the regulation are used and the extent to which environmental investments are co-financed under this regulation is scarce.

7.3 Structural policy in the context of regional and rural development

In 1988 the structural funds were reformed to integrate financial support from different sources to strengthen socio-economic cohesion of regions (see also section 4.2.3). In 1993 the Council approved 6 new regulations to manage the Structural Funds for the period 1994 until 1999 (in this context Council Regulation 2085/93 is most relevant). The adjustments within the regulations of the Structural Funds are not as fundamental as those at the reforms of the Funds in 1988. The main changes are that possibilities for financial support are enlarged: the list of regions eligible for financial support is expanded, procedures are adjusted (made more flexible) and new measures are to be co-financed by the Commission. The principles of the Funds however remain and financial support is granted for programmes aimed basically at the improvement of the economic situation in regions. These programmes have to contribute to

the objectives as reformulated in the amendments of regulation 2052/88 on Structural Funds. The priority Objective 1 and 5a did not change in 1993 while Objective 5b ('promoting the development of rural areas') has been reformulated into 'promoting the development and structural adjustment of rural areas'. Member States have to submit regional plans to the Commission for approval if they want Community (financial) support. During the 6 years' period until the year 2000 a total amount of 141 billion ECU is available for cofinancing from the Structural Funds. This is a significant increase, compared to the 60 billion ECU which was available for the period 1989-1993. Of this total amount of 141 billion ECU, around 70% (96 billion ECU) is assigned to Objective 1 regions. About a quarter (22 billion ECU) will come from the FEOGA Guidance Section (CEC, 1995: 111).

Objective 1 refers to regions at NUTS II level whose development is lagging behind. Regions where gross domestic product is less than 75% of EU average level for the last three years are included. The Regulation includes a list of eligible Objective 1 regions for the period 1989-1993, and some newly eligible regions (figure 7.1)

Country	
Belgium:	Hainaut (as of 1994)
Germany:	The five new Länder, East Berlin (as of 1994)
France:	The overseas departments, Corsica The arondissements of Valenciennes, Douai and Avesnes, owing to their territorial adjacency to Hainaut in Belgium (as of 1994)
Spain:	Andalusia, Asturias, Castile-Leon, Castile-La Mancha, Ceuta-Melilla, Valencia, Extremadura, Galicia, the Canary Islands, Murcia Cantabria (as of 1994)
Greece:	The whole territory
Ireland:	The whole territory
Italy:	Abruzzi a), Basilicata, Calabria, Campania, Molise, Apulia, Sardinia, Sicily
Netherlands:	Flevoland (as of 1994)
Portugal:	The whole territory
United Kingdom:	Northern Ireland Merseyside, Highlands and Islands Enterprise Area (as of 1994)

Figure 7.1 Eligibility of Objective 1 regions

a) Abruzzi is only eligible for a three years' transition period (from January 1, 1994 to December 31, 1996).

These regions in total cover approximately 45% of the EU area, and 27% of the EU population lives. The Union supports projects proposed by the Member States and aimed at promoting the development and the structural adjustment within these regions.

The first programme period ran from 1989-1993. Finance by the FEOGA Guidance Fund was mainly focused on supporting agricultural holdings, diversification of income sources, contribution towards activities in the rural area. Some reforestation activities have been financed in Ireland and Italy. After the reform of 1993 the focus was broadened to housing improvement, quality and sales improvement, support to applied research and financing techniques. The second programme period operates from 1994 till 1999. In most cases financial assistance from the FEOGA support measures under the Objective 5a like to improve production, processing and sales of agricultural and forestry products. Community support of integrated programmes for local rural development is very limited and the main focus is to stimulate economic activities in agriculture, tourism and recreation (see Van de Klundert et al., 1995).

Table 7.1 Objective 1 indicative financial allocations 1994-1995

Country	Total from all Structural Funds (in mln ECU)	From FEOGA		Inhabitants (% of national total)	Area (% of national total)
		(mln ECU)	(%)		
Belgium	730	167	22.8	12.8	12.4
Germany	13,640	4,092	30.0	20.0	30.0
Greece	13,980	2,560	18.3	100.0	100.0
Spain	26,300	6,047	23.0	59.4	77.7
France	2,190	525	24.0	4.3	16.8
Ireland	5,620	1,953	34.8	100.0	100.0
Italy	14,860	2,739	18.4	36.3	40.8
Netherlands	150	40	26.7	1.8	3.4
Portugal	13,980	3,148	22.5	100.0	100.0
United Kingdom	2,360	747	31.7	5.9	18.7
Total	93,810	22,020	23.5	26.6	45.5

Source: CEC, 1995b:111.

A division of the structural funds for the period 1994-1996/99 is provided by Objective in table 7.2.

The most important programmes approved by the Commission in 1994 show little attention for safeguarding the environment (CEC, 1995b). In the new Länder of Germany some regional activities focus on the environmental maintenance. Spain, The Netherlands and UK have also implied some programmes in which the protection of the environment is (one of) the priorities.

Furthermore, it should be mentioned that schemes to objective 1 areas could be contradictory to the objectives of the agri-environmental regulation. For example, areas of steppeland targeted within a zonal programme of Spain are also targeted under the structural

unds and 34 Important Bird Areas are threatened by irrigation plans (Groves-Raines, 1992). Additionally, farmers in these areas also receive afforestation payments as well as payments under the market and price regimes.

Table 7.2 The Structural Funds, 1994-1996/99 financial allocation by Objective during the period 1994-1999 (% of total by Member State)

Member State	Obj. 1	Obj. 2 a)	Obj. 3 and 4	Obj. 5a	Obj.5b	Total	Total as % of EUR 12
Belgium	45	10	29	12	5	100	1.3
Denmark	-	9	45	39	8	100	0.5
Germany	73	4	10	6	7	100	14.8
Greece	100	-	-	-	-	100	11.1
Spain	87	4	6	1	2	100	24.1
France	19	16	28	17	20	100	9.0
Ireland	100	-	-	-	-	100	4.5
Italy	78	4	9	4	5	100	15.0
Luxembourg	-	9	31	52	8	100	0.1
Netherlands	8	16	59	9	8	100	1.5
Portugal	100	-	-	-	-	100	11.0
United Kingdom	26	23	37	5	9	100	7.2
EUR 12	74	6	11	4	5	100	100

a) 1994-1996.

Source: DG XVI.

Objective 5b focuses on the promotion of the development of rural areas in the context of the reform of CAP. It concerns rural areas not part of the Objective 1 regions. This holds for nine of the twelve old Member States: Belgium, Denmark, Germany, Spain, France, Italy, Luxembourg, the Netherlands and the UK. Greece, Ireland and Portugal can not be included in the Objective 5b because they are entirely covered by Objective 1. In the period 1989-1993 75 programmes were supported. Almost all programmes aim to (i) combat forest fires and erosion, etc., (ii) develop agricultural activities by improving the structure of agriculture, and (iii) improve economic activities in a region. For the period 1994-99 programmes financed by the Funds under Objective 5b are operational in 72 areas. Programmes cover about 26.5% of total EU area where about 8.3% of the EU population lives. Total EU appropriations to cover the schemes are allocated to be 6,134 bn ECU, to help finance operations costing a total of 22.625 bn ECU (Agra Europe/London, March 17, 1995:E/8). The Commission approved the last programmes only in the summer of 1995. One of the priority objectives within the programmes can be the maintenance and improvement of environment, nature and countryside.

Regional programmes in Objective 1 and 5b which were developed during the period 1989-1993, include measures relating to protection of the environment:

- measures for the protection against erosion;
- measures against destruction of woodland by forest fires;
- protection of rare or endangered species;
- restoration of habitats and improved management of wilderness areas;
- alternative energy;
- improvement of waste water management systems including sewage plants;
- improvement of irrigation systems to prevent wastage;
- investment in environmentally sound production techniques;
- production and marketing of organic products.

In the period 1989-1993 from EU sources about 865 million ECU was spent in the field of protection of the environment, nature and countryside. Funds from Member States should be added to get the total amounts spend.

Broadly speaking measures taken under the programmes of Objective 5b can be divided into five headings:

- Support for agricultural development and diversification;
- Forestry development;
- Tourism development;
- Economic development and support for small and medium sized enterprises;
- Support for improvements in the quality of life.

An ex-post evaluation on the implementation of the Objective 5b programmes in 21 regions were commissioned by the European Commission in 1994. Conclusions regarding the environmental initiatives of the case studies investigated tend to be 'small in scale and in part did not proceed as originally intended in spite of the Commission emphasis on the need for such measures. It was originally felt that for the new Objective 5b programmes more coordination and consensus on the action for preserving the natural endowment was required' (CEAS, 1995). The largest budget allocation was to agricultural measures (33%) followed by general measures for economic development and promotion of small and medium sized firms (24%) and the development of tourism (13%). Budget to the promotion of environmental improvement was 7%. Five case studies have been reviewed on their environmental initiatives, including Limousin, Midi Pyrénées, Bretagne, Trento and Cantabria. The main kinds of actions taken include the environmental control of agricultural activities, the maintenance or improvement of the natural environment; and, waste disposal and waste water treatment (CEAS and Centre d'Etudios de Planificació, 1995). Programmes in the region of Hageland (located in the Flemish region Brabant in Belgium) include several measures taken regarding priority 1: agricultural development and diversification:

- model projects and agriculture and horticulture centre. Testing centre for equipment to spray pesticides; develop an advisory system for pesticide use in winter wheat and barley (EPIPRES);

- research project to maintain the production potential and diversification into strawberries, small and stone fruits. This measure includes the promotion of a range of fruit crops and measures to prevent soil erosion;
- demonstration and information projects. Their objective is the promotion of horticulture in the Hageland;
- diversification projects;
- Melkwezer landmanagement project;
- water management works on the Kleine Gete;
- water management works on the Velpe.

The evaluation of Objective 5b programmes in Bretagne reported on a growing number of farmers which were becoming aware of the new opportunities that were opened up by environmentally sensitive farming.

There is a wide range of possible priorities to be given to activities subject for cofinancing from the structural funds. Operational programmes can and in practice will have more than one priority. For an assessment of the effects of the programme - for instance on the environment and landscape - one needs to have detailed information on the contents of the programmes and also knowledge about how a programme has been implemented. At the moment an overview of such detailed information is lacking, so possible effects of these activities on the environment and landscape can hardly be assessed. Because of the very short time period since the approval of (most of) the programmes included in the second period, there is no insight into the contents of these programmes yet.

One of the new rules for programmes under Objective 1 and 5b submitted for the period 1994-1999 is the obligation to include an assessment of the environmental situation in the regions involved and an ex-ante evaluation of environmental effects of the strategies and activities foreseen. The involvement of the environmental authorities is compulsory. In addition, the annual reports of the application of programmes must include an evaluation of the compatibility of Structural Funds assistance with EU environmental rules. These rules clearly indicate the increased attention towards environmental implications of the programmes cofinanced by the structural funds.

8. EFFECT OF THE ACCOMPANYING MEASURES ON THE ENVIRONMENT AND LANDSCAPE

8.1 Introduction

One of the objectives of the 1992 CAP reform was to improve environmental soundness of agricultural production. It included three Accompanying Measures, i.e. measures on the environment, pre-retirement and afforestation of agricultural land. Regarding their impact on the environment, the most relevant one is likely to be Regulation (EEC) 2078/92 concerning the Agri-environmental Measures.

Council Regulations (EEC) 2078/92 and 2080/92 both are obligatory, which means that member states have to establish a general national framework which will be defined and possibly differentiated for different regions. Co-financing by the EC originates from the Guarantee Section of EAGGF, and amounts to 75% in Objective 1 regions and 50% in other regions. Total expenditure therefore is subject to the financial limits for agricultural policy which were agreed in 1988.

The objective of the present chapter is to review the effect of the accompanying measures on the environment and landscape in the European Union. A distinction is made between Regulation (EEC) 2078/92 (Section 8.2), Regulation (EEC) 2080/92 (Section 8.3) and Regulation (EEC) 2079/92 (Section 8.4).

8.2 Agri-environmental measures (Regulation 2078/92)

Regulation (EEC) 2078/92 is an aid scheme which is aimed to encourage farmers to introduce or continue on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside. The regulation aims to 'encourage farmers to make undertakings regarding farming methods compatible with the requirements of environmental protection and maintenance of the countryside, and thereby to contribute to balancing the market; whereas the measures must compensate farmers for any income losses caused by reductions in output and/or increases in costs and for the part they play in improving the environment'. The agri-environmental measures under Regulation (EEC) 2078/92 have three general purposes:

- to accompany the changes to be introduced under market organization rules;
- to contribute to the achievement of the Community's policy objectives regarding agriculture and environment;
- to contribute to providing an appropriate income for farmers.

Measure	Market organization reduction of surpluses	Environment less pollution	Biodiversity and landscape preservation	Prevention of agricultural decline and hazards
Reduction of inputs (Article 2.1.a)	■	■		
Organic farming (Article 2.1.a)	■	■		
Extensification (Article 2.1.a)	■	■	■	
Convert arable into grassland (Article 2.1.b)	■	■		
Reduction of livestock density (Article 2.1.c)	■	■		
Environmental practice (Article 2.1.d)	■	■	■	■
Maintenance of landscape (Article 2.1.d)			■	■
Rearing animals in danger (Article 2.1.d)		■		■
Upkeep of abandoned land (Article 2.1.e)			■	■
20 year set-aside (Article 2.1.f)	■	■	■	■
Manage land for public access (Article 2.1.g)			■	
Training and demonstration projects (Article 2.2)		■	■	■

Figure 8.1 Elements of the aid scheme of Regulation (EEC) 2078/92 and their main objectives
Source: De Putter, 1995: 13.

The agri-environmental programmes, elaborated at national, regional and local level, include aid to farmers who undertake (Article 2, paragraph 1 of Regulation (EEC) 2078/92):

- (a) to reduce substantially, or maintain reduction in their use of fertilizers and/or plant protection products, or to introduce or continue with organic farming methods;
- (b) to change, by means other than those referred in a), to more extensive forms of crop production, 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 to maintain the countryside and the landscape, or to rear animals of local breeds in danger of extinction and plants endangered by genetic erosion;
- (e) to upkeep of abandoned farmland or woodlands for environmental protection;
- (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.

In addition (Article 2, paragraph 2 of Regulation (EEC) 2078/92), the scheme also includes measures to improve the training of farmers with regard to farming or forestry practices compatible with the environment. A classification was made of the various elements of the aid scheme and their objectives (figure 8.1).

Table 8.1 Characteristics of programme budget of Council Regulation (EEC) 2078/92 by Member State

Country	Budget (ECU/ha)	Participation (x 1,000 ha)	Participation (% of farms)
Belgium	123.0	63.0	5
Denmark	88.5	210.0	10
Germany	142.0	3,000.0	50
Spain	30.6	4,073.8	15
France	51.3	6,343.9	20
Ireland	66.6	1,036.3	20
Italy	74.4	1,484.9	10
Luxembourg	160.5	16.4	15
Netherlands	144.7	67.4	5
Austria	105.0	3,194.0	90
Portugal	83.2	871.7	20
United Kingdom	?	?	?
European Union	97.2		

Source: De Putter, 1995: 143.

The implementation of programmes under Regulation (EEC) 2078/92 is based on proposals developed by national and regional authorities in the Member States. The programmes which have been accepted by the STAR Committee have recently been summarized (De Putter, 1995). Participation of the programmes is assessed to range across Member States between 3% of UAA (the Netherlands) and 25% of UAA (Germany). Participation by farmers of the programmes submitted by Austria is assessed to be very high (90% of the farms) (table 8.1). In the following, we will examine progress on the implementation of the programmes in the Member States. It will focus on Spain, France, United Kingdom, Germany and Finland. Some general remarks on the Agri-environmental Measures are made by the end of this section.

Spain

The first two Spanish zonal programmes of Council Regulation 2078/92 were approved in 1993. It includes a programme to save irrigation water for the National Park 'Tablas de Daimiel' in the region Castilla-La Mancha, as well as a programme to protect steppe birds in two areas of Castilla Leon. However, the complete application by Spain of the package of agri-environmental measures was postponed until the end of 1994.

The framework programme which was approved for Spain, includes the establishment of 4 horizontal measures which are potentially applicable throughout the Spanish territory (table 8.2). Measures include (i) promotion of organic farming (Article 2.1.a), (ii) extensification of cereal production (Article 2.1.a), (iii) maintenance of endangered breeds and varieties (Article 2.1.d), and (iv) agri-environmental training (Article 2.2). The programme was completed through a set of zonal measures which are applicable to specific areas designated by the Central Administration, areas of influence of National Parks, wetlands included in the Ramsar Agreement and Special Bird Protection Areas. On the other hand there are specific areas designated by the regional governments.

Among the horizontal measures, the programme on extensification of land to grow cereal crops is considered to have a major impact on agriculture and the environment. It is applicable to almost 2.5 million hectares, which is about 98% of the total surface applicable for horizontal measures. An amount of 60,548 million ptas (about 405 million ECU) (85% of the total budget for horizontal measures) is budgeted for this part of the programme. The objective of this measure is to preserve traditional fallow, regardless of set-aside requirements, as established in Regulation 1765/92. At present, this traditional fallow does not receive any compensation from CAP. Soils and climate limitations in the arid and semi-arid regions of Spain have favoured the development of a special extensive agricultural system where fallow has been a common practice traditionally included in the rotational use of the land. Potentially, traditional fallow in Spain accounts for about 4 million hectares, which is about 20% of total arable land.

Although traditional fallow can be found throughout most of the national territory, 80% is concentrated in five regions - Andalucia, Aragon, Castilla-La Mancha, Castilla-Leon and Extremadura. Their surface has decreased during the past 20 years, which was attributed to incentives provided for intensive agricultural practices (Sumpsi, 1994).

Table 8.2 *Horizontal measures of the agri-environmental programme in Spain*

Measures	Coverage	Costs (mln ptas)	Cofinancing FEOGA (MECU)
Extensification (ha)	2,443,187	60,548	262,31
Training (farmers)	4,900	3,200	13,81
Endangered breeds	66,187	2,645	11,42
Organic farming (ha)	28,130	4,609	18,75
Total		70,914	306,29

Note: 1,000 PTAs are equivalent to 6.7 ECU (exchange rate in 1993).

Source: Ministerio de Agricultura, Pesca y Alimentacion (MAPA), 1995.

Traditional fallow plays a major role in maintaining an adequate water balance of soils, and also implies a low level of input use within the farm. However, the common practice of burning stubbles in fallows is a source of erosion, contributes to the destruction of organic matter, microflora and microfauna in the soil, and increases the risk of fires (Velez, 1991; Díaz Alvares and Almouroux Alonso, 1994).

The programme on extensification of cereal growing lands introduces improved management practices to avoid erosion and establishes a grazing schedule adapted to the biological cycle of each habitat. Referring to the zonal measures, it should be remarked that 4 out of the 12 adopted measures allocate most of the budget and potential land. The most important measure is related to flora and fauna protection in extensive arable lands, which accounts for 37% of the total budget for zonal measures and can be potentially applied over more than 1 million hectares. The second most important measure is erosion control which allocates 17.4% of the budget and covers a potential surface of about 400,000 hectares. Other important measures are (i) the maintenance of abandoned lands, which represents 12% of the budget and covers almost 200,000 ha, and (ii) the programme on saving irrigation water. This programme is applicable to 90,000 ha and accounts for 4% of the budget.

The full programme will allocate a large amount of financial resources during the next five years - nearly 250,000 million ptas (or the equivalent of approximately 1,650 million ECU) - and will potentially cover about 5 million hectares. The implementation phase of this programme started in 1995, and therefore no data or studies can be reported on its environmental effect yet.

France

Measures under Regulation 2078/92 in France include support on (i) grassland, (ii) reduction of the use of inputs, (iii) conversion of arable land to extensive grassland, (iv) taking land out of production, (v) rearing of threatened species, (vi) reduction of stocking density, (vii) protection of flora and fauna, as well as (viii) local programmes.

- (i) An annual grassland premium per hectare (of permanent grassland) is granted to farmers who comply during a period of five years to a number of conditions, among others to a stocking density below 1.4 LU/ha or in some cases even below 1 LU/ha. The maximum eligible acreage is 100 ha (maximum total premium is FF 30,000 or ECU 4,500).
- (ii) The scheme for reduced use of inputs in agriculture is restricted to limited areas, including water catchment areas and rivers fringes, and also participation is limited to farmers who meet conditions focusing on extensification (like conversion to organic farming and set-aside). Applicants of this scheme must submit a proposal leading to a 20 percent decrease in fertilizer application for the nitrogen component, and incorporating the prescriptions of extension services and leading to pest integrated management for the chemical and pesticide component.
- (iii) Conversion from arable to extensive grassland is a 5-year scheme with three different objectives: protection of water catchment areas, protection of water courses and erosion control. This is to be achieved by planting grass and managing grassland in a proper manner. Conditions for grants are set to stocking density (below 1.4 LU/ha) the use of fertilizers, and the mowing of grass.
- (iv) Taking land out of agricultural production is a long term (20 years) scheme which focuses on strips of land (5 meters width) which have to be devoted to grassland under very strict management prescriptions. Tree plantation can also be allowed in some cases. The premium amounts to FF 3,000/ha (ECU 450) (\pm 20%). This amount does not include any other payments provided by the agri-environmental measures, compensation paid for planting trees or to put land aside. Both the farmer and the land-owner have to comply to the various provisions under this scheme.
- (v) To be eligible for support under the scheme 'Rearing of threatened breeds' the applicant must raise females of bovine, ovine, caprine and asine breeds where there is a risk of rapid extinction. The minimum number of females is equivalent to 3 livestock units except for equine and ovine breeds where the minimum is 1 livestock unit. Moreover the applicant has to join a technical society and must not decrease his herd for 5 years.
- (vi) The purpose of the scheme 'Reduced stocking densities for livestock' is to reduce stocking densities through a combination of the following measures focusing on either enlarging the acreage and/or reducing the number of animals. Eligibility implies that the reference stocking density does not exceed 3.5 livestock units per hectare. All categories of livestock are taken into account to determine stocking densities by only bovine and ovine unit removed are granted. Annual payments per eligible livestock unit equal FF 1,500 (ECU 225). This premium is not compatible with the grassland premium and with the subsidy under the conversion from arable to extensive grassland.
- (vii) The 'Flora and fauna protection' scheme only applies for specific areas of ecological and scientific interest. It operates under a steering committee and through a 20 year agreement with farmers. Premiums paid depend on past income, with a maximum of FF 3,000/ha/year (ECU 450).
- (viii) Local (or zonal) programmes are based on voluntary participation. Entering farmers are granted for adopting specific management prescriptions. Payments are based on extra

cost or profit loss. There are two categories of local programmes. The first category is concerned with the protection of the environment in homogeneous areas. A high priority is given to wetland protection. The second category is concerned with land abandonment with an emphasis on the preservation of landscape, mediterranean terraces, bocage, orchards and chestnut plantations, and the prevention of forest fires. In addition there are opportunities for the protection of endangered species and of habitats.

An assessment of the implementation of agri-environmental measures in France can only be very preliminary. Detailed information on the grassland premium is available for the first year (1993) of implementation. About 117,000 entrants received support up to almost 1 billion FF (150 million ECU). Total acreage enrolled under this scheme was 4.8 million hectares.

There was a second round of implementation in 1994 to target two categories of farmer: new entrants into farming, and farmers having extensified from 1993 to 1994 who meet the prescriptions of the scheme. It must be emphasized that new entrants have to comply with the prescriptions for 5 years but that they will be compensated for only 4 years. The geographical distribution of the participation in this scheme is concentrated in mountain areas of central France where cattle breeding is of major importance. These areas are handicapped because of altitude by a short growing season and by steep slopes: 42% of the total number of entrants are localized in 10 'départements'. Otherwise entrants are distributed across less-favoured areas in danger of depopulation (such as the Southern Alps, the Pyrénées) or less-favoured areas in which farming must be continued to ensure the conservation of the environment (Wetlands in Normandie).

In conclusion the grassland premium scheme operates in areas where a process of extensification has been in progress for years. The scheme is consistent with a series of European legislation on mountain and hill farming. The purpose of the scheme could be restated as 'the continuation of farming thereby maintaining a minimum population level or conserving the countryside'. The grassland premium scheme is directed towards the preservation of the environment as far as it participates in the maintenance of farming in areas under the threat of depopulation.

Table 8.3 gives the distribution of total expenditure according to the various other schemes implemented in France. Expenditure made under schemes mainly targeted to protect water resources has been added to the sub-total 'water protection' whereas the heading 'other' corresponds to expenditures for which detailed information is not available. The so-called 'Prime à l'herbe' is aimed to maintain extensive grassland, and includes a premium of up to 31 ECU/ha to holdings with a livestock density of less than 1 LU per hectare of forage crops or less than 1.4 livestock units per hectare if at least 75% of the holding is grassland. The measure is generally considered as social (e.g. income support) rather than environmental in its objectives. This scheme takes about three quarters of the total budget. An assessment of the environmental efficiency of this measure is to be done.

Compared to the expenditures of the grassland premium scheme, total expenditure on the other agri-environmental schemes is limited: FF 286 million (43 million ECU) vs FF 967 (145 million ECU). The majority of expenditure is channelled from central government since

regional and local authorities only provide support up to 10%. The share of local programmes cover over a third of total expenditures and 'water protection' measures cover about one-fourth. So the major part of total expenditure is concentrated in a limited number of schemes; schemes aiming at 'rearing threatened breeds' and at 'flora and fauna protection' receive a small amount of money.

Cumulative expenditure relative to all schemes operating in 1994 reveals an uneven distribution of resources across France. Three regions (Midi-Pyrénées, Rhône-Alpes and Pays de Loire) concentrate 27% of the total and four regions (Alsace, Champagne Ile-de-France, Nord - Pas-de-Calais) receive 9% of the total. There is an inverse relationship between expenditure and regional agricultural income. This pattern is strongly influenced by schemes either with a high total expenditure, or applicable only to designated areas.

Table 8.3 Projected expenditure of the agri-environmental measures in France in 1994

Measure	Million FF	Share of total
Taking land out of agricultural production	3.65	1.3
Conversion from arable to extensive grassland	35.08	12.2
Reduced use of agricultural inputs	23.01	8.0
Other	12.49	4.4
Subtotal 'Water protection'	74.23	25.9
Conversion to organic farming	27.31	9.5
Reduced stocking densities for livestock	59.81	20.9
Rearing threatened breeds	6.43	2.2
Flora and fauna protection	4.58	1.6
Local programmes	102.38	35.7
Other	11.83	4.2
Total	286.57	100.0

Note: 1,000 FF is equivalent to 150.7 ECU, according to the exchange rate in 1993.

Source: Ministère de l'Agriculture et de la Pêche.

The high expenditure on 'water protection' schemes in Bretagne and Midi-Pyrénées was expected. The former is a region of intensive livestock production, particularly pig, poultry and dairying, with serious nitrate contamination of surface and coastal waters. The latter region faces serious erosion problems and a series of action programmes are carried out. An analysis of the broad distribution pattern of 'reducing stocking densities' shows a close relationship with the distribution pattern of the grassland premium scheme. Regarding local programmes it must be mentioned that a limited number of regions have undertaken significant action. The 'flora and fauna' scheme expenditure is highly concentrated since four regions (Basse-Normandie, Midi-Pyrénées, Nord - Pas-de-Calais and Pays de Loire) receive 65% of the total.

Two main conclusions emerge with respect to expenditure on agri-environmental schemes:

- expenditure is relatively low in comparison to other public sector funding for agriculture. The expenditures on Council Regulation (EEC) 2078/92 are assessed to be less than a few percent of total budget of agricultural policy of the Community;
- expenditure has also an uneven geographical distribution.

It is still too early to judge the cost-effectiveness of the agri-environmental measures and evaluate on their contribution to the achievement of an environmentally sustainable form of agricultural production. Given the uneven distribution of areas with high or low environmental quality, the second finding is logical. Broadly speaking, areas with higher funding in Spain tend to be either associated with degraded water quality or with land abandonment and depopulation (Varela-Ortega and Sumpsi, 1995).

United Kingdom

Government did submit a considerable number of programme schemes, which focus on various themes.

- Environmentally Sensitive Areas (ESA). It is the largest scheme which is available in 43 designated areas covering 15% of agricultural land (nearly 3.5 million hectares). These are part of the country of high landscape, wildlife or historic value which are vulnerable to change in farming practices. Incentives are offered to farmers to adopt agricultural practices which will protect and enhance the rural environment and create new opportunities for public access to it.
- Nitrate Sensitive Areas (NSA). In total 32 NSAs are selected and cover groundwater sources where incentives are offered to farmers to undertake significant changes in agricultural practices which will help to stabilize or reduce nitrate levels, thus protecting the quality of drinking water sources.
- Organic Aid Scheme is available to farmers who wish to convert to organic production methods in accordance with the rules of the UK Register of Organic Food Standards;
- Livestock extensification schemes. It includes the Moorland Scheme which is aimed to improve the moorland environment by encouraging upland farmers outside ESAs to graze fewer sheep.
- Long-term set-aside (Habitat Scheme).
- The Countryside Access Scheme. Farmers may make set-aside land available to the public for walking and other forms of quiet recreation.
- The Countryside Stewardship Scheme which aims to conserve targeted landscapes and habitats and achieve improvements in public access to them.

Some difficulties may arise on the uptake by farmers to the Accompanying Measures. One item was observed in the United Kingdom which is important in this respect.

- The effectiveness of the Accompanying Measures largely depends on market regimes, and is reduced by the relatively high prices paid for cereals. If the level of support for arable crops would be less compared to present levels, then one could also achieve the objectives of Regulation 2078/92 at lower costs. Response by farmers to participate in that Regulation among others depends on incentives provided by alternative policies.

Farmers presently receive support by reversion of arable land into extensive grassland. This is part of the Environment Sensitive Areas Scheme (ESA) and the Nitrate Sensitive Areas Scheme (NSA) under agricultural policy in England. These schemes were successful since farmers were willing to revert their marginal land from growing cereals towards pasture land. For example, fields next to a river have been put under the ESA scheme. Such fields may be very important for wildlife. A loss of habitats might be observed in case such fields are reverted to grow cereals.

In recent years, there has been a tension in the United Kingdom between participation in the market set-aside scheme which is part of the reform of the arable crop regime, and the ESA scheme. Farmers are reluctant to participate in ESA for following reasons. In order to receive compensation, they have to put aside some 12% of their land. This implies there is competence among using the land under the ESA scheme or under the market set-aside scheme. If farmers revert part of their land to low intensity grazing land, they also need quota to grow livestock. In England, a limited part of the milk quota is reserved for this purpose. In case a farmer sells his milk quatum, he has to surrender some 15% of that to the national reserve.

The arable support arrangements introduced in 1992 prevented farmers from counting arable land taken out of agricultural production under agri-environmental schemes towards their set-aside requirement under Regulation 1765/92. This was a factor in discouraging arable farmers from participating in some agri-environment schemes. Many arable farmers were only willing to cease production on a limited part of their holding since they needed a certain area of productive land to retain a viable agricultural enterprise.

Following the amendment to Regulation 1765/92 in June 1995, arable land taken out of production under agri-environment schemes can be counted against farmers' set-aside requirements, subject to it complying with the normal eligibility rules. This agreement should help to boost uptake under certain of the agri-environment schemes in arable farming areas. In the UK the main measures which will benefit are the Habitat and the Nitrate Sensitive Areas schemes.

Germany

A variety of programmes provide support to farmers in Germany. These are aimed at preserving the countryside and its habitat. Each of the Bundesländer offer different programmes to its farmers. This is because environmental policy regarding the quality of landscape is dominated by regionally-based programmes. Wilson (1994) identified several characteristics of agri-environmental programmes (under Council Regulations 2078/92, as well as 2328/91) in Germany:

- the total number of environmental programmes is large (total of 91 schemes);
- participation in schemes is on a voluntary basis, which is consistent with EU policies to protect the countryside. Participation rates therefore are not necessarily high;
- priority is given to programmes on wetland conservation (21% of all schemes) and preservation or re-establishment of extensive pastures (18% of all programmes);
- a large share of the programmes (45%) are eligible to all farms within a Bundesland, rather than being limited to designated areas like the ESA scheme in the United Kingdom;
- most schemes have been developed only recently, with about a third of them to have been implemented since 1992.
- most schemes (79%) have no specified time limit;
- payment levels are relatively high compared to other countries. This is consistent with the relatively high payments which are under the other programmes such as the market set-aside.

A review of the MEKA programme was recently published (Wilson, 1995). It is a programme to support Market Relief and Landscape Conservation (Programm zur Marktentlastungs und Kulturlandschaftsausgleich, MEKA), which currently is only available in Baden-Württemberg. MEKA participation has been reviewed in part of the region of Baden-Württemberg. Compensatory payments under this scheme contribute to farm income. In the district of Heidenheim for example, maximum payments per farm through the MEKA programme are around DM 25,000 (ECU 12,900). Average yearly income of typical 40 ha farm in this region is some DM 78,000 (ECU 40,300). 6% of the yearly income comes from MEKA. Other subsidies account for 15% (water protection payments) and 8% (both the Less Favoured Areas scheme and support under the 1992 CAP reform).

Finland

The Agri-environmental measures under Council Regulation 2078/92 in Finland include the General Agricultural Environmental Protection Scheme (GAEPS) and the Supplementary Protection Scheme (SPS). The overall objective of the programme is to reduce emissions to the environment, especially with respect to emissions of minerals to surface water and groundwaters and to the air, as well as concerning emissions of pesticides. The programme is also to preserve biodiversity and to manage landscape. Finally, the programme is to preserve or improve the productive capacity of the land. Conditions for participation in GAEPS are (i) develop an environmental management plan, (ii) meet certain base levels of fertilizers used, (iii) inspect equipment to spray plant protection products, (iv) use buffer strips on the fields, (v) maintain adequate plant cover, and (vi) preserve landscape (Pirttijärvi et al., 1995).

An assessment has been made for Finland of the environmental effects of the agri-environmental measures. It is estimated that they contribute to a reduction of erosion and the emissions of nitrogen and phosphorous by some 30-50%. Also, the emissions of ammonia are projected to decrease due to improved management of livestock manure (Pirttijärvi et al., 1995).

General remarks

A successful implementation of the programmes under the agri-environmental scheme depends on many items including organization, provision of information, monitoring of progress, integration with other policy objectives and the financial resources available. These aspects are discussed in some more detail below.

Administrative units at different levels are in charge of the implementation of programmes. The agricultural sector may also be involved in the development and implementation of programmes. The implementation of programmes requires major expertise by regional authorities in coordination and delegation of tasks. Furthermore, knowledge on policies towards environmental protection may also contribute to the achievement of the objectives of the agri-environmental programmes. It seems likely that the lack of organizational capacity and experience may limit the potential of this programme, especially in countries which have never implemented national schemes whereby farmers are paid in return for undertaking specific environmental practices. In such a situation programme implementation becomes even more difficult when the Member State has a highly complex and large variety of farming systems and habitats to deal with. Consequently a great number of difficulties may arise concerning its design, implementation and future monitoring.

Lack of scientific and technical information is observed at various levels. A limited number of reports is available about the different agricultural systems and the coexistence of fauna and flora of high conservation value. In Spain the most studied agro-ecosystems are the 'dehesas' and steppes. Even in these cases, lack of available, reliable and up-to-date data have been reported. A similar problem has been reported about one of the most important bird areas in Spain, the mediterranean steppes (Suarez, 1994). Varela-Ortega and Sumpsi (1995) conclude that more studies and deep research is needed on the global behavior of each particular ecosystem. Also the contribution of the different agricultural practices to nature conservation should be identified and evaluated.

The agri-environmental regulation is designed to achieve environmental objectives, along with other parts of CAP (e.g. market and price policies and structural measures such as forestry and rural development). Birdlife (1994) mentioned the poor integration with other CAP policies (commodity regimes, set-aside, rural development programmes and forestry programmes) to be one of the greatest problems facing Council Regulation (EEC) 2078/92. The potential to achieve the objectives of this regulation depends on the integration with other policies. For example, afforestation programmes which derive from Council Regulation (EEC) 2080/92 will have to be tuned with the proposed agri-environmental measures of Council Regulation (EEC) 2078/92. The environmental objectives under the agri-environmental measures might not be fully achieved in case in case measures are taken without sufficient coordination with other measures. In general there is insufficient monitoring towards the achievement of EU environmental policy. This might be partly due to the programmes which are developed by Member States. There are also examples (in Extremadura, Spain, see Palomo Molano, 1994) that the development and irrigation plans to be cofinanced by the EU structural funds and even by the cohesion fund contradict the new agri-environmental objec-

tives. Such events point at the necessity of an integrated approach of a nature conservation policy.

Programmes which are developed under the agri-environmental regulation have multiple objectives on the environment and landscape, including protection of flora, fauna and groundwater resources. However, they also have economic and social objectives, which often brings competition between the different interest. There is a concern to whether some zonal programmes will be challenged as simply aiming to increase farmers incomes, especially when these programmes are located in the poorest regions where governments may regard nature conservation as a relatively low priority. A careful monitoring effort is needed to assess incentive payment schemes for their success in achieving environmental objectives and their effectiveness as policy instruments.

8.3 Forestry measures (Regulation 2080/92)

Council Regulation (EEC) 2080/92 includes a support scheme, which is designed to encourage afforestation of agricultural land. Regulation 2080/92 (EEC) replaces Title VIII of Regulation 2328/91 concerning forestry measures on agricultural holdings. The new support scheme replaced the old one because the Council by that time considered the available measures to promote afforestation as insufficient. Afforestation of agricultural land is considered important with regard to land use and environmental protection. Furthermore, it may contribute to decrease shortages on wood products in the Community and can be seen as a complementary policy in the efforts to control agricultural production. According to article 1 of the Regulation, the purpose of the support scheme is:

- (1) to accompany changes in the market and price policy;
- (2) to contribute to woodland improvement;
- (3) to contribute to a kind of nature management that serves nature conservation; and
- (4) to counteract the greenhouse effect and absorb carbon dioxide.

Most important changes in the latest scheme refer to the maximum amount of support which may be granted by governments, and to the target group eligible for support. Member states may grant support for afforestation to farmers, to all other individuals and to forestry associations or cooperatives or other bodies which afforest agricultural land.

Support may be granted to meet:

- a) costs of planting;
- b) costs of maintenance of the woodland over a period of (the first) five years;
- c) income losses in agriculture because of afforestation; and
- d) investments in woodland improvements, such as the provision of shelterbelts, fire-breaks, waterpoints and forest roads, and the improvement of woodland under cork oaks.

With respect to each of the four items mentioned above, maximum amounts of support are determined (see table 8.4). With regard to the costs of planting, the maximum eligible amount for planting of coniferous trees is ECU 3,000/ha, for broadleaf trees ECU 4,000/ha. For planting eucalyptus trees (not mentioned in the table) the EU contributes a maximum of 2,000 ECU/ha. To maintain coniferous wood, in the first two years 250 ECU/ha/year is granted and 150 ECU/ha/year in the following (three) years. Support to cover costs of maintenance of deciduous forests will be 500 ECU/ha/year in the first two years and 300 ECU/ha/year in the following years. The maximum eligible amount of the annual premium for compensating income loss is 600 ECU per hectare afforested per year for a professional farmer and 150 ECU for other beneficiaries. This compensation will be given for maximum 20 years. Investments in shelterbelts may be supported by 700 ECU/ha improvement of woodland under cork by 1,400 ECU/ha, forest roads by 18,000 ECU/km and firebreaks and waterpoints by 150 ECU/ha woodland. Upon reasoned request by a member state and subject to budget availabilities, the Commission may decide to increase the maximum amounts for woodland improvements and for the renewal and improvement of woodland under cork oaks up to maximum amounts of ECU 1,200 and ECU 3,000 respectively.

Table 8.4 Maximum amount of compensation granted for afforestation of agricultural land (in ECU per hectare)

Item	Coniferous trees	Broadleaf trees
Planting (only in the first year)	3,000	4,000
Maintenance: first two years	250	500
- Following (3) years	150	300
Income support (max. 20 years)	150/600	150/600
Investment:		
- Shelterbelts	700 (1,400)	700 (1,400)
- Woodland improvement under cork oak	1,400 (3,000)	1,400 (3,000)
- Forest roads (ECU/km)	18,000	18,000
- Firebreaks and waterpoints	150	150

Support for fast growing varieties giving short-term returns is limited to the cost of planting and to those whose main source of income is farming. Support concerning afforestation and maintenance may be combined. In that case, payments will be made over a period of five years and the maintenance of new plantations must be ensured. Support will not be available for Christmas trees.

Member States' programmes

In summer 1993 Member States had to submit national and/or regional multiannual programmes to the Commission in which they designated the programme, estimated the yearly costs and determined the execution of the programme (control etc.). Programmes were approved by the European Commission in 1993/94. A comparison of the identification of forestry measures by Member States, done by Nijland (1995), shows that relatively woody countries like Finland, Austria and Greece focus on the improvement of woods already existing, while Member States with less woods stress the planting of new trees and the expansion the forestry area in their country. It is estimated that the area under wood in the EUR 15 will increase by around 2% to about 85 million hectares in the period 1993-1999. There may however be big differences between the Member States. Ireland aims at an expansion of the country's forest area with no less than 35%, France wants 9% more, Spain 7% and Portugal 4% more woods. The financial means available in the period 1993-1999 for the forestry measure is relatively high in Spain (1,750 MECU), Italy (1,030 MECU) and Germany (480 MECU). Of the other Member States only UK, Ireland and Portugal have a budget more than 100 MECU (Nijland, 1995).

Whether the expectations of expanding the wood areas will be realized depends on the relative attractiveness of the premiums. Planting costs are reimbursed up to 100% but also subject to a maximum amount. Furthermore costs covered may be (much) less depending on the type of trees planted, the features of the area or region and the group aimed at. There is much difference between the Member States in paying income compensation to farmers who change their agricultural land into woods. Some Member States do not compensate for income losses at all (Denmark, Austria), while in other countries this grant is subject of criteria also used for the contribution to planting costs. Regional differences in those criteria and levels of compensation occur.

In UK after two years the actual afforestation is less than expected: the area afforested in 1995 is 7.5% less than estimated (Nijland, 1995). Also in Spain the results so far are disappointing: around 10% of the hectares applied for has been afforested in the period 1993-1995 (Varela-Ortega and Sumpsi, 1995). And in France only 836 demands were registered in the first two years, of which 170 applications were accepted resulting in farmland afforestation of 2,317 ha (Rainelli, 1995). For France, Rainelli and Bonnieux (1995) state that the low participation of farmers in this scheme is due to the insufficient level of the contributions in planting costs and compensation payments offered. If the premium was doubled the potential area afforested would triple, indicating a high sensibility to the level of payment. In the past, this sensibility explained the decline in afforestation when grants from the National Forestry Fund in France decreased, according to Rainelli and Bonnieux (1995).

Environmental effects

Most Member States have formulated explicitly objectives in favour of the environment and landscape. Measures taken under this forestry scheme should avoid negative consequences to the environment or limit negative effects to the minimum. How this would be realized is not always clear from the programmes as described by Nijland (1995). Some countries have rules regarding the integration of forestry in the landscape (e.g. Luxembourg, Ireland). Other countries have regional zones and use specific rules for locating planting new trees (e.g. Italy, France, the Netherlands, Portugal and Spain). In the Netherlands for example, afforestation schemes are harmonized with the interests of nature and landscape by means of a map on important breeding areas and important wintering areas for birds and characteristic open landscapes. The afforestation scheme is not applicable to such areas. When an Irish farmer applies for a grant under this scheme he has to comply with a long list of environmental requirements. In case the Irish Ministry of Agriculture thinks that forestry has negative effects on the environment and landscape, no grants will be paid. For afforestation of more than 200 ha, a special 'Environmental Impact Assessment' has to be made. In the UK, to qualify for grant aid for afforestation, farmers must meet the standard of silviculture and environment protection and practice set out in comprehensive landscape design and conservation guidelines published by the Forestry Commission.

The lack of detailed environmental requirements in the programmes, the rather low participation level and the short time period since the scheme was introduced in most countries all contribute to the fact that environmental consequences of CR 2080/92 can not (yet) be analysed. Furthermore, since regional or even local administrations are responsible for its implementation, the environmental impact may clearly differ between regions. In some regions, monitoring of forestry practices and potential environmental impacts are very strict while in other regions neither an environmental evaluation nor even a simple project is required (Varela-Ortega and Sumpsi, 1995).

Conditions of forestry are obviously important in an assessment of their impact on nature conservation and landscape. A market-oriented approach towards the production of timber may reduce options to provide non-market environmental goods. The available technology presently allows us to produce particle boards as good as traditional boards made with hardwood. Consequently there is strong competition between the various types of wood and the price of timber has fallen close to the price of pulpwood. This has a consequence towards more productive forests, and therefore towards an intensification through short rotation forest trees which require herbicides and fertilisers. In some Member States such tree species may also lead towards a more homogeneous landscape.

In sites of particular interest uncontrolled afforestation obstructs the landscape and limits public access. This phenomenon occurs mainly in wooded regions. To avoid this it is possible to use zoning schemes limiting the development of wooded land. In France, such schemes are implemented in about 50% of the 'départements' on a line from the Pyrénées to the Vosges (Rainelli and Bonnieux, 1995). This zoning partly explains the difference between the utilised agricultural area potentially affected by Regulation 2080/92 (8,500 ha per year)

and the area actually afforested (an average of 1,160 ha per year in 1992-1993). Another objective of zoning is to avoid depopulation of rural areas due to the shift of agriculture to forestry. In a département such as Cantal the increase in wooded areas is considered to have a negative impact on the development of tourism (Rainelli and Bonnieux, 1995).

The environmental benefits of farmland afforestation come from the extension of semi-natural areas which are important refuges for farmland wildlife, including plants and invertebrates and for vertebrate animals (mainly game). Reforestation may increase diversity and spatial heterogeneity when it takes place in regions where no important semi-natural areas need to disappear. Well managed short rotation forest trees have a positive impact on the environment since nutrient uptake is important. For example, short rotation poplars uptake 5 to 7 kg of phosphorus per ha per year. Nitrogen uptake reaches 30 to 50 Kg per ha per year. This contributes to a decrease in residual nitrogen and in residual phosphorus present in the soil. For this reason, environmental scientists propose the planting of short rotation forest trees along rivers bordering arable crops, in the hope of decreasing water contamination by agricultural pollution.

Finally it should be noted that afforestation payments may compete with payments offered under other schemes, such as the grassland premium or the long-term set-aside premium.

8.4 Early retirement measures (Regulation 2079/92)

Regulation 2079/92 allows for support to be paid to full-time farmers and agricultural workers aged 55 years and over for stopping agricultural work. The measure is aimed at improving production structures and at controlling agricultural production as well as helping older farmers. Member States are not obliged to develop national programmes. No programmes have been developed yet in Luxembourg, the Netherlands and the United Kingdom. The scheme has an environmental requirement to farming land transferred to other farmers is to be used in a way that it serves the environment (Article 6.4 and 6.5). This was introduced to prevent farmers to abandon their land after retirement.

France adopted an early retirement scheme as early as 1991. It was first of all aimed to provide support to older farmers, and also to enable the agricultural sector to adapt to the reform of CAP which was negotiated by that time. The population concerned by this policy was limited to full-time farmers aged between 55 and 60 years old. The length of the payment was limited to a maximum of 10 years (Regulation 2079/92 allowed for 15 years) and the plan life-time of the policy was 3 years (this was prolonged by 3 years). The payments have a fixed part (FF 35,000, or the equivalent of ECU 4,500, under 10 ha) and a variable part of FF 500 (or ECU 75) per ha (between 10 and 50 ha). The French policy is more restrictive than the European policy. Compared to other member states the French policy is more important. Four members states have a policy directed towards a large number of farmers: France, Greece, Spain and Italy.

In France 57,000 farmers were affected by the policy during a period of some three years. In Greece, 50,000 farmers were affected, but over a five-year period. In Spain and Italy 26,500 farmers were affected over a five-year period. On the other hand, Germany only expects 2,000 farmers to be affected from 1992 until 1996. France is the largest consumer of European funding for this policy (ECU 900 million), which is scheduled to be followed by Spain (ECU 800 million), Italy (ECU 650 million) and Germany with only ECU 32 million.

The policy was adopted very rapidly in France and also was quite successful. In each 'département' commissions composed jointly of representatives of the Ministry of Agriculture and professional bodies decided how to apply the policy. This insured the policy was adapted to different local conditions. By the end of 1994 almost a quarter of eligible farmers choose early retirement (23.4%). With the prolongation of the policy for another 3 years, if behaviour remains the same, 38% of male farmers and 30% of female farmers will retire early, Allaire and Daucé, 1994. Even if Regulation 2079/92 only accelerates retirement which would have taken place any way, it leads to a large coverage of land to become available, either for agriculture by other farmers or for other purposes. Of course, this acceleration has a certain number of consequences on both production system and on land abandonment.

9. EFFECTS OF INCENTIVES FOR ORGANIC FARMING ON THE ENVIRONMENT AND LANDSCAPE

9.1 Introduction

Among the incentives concerning alternative crops, the two most interesting for our purpose are those related to (i) organic farming; (ii) non-food use option for set-aside. The non-food use option for set-aside was discussed in Section 5.2.2. The remaining part of this chapter is on organic farming.

Organic farming

Council Regulation 2092/91 on organic production of agricultural products includes uniform and harmonized rules of this type of production. Organic farming can be defined as a system of managing agricultural holdings that implies major restrictions on fertilizers and plant protection products. This method of production is based on varied crop farming practices, is concerned with protecting the environment and seeks to promote sustainable agricultural development. It differs in a variety of ways from conventional farming. It is considered that organic farming among others (Baillieux and Scharpe, 1994):

- does not pollute soil and groundwater from plant protection products;
- increases biological diversity among plants and animals;
- reduces leaching of minerals.

The agri-environmental measures under Regulation 2078/92 include aid to farmers who undertake to introduce or continue with organic farming. It has been implemented according to Regulation 2092/91. The area under organic cultivation in 1993 included more than 400,000 hectares, which is about fourfold of the coverage in 1987 (table 9.1). It however remains a limited share (about 0.3%) of total utilized agricultural area of EUR 12.

Organic farming aims at self-sufficiency of the farm by avoiding the use of inputs obtained from off the farm, and at excluding synthetic inputs. So, inorganic fertilisers, plant protection products from chemical origin, growth regulators, livestock additives are eliminated. Crop rotation and biological controls are used in order to protect plants against weeds, insects and diseases. Concerning nitrates and the quality of water, organic farming does not clearly offer an advantage, since mismanagement of organic waste and animal manure might result into high levels of leaching losses. However, the elimination of using plant protection products is likely to provide benefits in terms of improvements of water quality and human health. Because it reduces erosion on sloping, it decreases phosphorus deliveries to rivers and lakes and avoids eutrophication. Providing a more diverse habitat organic farming preserves biodiversity. Consequently it is clear that alternative farming provides interesting environ-

mental benefits. Subsidies are allowed in order to allow farmers to adjust their farming practice towards the requirements under Regulation 2092/91. The higher prices provided to these crops do not necessarily offset lower yields, although this might differ between countries. At the European level the existing rules under Regulation 2092/91 only apply to unprocessed plant products (fruits, vegetables, cereals) and to other products of plant origin. As long as there is no complete European legislation, existing national rules apply for animal products.

Table 9.1 Areas in the European Union cultivated according to the principles of organic farming in 1987 and 1993

Country	Area under cultivation (ha)		Number of farmers in organic agriculture (1992)
	1987	1993	
Belgium	1,200	1,600	151
Denmark	4,000	18,600	804
Germany	34,000	228,000	4,794
Greece	-	200	75
Spain	2,700	8,500	562
France	40,000	90,000	3,235
Ireland	1,300	1,600	150
Italy	6,000	15,000	3,000 a)
Luxembourg	162	500	13
Netherlands	3,400	10,000	433
Portugal	320	1,500	136
United Kingdom	8,600	30,000	737
EUR 12	102,682	405,500	14,000

a) Estimate of Ministry of Agriculture in the absence of more definite data.

Source: Baillieux and Scharpe, 1994.

In France the premium which is given during 5 years to adopt organic methods varies according to the specialization: 1,200 FF/ha (ECU 180) for annual crops; 1,400 FF/ha (ECU 210) for vegetables; 4,700 FF/ha (ECU 710) for fruits; 1,000 FF/ha (ECU 150) for vineyard; 2,300 FF/ha (ECU 345) for olive oil and 480 FF per livestock unit (ECU 72) for bovine growers. In 1993 only 211 demands have been approved corresponding to a total amount of FF 6 million (ECU 905,000) (CNASEA, 1994). The limited success of this measure explains the insignificance of the estimated volume of land under organic production in France. In 1993 the area under cultivation using organic production methods reached 90,000 ha representing only 0.30% of total utilised agricultural area (Agra Europe Feb. 10, 1995). This share of land organically farmed has the same magnitude as the European (0.31%). The marginal character of organic farming in France is due to the fact that payments are too low and that the mar-

Table 9.2 Characteristics of holdings with organic farming compared to conventional farming in Germany

Characteristic	Organic farming	Conventional farming	Total full-time
Number of farms	112	415	8,434
Utilized agricultural area (ha)	35.0	35.2	37.1
Arable crops (ha)	19.2	19.5	22.7
- Cereals (% arable crops)	51.1	60.0	54.8
- Potatoes (% of arable crops)	4.6	1.6	2.6
- Sugarbeet (% of arable crops)	0.5	2.6	5.7
- Fodder maize (% of arable crops)	1.5	14.4	14.0
- Other fodder crops (% of arable crops)	26.4	9.4	6.2
- Set-aside (% of arable crops)	9.7	5.9	10.1
Livestock density (LU/100 ha UAA)	98.1	116.0	156.7
- Dairy (% of total livestock density)	44.6	50.0	28.7
- Other cattle (% of total livestock density)	45.2	44.7	38.4
- Pigs (% of total livestock density)	3.0	4.9	29.4
- Poultry (% of total livestock density)	4.1	0.5	3.0
Yields			
- Wheat (dt/ha)	38.3	61.0	67.0
- Rye (dt/ha)	33.9	51.4	52.0
- Potatoes (dt/ha)	171	324	328
- Milk (kg/animal)	4,044	4,886	5,116
Output			
- Wheat (DM/dt)	85.8	26.2	27.7
- Rye (DM/dt)	74.8	23.8	26.3
- Potatoes (DM/dt)	62.6	16.6	15.1
- Milk (DM/100 kg)	68.9	61.9	61.5
Inputs bought (DM/ha UAA)			
- Fertilizers	29	151	164
- Plant protection products	4	70	101
- Young animals bought	154	133	437
- Feed	195	320	632
Profit			
- Profit (DM/ha UAA)	1,133	1,084	1,097
- Profit (DM/family working unit)	29,570	26,226	28,649
- Profit (DM/holding)	39,648	38,097	40,653

Source: Bundesministerium für Ernährung, Landwirtschaft und Forsten, 1995.

keting system is not well developed for organic commodities. Another reason is that organic farming requires more labour than other farming systems and not that the prescriptions are too restrictive.

In a survey conducted in the National Regional Park of Cotentin (Basse-Normandie) people were asked on their willingness to accept to move from conventional agriculture to organic farming. Among 227 farmers, 206 participated in a contingent market and 154 gave a positive amount using a payment card. Payments range from FF 500 per ha (ECU 75) up to FF 3,000 per hectare (ECU 450). Average per hectare is FF 2,310 (ECU 350) indicating a very important lag with the proposed premium (FF 1,200 to FF 1,400 according to the system) (Bonnieux and Rainelli, 1994).

Characteristics of conventional farming in Germany are compared to organic farming. The holdings with organic farming are mainly characterized by:

- a large variety of crops with a high share of legumes and fodder maize in cropping plan, and a low share of wheat and sugar beet;
- lower density of stocking population compared to conventional farming, and emphasis on cattle;
- no use of chemical plant protection products;
- limited amounts of feed bought. Emphasis is being given to closed cycles of minerals;
- higher demand for labour, especially by mechanical treatment of weeds and pests.

Profit levels of organic farming in 1993/94 was at about the same level compared to the average of the group of holdings with full-time farming (table 9.2). A distinction is made between a sample of farm holdings with organic farming, a sample of farm holders with conventional farming practice and a sample of farms with full-time farming.

10. EFFECTS OF CAP ON ENVIRONMENTAL QUALITY

Assessments of the impact of CAP on the environment have been very scarce so far. This holds the more so on the effects on the environment and landscape of the reform of 1992 of CAP. In many respects this is too early to judge.

However, knowledge on the effects of agricultural policy on quality of the environment and landscape is required in order to ensure that 'environmental concerns are taken into account from the outset in the development of policies and in the implementation of those policies, and the need of appropriate mechanisms within the Member States', as stated by the Council and the Representatives of the Governments of Member States' Meeting with the Council on the Fifth Environmental Action Programme. The objective of the present chapter is to identify possible causal relationships between the different elements of the Common Agricultural Policy and quality of the environment. Focus is on the development of indicators that contribute to the understanding of linkages between the causes and effects of agriculture on the environment; and contribute to monitoring effectiveness of agri-environmental policies. The UN Commission on Sustainable Development, for example, has requested countries to use indicators in their attempts to measure progress in achieving sustainable development, according to the AGENDA 21 adopted at the UNCED Rio Summit in 1992.

Agri-environmental indicators are required in order to monitor the response by the agricultural sector and to examine to what extent policy objectives on environmental stress and/or quality are met (Brouwer, 1995b). They are aimed at serving the achievement of the following objectives (Parris, 1994):

- provide information on the current trends and state of the natural environment in agriculture;
- assist policy makers in the analysis of the environmental impacts of policy decisions and market processes, and monitoring the effectiveness of policies promoting sustainable agriculture.

The OECD Joint Working Party of the Committee for Agriculture and the Environment and the Environment Policy Committee (JWP) is developing a set of indicators that would contribute to achieving these objectives mentioned. A tentative list of agri-environmental indicators distinguish between (Parris, 1994):

- trends of environmental significance, with proposed indicators to focus among others, on mineral balances, use of plant protection products as well as of energy and water resources;
- agriculture - environment interactions, with indicators included to reflect quality of soil, water and air, but also to focus on biodiversity and natural habitats, and landscape;
- agricultural and environmental policy and market interventions.

Different pressure indicators are identified. They derive from the Fifth Environmental Action Programme:

- water pollution (e.g. pollution of waters from nitrates and plant protection products and farm wastes). Indicators to be addressed are agricultural nutrient balances as well as use and risks of plant protection products by agriculture. Nutrient balances reflect the total quantity of nitrogen and phosphate applied on agricultural land from the use of chemical fertilizers and animal manure, less the amount of nutrients absorbed by crops. ;
- water resources (e.g. quantities of water used compared to water availability). It is to address the efficiency in using water by agriculture, including irrigation;
- soil quality (e.g. erosion and overgrazing). This might be reflected by agricultural soil conservation management or by agricultural soil degradation;
- landscape (e.g. marginalization and abandonment; standardization and loss of traditional features);
- biodiversity;
- air pollution from agriculture (e.g. acid emissions from agriculture, including ammonia and their subsequent effects on acidification). This is reflected by the level of acid air emission from the sector agriculture and by the occurrence of smell from farming practice;
- climate change (e.g. emissions of greenhouse gases from agriculture). Greenhouse gas emissions from agriculture reflect this pressure on the environment deriving from agriculture.

An attempt is made to assess linkages among the pressure indicators identified and the various instruments under CAP. Linkages identified reflect the impact on the environment of agricultural policy. A distinction is made between market and price policy (figure 10.1) and other policy measures in CAP (figure 10.2). Figure 10.1 is to address policies based on Council Regulations related to market regulations of cereals, grapes, beef, sheep and dairy. Market regulation on cereals distinguishes between CAP price and direct income support and the obligation to put aside part of the land in order to get compensatory payments.

Market and price policies distinguished include (i) price reduction of cereals, (ii) the obligation to put aside part of the land, (iii) the provision of compensation to farmers who give up wine production, (iv) reform of the beef regime, (v) reform of the sheep regime, and (vi) the milk quota system. Linkages among CAP and the pressure indicators reflect observations made in previous chapters and derive from possible trends as identified in literature. The reform of the beef and sheep regimes for example, mainly are to affect landscape and/or landscape. This is because of the authorization to Member States to put restrictions to compensatory payments to those farmers who comply with certain environmental rules. No attempt has been made to provide a quantitative assessment of the impact of the market regimes on the environment and landscape. The reduction of cereal prices for example, may result into a decrease of the use of chemical inputs. However, it may also result into an increase in case there

Pressure indicator	Cereals	Set-aside	Grapes	Beef	Sheep	Dairy
Water pollution	■					■
Water resources						
Soil quality			■	■	■	
Landscape	■	■		■	■	■
Biodiversity		■		■	■	
Air pollution				■		
Climate change				■	■	■

Figure 10.1 Main pressure indicators and driving forces addressed with market and price policies

is a change from growing cereals towards more intensive horticultural products. Such differences may largely depend on the prevailing farming systems, cropping plan and biophysical conditions.

Driving forces addressed in figure 10.2 include Directive 75/268, and Council Regulations (EEC) 2328/91, 2052/88, 2078/92, 2079/92, 2080/92 and 2092/91.

Indicator	75/268	2328/91	2052/88	2078/92	2079/92	2080/92	2092/91
Water pollution		■	■	■			■
Water resources			■	■			
Soil quality	■		■	■		■	■
Landscape	■		■	■	■	■	
Biodiversity			■	■		■	■
Air pollution		■					
Climate change						■	

Figure 10.2 Main pressure indicators and driving forces addressed

Directive 75/268 on mountain and hill farming in certain less-favoured areas (LFA Directive); Council Regulation (EEC) 2328/91 on improving the efficiency of the agricultural structures; Council Regulation (EEC) 2052/88 on the tasks of the Structural Funds and their effectiveness; Council Regulation (EEC) 2078/92 on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside; Council Regulation (EEC) 2079/92 instituting a Community aid for an early retirement scheme in agriculture; Council Regulation (EEC) 2080/92 instituting a Community aid scheme for forestry measures in agriculture; Council Regulation (EEC) 2092/91 on organic production of agricultural products and indications thereto on agricultural products and food-stuffs.

11. MAJOR FINDINGS

The objectives of the report are to analyse the effects of CAP on the environment of the European Union and to make an inventory of environmental measures already affecting agriculture in the European Union. The objective of the present chapter is to summarize major findings of the report. Also, this chapter is to identify areas of possible future research. Some recommendations for monitoring and research are provided in this chapter as well.

Issues of environmental concern in the European Union

1. Quality of water, soil and air, biodiversity, landscape and natural habitats are major issues of concern to the public opinion, local and national authorities and the European Commission. Issues of concern are very diverse, with large differences across regions in Europe regarding to the seriousness of the issues.

The present state of the environment in Europe includes several policy issues which need to be addressed for the agricultural sector (EEA, 1995). They derive from the Fifth Environmental Action Programme 'Towards Sustainability' and include (i) water pollution, particularly from nutrients and plant protection products, (ii) quality of soils, as reflected by soil erosion, especially in the Mediterranean countries, (iii) destruction of wildlife habitats and loss of biodiversity, resulting from intensive farming practices in areas which are vulnerable to risks of losing species diversity, and (iv) deterioration of cultural landscape, e.g. by removal of features like hedgerows, as well as the occurrence of marginalization and abandonment of agricultural land.

Differences across regions are very large because of the wide range of biophysical conditions, geomorphological features, intensity of farming practice, and structural characteristics of agriculture across the EU.

The need for environmental policies by Member States

2. The present state of the environment requires strong efforts by Member States in meeting targets. Several directives are formulated in the EU to meet quality standards of water, such as the Nitrate Directive, the Drinking Water Directive (80/778) and the Communication from the Commission to the Council and the European Parliament for a European Community Water Policy (COM (96) 59 Final). The latter one is proposal for a Framework Directive on Water Policy in the European Union. Other environmental policies affecting agriculture are Directive 91/414 concerning the placing of plant protection products on the market, Directive 92/43 on the conservation of natural habitats and of wild fauna and flora and amendments to Directive 85/337 regarding environmental

impact assessments of certain projects. The implementation of such Directives is left to Member States. This allows them to achieve the common goal of unity in a way that recognize the national character.

Production, prices and the use of inputs

3. From the argument that agricultural price support stimulates the use of (chemical or other environmental devastating) inputs, a reduction of price support would have positive consequences for the environment. Although a positive correlation between high level of support and input use does exist, this does not mean per se that a lowering of agricultural support will lead to an improvement of the environment. Effects of policy instruments are sometimes ambiguous, depending among others on the instrument applied, the features of the commodity and farming sector it is applied to, and local natural circumstances.

Furthermore, the environmental effects of agricultural policy may also differ over time and across regions, due to specific local conditions. Both agricultural production and environmental impacts depend on site-specific environmental conditions. Reality is much too complex to allow generalizations about the environmental impacts of agricultural policies. Therefore, in assessing the environmental impact of CAP, the widest possible attention should be given to local/regional differences of environmental consequences of policy instruments identified per product.

CAP and agriculture in the European Union

4. Relevant policy measures in CAP are market and price support measures for various products, the Accompanying Measures, horizontal socio-structural measures (Objective 5a), regional and rural policy (Objective 1 and 5b) and other policies like incentives for alternative crops. Market and price policies of agricultural products apply at Community level. Regional differences however are increasingly recognized in CAP. This is reflected by the increasing importance to integrate rural policies with regional targets (Objective 1 and 5b) and environmental requirements with the objectives of CAP (agri-environmental measures). Council Regulation (EEC) 2078/92 (Agri-Environmental Measures) for example is based on programmes formulated at national, regional and local level and aimed towards agricultural production methods which are compatible with the requirements of the protection of the environment and the maintenance of the countryside.
5. The 1992 CAP reform included a switch from supporting market measures through market price support to targeted compensatory measures. The share of expenditures on structural policy (covered by the Guidance Section of EAGGF) shows an increasing trend.

Environmental conditions in CAP

6. Environmental issues are better recognized in CAP than they were in the past. Environmental requirements presently are included in Council Regulations on products like arable crops, beef and sheep. No environmental conditions are explicitly included in measures to produce wine, pigs and dairy.

Environmental clauses in agricultural policy presently allow Member States to put conditions for direct (compensatory) payments. Environmental requirements in market and price policies are included in the Arable Crop Scheme (Regulation (EEC) 1765/92), formulated as management conditions to land which is put aside. Such environmental conditions are presently also added to several livestock schemes, including the Council Regulation on beef market organization, and the Council Regulation on sheep. Compensation for the decline in beef prices is subject to a limit on the number of eligible male animals per farm and the stocking density. The inclusion of environmental requirements in the beef and sheep regimes presently is limited to the United Kingdom. Also, Member States are allowed to put payment conditions in order to encourage the use of practices which are compatible for the need to safeguard the environment and preserve the countryside (agri-environmental measures). Environmental conditions also are placed to the Less Favoured Area Scheme, and to programmes under Objective 1 and 5b.

7. Market and price policies however do not cover all products produced. Price support to intensive livestock production for example, is negligible in the European Union. The use of chemical inputs is relatively high in regions with intensive horticulture production (e.g. northern Italy, south coast of France, southeast coast of Spain and the Netherlands). Also, animal manure problems are highest in regions with a high concentration of intensive livestock production (e.g. Flanders region in Belgium, the Netherlands, Bretagne, northern part of Germany and of Italy).

Deterioration of the environment due to such activities can not be counteracted by putting conditions to agricultural policy. This requires environmental regulation.

Effects of CAP on the environment and landscape

8. Empirical evidence shows a decline in consumption of agrochemicals to grow cereals during the past decade. The 1992 reform of the cereal regime may be one of the factors which contributed to that trend. Its impact on the environment and landscape comes from changes in price support and from the set-aside regulation. Lower prices may induce farmers to reduce their use of fertilizers, plant protection products and (in certain regions scarcely available) water. However, farmers may change their cropping plan towards products which require more intensive production methods and higher dosages of agrochemicals (e.g. fruit, vegetables, potatoes). Lower prices have complex implications for the agricultural system and environmental benefits at one aspect may be offset

by costs on another aspect. Differences across Member States are large due to different farming systems and biophysical conditions.

A reference area was introduced, such that the area which is eligible for the arable payments scheme is limited to the area of arable crops and temporary grass used by December 31, 1991. This condition has a positive effect on the environment as it prevents farmers to revert extensive grassland towards arable crops. Also, conditions are formulated in several Member States to the management of land which is put aside. Set-aside policies allow for conservation of nature and maintenance of landscape.

The set-aside scheme can be applied in a rotational and a non-rotational basis. Farm specific features, like soil productivity and cropping plan, affect the farmers decision whether to opt for one form or the other. Of both options, the non-rotational form appears to have a more favourable impact on the environment and landscape. A greater diversity of plant species is likely to develop, and this will subsequently support a greater variety of fauna. The management rules on the treatment of land which is put aside are, however, crucial to the environmental impact of both forms of the set-aside scheme.

9. Extensification of livestock production in response to the reform of the beef and sheep regimes has been limited so far. Experiences in Member States with the scheme indicate the relative inattractiveness of the premium to the farmer and the ineffectiveness of the measure to reduce livestock density. Also, the reduction of livestock prices did not reduce stocking density during the past couple of years because different trends were observed outside agriculture (e.g. monetary changes in some national currency). Price of feed concentrates declined as well.

The extensification effects of the reform of the sheep regime is considered to be limited, because a large share of the farms remain within limits put in the Sheep Regime and therefore are eligible for full compensation.

10. Council Regulations which are aimed at regulating the market regimes of grapes, pigs and dairy presently do not include environmental conditions to production. Market and price policy on these products, however, may affect the environment in the European Union:

- market policy on grapes is to affect the location of production, with possible subsequent effects on landscape. Knowledge on the effects of the wine regime on the environment and landscape are very scarce so far;
- pig production may benefit from lower cereal prices in response to the arable crop reform. Environmental effects could come from changes in allocation and concentration of pig production because of changes in relative cost advantages between EU regions. These consequences have been limited so far. Environmental policies on the treatment and production of animal manure are formulated in several countries, which is to affect future disposal of slurry to a large extent. The future location of pig

- production is largely affected by environmental policy in several countries (e.g. the Netherlands, Belgium, Denmark, parts of Germany and of France);
- the system of milk quota may have stimulated extensification of dairy production, because of the autonomous increase of productivity. This is observed in the northern part of Europe. Abandonment could also increase in response to the milk quota system, because production could be achieved at a smaller number of farms. Small-scale farmers may give up production by selling their quota and leave the countryside. Abandonment of agricultural land could result. It increased, in response to the reduction of milk quota, on the traditional used mountain pasture land in Spain. Stocking density of dairy farms slightly reduced in the EUR 12 since the mid-1980s. The impact of milk quota on extensification depends on quota transfer arrangements. Transfer of quota to other holdings may also require buying of land, which counteracts intensification of milk production. Structural adjustments in dairy production are important as well. The share of other cattle increased at dairy farms, and production of sheep increased in parts of Europe in response to the limits put to national milk production. A shift in farm management has occurred in response to the quota system, from output increase towards a reduction of expenditures on input. An improvement in treatment of minerals observed in dairy holdings may have had a positive effect on the environment.

Effects of agricultural structure policies on the environment and landscape

11. LFA policy may have a positive effect on landscape by maintaining a viable agricultural structure. This holds especially in marginal areas with very low net incomes. Compensation plays a significant role in such conditions. Direct subsidies (including LFA payments) may include a very high share of family farm income. However, negative effects of the LFA scheme may also arise in case the intensity of livestock production exceeds certain thresholds.
Environmental or management conditions on stocking density for getting compensatory allowances may be required in order to reduce overgrazing. Such conditions are set in national LFA schemes only to a very limited extent, making the apparent benefits of this scheme for nature conservation rather small. Environmental and management conditions presently are only introduced in the United Kingdom.
12. Programmes financed by Structural Funds under Objective 1 and 5b during the period 1989-1993 focussed on stimulating economic activities (including agriculture), rather than on safeguarding the environment. About 7% of total budget of Objective 5b programmes during the period 1989-1993 was on the promotion of environmental improvement. Main actions taken were the environmental control of agricultural activities, the maintenance or improvement of the natural environment, and waste disposal and waste water treatment.

The new rules for programmes under Objective 1 and 5B require an assessment of the environmental situation in the regions involved and an ex-ante evaluation of environmental effects of the strategies and activities foreseen.

Effects of the Accompanying Measures on the environment and landscape

13. Administrative units at different levels are in charge of the implementation of programmes. This requires major expertise by regional authorities in coordination and delegation of tasks. Any lack of organizational capacity and experience may limit the potential of the Accompanying Measures, especially in countries which have never implemented national schemes, whereby farmers are paid in return for undertaking specific environmental practices. The poor integration of Council Regulation 2078/92 with other CAP policies (commodity regimes, set-aside, rural development programmes and forestry programmes) may be one of the greatest problems facing the agri-environment measures. The environmental objectives might not be fully achieved in case measures are taken without sufficient coordination with other measures. In general, there is insufficient monitoring towards the achievement of EU environmental policy.
14. The effectiveness of the Accompanying Measures largely depends on market regimes. The response by farmers to participate in programmes under these measures among others depends on incentives provided by alternative policies. If the level of support for arable crops would be lower compared to present levels, then one could theoretically also achieve the objectives of Regulation 2078/92 at lower costs.
The arable support arrangements introduced in 1992 prevented farmers from counting arable land taken out of agricultural production under agri-environment schemes towards their set-aside requirement under Regulation 1765/92. This was a factor in discouraging arable farmers from participating in some agri-environment schemes. Following the amendment to Regulation 1765/92 in June 1995, arable land taken out of production under agri-environment schemes can be counted against farmers' set-aside requirements, subject to it complying with the normal eligibility rules.
15. National and regional programmes under Regulation (EEC) 2080/92 aim at expanding EU forestry area by about 1.5 million hectares in the period 1993-1999. So far, the measures have resulted in a small fraction of what was expected to be added to the forestry area. Main reason is the rather low compensation for planting costs, maintenance and income losses. Furthermore, the regulation and its compensation levels compete with measures under Regulation (EEC) 2078/92 for keeping an open landscape.

Incentives for organic farming

16. The agri-environmental measures include aid to farmers who undertake to introduce or continue with organic farming. It has been implemented according to Council Regula-

tion 2092/91. The area under organic cultivation in 1993 is more than 400,000 hectares, which is about fourfold of the coverage in 1987. However, it remains a limited share (about 0.3%) of total utilized agricultural area of EUR 12. More than half of the area in EUR 12 cultivated according to the principles of organic farming in 1993 is in Germany.

Recommendations for research and monitoring

17. Limited studies have been conducted so far in relation to certain issues and regions. Knowledge remains very patchy in relation to the effects of market and price policies on the environment and landscape.
Therefore, further research efforts in the field of linkages between agriculture and the environment are necessary. Strongly needed are efforts to disaggregate the agricultural sector to better capture the complexities of agricultural commodity programs and changes in the composition of agricultural production as a result of changes in policies, which might have important environmental implications since some commodities are more environmentally damaging than others (as are agricultural policies, too). So, the approach to study the relation between agricultural policies and the environment has to focus on policy instruments and products.
18. It is recommended to develop indicators on the environment and landscape for monitoring effects of CAP on the environment and landscape. Environmental pressure indicators and indicators on quality of landscape, as well as on responses by policy and farming practice are important to the monitoring of the impact of CAP on the environment and landscape.
19. The available knowledge about the reform of CAP and its impact on the environment and landscape remains to be limited. This is due to the rather recent implementation and complex relations between agricultural policy, farmers' behaviour and environmental issues. It is recommended to develop more detailed and consistent approaches to relate CAP reform with the environmental issues deriving from the Fifth Environmental Action Programme.

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APPENDIX A Contributing organizations

Belgium

- Ambassade van het Koninkrijk der Nederlanden, Bureau van de Landbouwrap
- Ministerie van Middenstand en Landbouw, Afdeling Integratiepolitiek
- Ministerie van de Vlaamse Gemeenschap, Departement Economie, Werkgelegenheid, Binnenlandse Aangelegenheden en Landbouw, Administratie Land- en Tuinbouw

Denmark

- Danish Institute for Agricultural and Fisheries Economics (SJI)
- The Agricultural Council of Denmark
- Farmers Union
- Danish Environmental Protection Agency, Ministry of Environment

Finland

- Maatalouden Taloudellinen Tutkimuslaitos (Agricultural Economics Research Institute)

Germany

- Bundesamt für Naturschutz
- Bundesministerium für Ernährung, Landwirtschaft und Forsten
- Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit
- Deutscher Bauernverband
- Institut für Agrarpolitik, Marktforschung und Wirtschaftssoziologie
- Institut für Betriebswirtschaft, Bundesforschungsanstalt für Landwirtschaft Braunschweig-Völkenrode (FAL)

Greece

- Ministry of Agriculture, Directorate of Agricultural Policy
- Athens University of Economics and Business

Spain

- Universidad Politécnica de Madrid, Departamento de Economía Agraria

France

- Ministère de L'Environnement, Direction de la Nature et des Paysages
- Institut National de la Recherche Agronomique, Station d'Economie et Sociologie Rurales

Italy

- Ministry of Environment
- Ministry of Agriculture, Rome
- Ministry of Agriculture, Regional Office Emilia Romagna, Bologna
- National Institute of Agricultural Economics (INEA)

Luxembourg

- Ministère de l'Environnement

Netherlands

- Ministerie van Landbouw, Natuurbeheer en Visserij (LNV)
- Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer (VROM)

United Kingdom

- Council for the Protection of Rural England
- Country Landowners Association (CLA)
- Countryside Commission
- Department of the Environment (DOE)
- Institute for European Environmental Policy (IEEP)
- Ministry of Agriculture, Fisheries and Food (MAFF)
- National Farmers' Union (NFU)
- The Royal Society for the Protection of Birds (RSPB)
- University College London, Department of Geography

APPENDIX B Council regulations and Directives, environmental requirements in agricultural policies

Full titles of the Regulations and Directives considered:

1. Council Regulation (EEC) No 1765/92 of 30 June 1992 establishing a *support system for producers of certain arable crops* (codified 4 February 1994)
2. Council Regulation (EEC) No 1766/92 of 30 June 1992 on the *common organization of the markets in cereals*
3. Commission Regulation (EEC) No 762/94 of 6 April 1994 laying down detailed rules for the application of Council Regulation (EEC) No 1765/92 with regard to *the set-aside scheme* (repealing Regulation (EEC) No 2293/92)
4. Council Regulation (EEC) No 1756/92 of 30 June 1992, amending Regulation (EEC) No 822/87 on the *common organization of the market in wine*
5. - Council Regulation (EEC) No 2066/92 of 30 June 1992 amending Regulation (EEC) No 805/68 on the *common organization of the market in beef and veal* repealing Regulation (EEC) No 468/87 laying down general rules applying to the special premium for beef producers and Regulation (EEC) No 1357/80 introducing a system of premiums for maintaining suckler cows; and
- Commission Regulation (EEC) No 3386/92 of 23 December 1992 laying down detailed rules for the *application of the premium schemes* provided for in Council Regulation (EEC) No 805/68 on the *common organization of the market in beef* and repealing Regulations (EEC) No 1244/82 and (EEC) No 714/89.
6. Council Regulation (EEC) No 2069/92 of 30 June 1992 amending Regulation (EEC) No 3013/89 on the *common organization of the market in sheepmeat and goatmeat*, and Council Regulation (EEC) No 2070/92 of 30 June 1992, amending Regulation (EEC) No 3493/90 laying down general rules for the grant of premiums to sheepmeat and goatmeat producers.
7. Council Regulation (EEC) No 1249/89 of 3 May 1989, amending Regulation (EEC) No 2759/75 on the *common organization of the market in pigmeat*.
8. Council Regulation (EEC) No 2071/92 of 30 June 1992, amending Regulation (EEC) No 804/68 on the *common organization of the market in milk and milk products*.

9. Council Directive of 28 April 1975 on *mountain and hill farming and farming in certain less-favoured countries* (75/268/EEC)
10. Council Regulation (EEC) No 2328/91 of 15 July 1991 on improving the efficiency of the *agricultural structures*.
11. Council Regulation (EEC) No 2052/88 of 24 June 1988 on the tasks of the *Structural Funds* and their effectiveness and on coordination of their activities between themselves with the operations of the European Investment Bank and other existing financial instruments.
12. Council Regulation (EEC) No 2081/93 amending Regulation (EEC) No 2052/88 on the *tasks of the Structural Funds* and their effectiveness and on coordination of their activities between themselves and with the operations of the European Investment Bank and other existing financial instruments.
13. Council Regulation (EEC) No 2078/92 of 30 June 1992 on *agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside*.
14. Council Regulation (EEC) No 2080/92 of 30 June 1992 instituting a Community aid scheme for *forestry measures in agriculture*.
15. Council Regulation (EEC) No 2079/92 of 30 June 1992 instituting a Community aid for an *early retirement scheme in agriculture*.
16. Council Regulation (EEC) No 2092/91 of 24 June 1991 on *organic production of agricultural products* and indications referring thereto on agricultural products and foodstuffs.
17. Council Directive (91/676/EEC) Concerning the protection of waters against pollution caused by nitrates from agricultural sources (Nitrates Directive).
18. Council Directive (91/414/EEC) Concerning the placing of EEC-accepted plant protection products on the market.
19. Council Directive (92/43/EEC) on the Conservation of natural habitats and of wild fauna and flora (Habitats Directive).
20. Council Directive (85/337/EEC) requiring environmental impact assessments of certain public and private projects.

Arguments, concerns and conditions mentioned at the adoption of the Regulations and Directives considered (the figure for each paragraph refers to the title of the regulation mentioned above).

1. In Council Regulation No 1765/92 a new support system for producers of certain arable crops is established' in order to ensure better market balance. The objective of a better market balance is achieved by lowering of institutional prices compensated by direct payments. Participation in the support system should be voluntary. To be eligible for the compensatory payments under the 'general scheme', producers must set aside a predetermined percentage of their arable area. Furthermore, 'the land set aside would have to be cared for so as to meet certain minimum environmental standards; (...) the areas set aside as temporary fallow can also be used for non-food purposes, provided effective control systems can be applied' (as is laid down in CR No 2296/92 of 31 July 1992 'laying down certain rules for application of the use of land set aside for the provision of materials for the manufacture within the Community of products not primarily intended for human or animal consumption,' and in CR No 2595/93 of 22 September 1993 'laying down the detailed rules for implementing Council Regulation (EEC) No 1765/92 as regards the use of land set aside for the production of multiannual raw materials for the manufacture within the Community of products not intended for human or animal consumption'). The minimum environmental standards which are required to be met on land set aside are not elaborated in this regulation and so there is no environmental clause included.
2. In CR 1766/92 it is stated that the new orientation of the common organization of the market in cereals must lead to a better market equilibrium and to a better competitive position of the Community. The loss of income resulting from the drop in prices is offset by direct aid per hectare. No references are made explicitly to environmental concerns for being a reason to change the cereal regime. No environmental clause is part of the Regulation.
3. In CR No 762/94 of 6 April 1994, detailed rules for the application of Council Regulation (EEC) No 1765/92 with regard to the set-aside scheme (repealing Regulation (EEC) No 2293/92) are laid down. As it is formulated there, the set aside scheme is primarily meant to control production. Some conditions or provisions are imposed regarding maintenance and use of the areas set aside. These provisions are laid down because of environmental reasons. Article 3(3) says: 'Member States shall apply the appropriate measures which correspond to the specific situation of the land set aside so as to ensure the protection of the environment. These measures may also concern a green cover: in that case the measures must provide that the plant cover may not be used for seed production and that it may on no account be used for agricultural purposes before 31 August or produce, before the following 15 January, crops which are intended for commercial use.' To get compensatory payments for land set aside, it is obligatory to

fulfill the conditions. Member States can decide the penalties 'which are appropriate and proportional to the seriousness of the environmental consequences of not observing the said measures.'

5. The common organization of the market in beef has been reformed because 'of the structural imbalance between the supply and demand on the Community market'. A compensation for lowering the intervention price for beef is granted in the form of premiums, subject to a limit on the number of eligible male animals. Furthermore the special premium for beef producers and the premium for maintaining suckler cow herds continue. Therefore the schemes are adapted to the new situation by redefinition of the conditions of the grant. Conditions of major importance are the restriction of the total number of animals eligible for the premiums and the stocking density on the holding. Because 'the reorientation of the premiums should not be reflected in an increase in overall production, (...) 'the number of animals eligible for premiums should be limited by applying regional and individual ceilings respectively to be determined in accordance with reference years.' In order 'to encourage extensive production, the grant of such premiums should be subject to compliance with a maximum stocking density on the holding, and an additional amount should be granted to producers who do not exceed a minimum stocking rate'. Although support by premiums is subject to a certain degree of intensity of production, no reference is made explicitly to an environmental clause when applying for support under this scheme. However, by an amendment CR 3611/93 the option to Member States to include environmental conditions is given: 'Member States may apply appropriate environmental measures which correspond to the specific situation of the land used for the production of male bovine animals or suckler cows qualifying for premium. Member States which avail themselves of this possibility shall decide the penalties which are appropriate and proportional to the seriousness of the ecological consequences of not observing the said measures. These penalties may provide for a reduction or, where appropriate, cancellation of the benefits accruing from the premium schemes' (article 4a).
6. The regulation (EEC) Nr. 3013/89 on the market organization of sheepmeat and goatmeat has been amended to include the option for Member States to pay the ewe premium applying 'appropriate environmental measures which correspond to the specific situation of the land used for the production of sheep and goats qualifying for premium' (article 5 quinties). A Member State may penalize the applicant not observing the said measures by reducing or even cancelling the premium payments.
9. At the adoption of Council Directive of 28 April 1975 on mountain and hill farming and farming in certain less-favoured countries (75/268/EEC) it is said to be ' necessary that steps be taken to ensure the continued conservation of the countryside in mountain areas and in certain other less-favoured areas'. The concern is that ' the steady decline of agricultural incomes in these areas as compared with other regions of the Community, and

the particularly poor working conditions prevalent in such areas are causing largescale depopulation of farming and rural areas, which will eventually lead to the abandonment of land'. Therefore, 'in order to ensure the continuation of farming, and thereby maintaining a minimum population level or conserving the countryside in certain less-favoured areas (...), Member States are authorized to introduce the special system of aids (...) to encourage farming and to raise incomes in these areas' (Article 1). Article 3 says that 'the less-favoured farming areas shall include mountain areas, in which farming is necessary to protect the countryside, particularly for reasons of protection against erosion or in order to meet leisure needs; they shall also include other areas where the maintenance of a minimum population or the conservation of the countryside is not assured'. Financial aid in the scope of the LFA directive can be granted to farmers with at least three (in some areas two) hectares of usable agricultural area who undertake to pursue a farming activity for at least five years. Member States may lay down additional conditions for the grant of the compensatory allowance including conditions which encourage the use of practices compatible with the need to safeguard the environment and preserve the countryside. Member States fix the amounts of the compensatory allowance according to the severity of the permanent natural handicaps affecting farming activities. Since the codification of the different elements of the EC agricultural structural policy in 1991, the rules for payments to LFAs are incorporated in Regulation 2328/91 (art. 17-20).

10. Council Regulation (EEC) No 2328/91 of 15 Juli 1991 on improving the efficiency of the agricultural structures has the objective (among others) 'to contribute to the safeguarding of the environment and the preservation of the countryside, including the long-term conservation of natural farming resources.' The EAGGF, Guidance Section, provides part-financing for national aid schemes on (among others) measures relating to investments aimed at preserving and improving the natural environment. These investments should not entail an increase in production. Title II on extensification of production and Title VII dealing with aid in environmentally sensitive areas were repealed with the adoption of CR 2078/92. Forestry measures on agricultural holding, provided for in Title VIII, are replaced by CR 2080/92.
11. In the regulation on the tasks of the Structural Funds, Article 3.3 sets out the assistance from the EAGGF Guidance Section. Assistance is geared in particular to (among others) 'helping (...) to safeguard the environment, to preserve the countryside (inter alia by securing the conservation of natural agricultural resources) and to offset the effects of natural handicaps on agriculture' (3.3d).
12. Council Regulation (EEC) No 2081/93 is a Framework Regulation on the objectives and tasks of the Structural Funds. Article 7 states that 'Measures financed by the Structural Funds or receiving assistance from the EIB or from another existing financial instrument shall be in conformity with (...) Community policies, including those concerning

(...) environmental protection' Article 8.4 states that 'The Member States concerned shall submit to the Commission their regional development plan. These plans shall include (...) an appraisal of the environmental situation of the region concerned and an evaluation of the environmental impact of the strategy and operations referred to (...) and to ensure compliance with Community environmental rules'. Article 11a.5 states that 'The Member States concerned shall submit their rural development plans to the Commission. Those plans shall include an assessment of the environmental situation of the region concerned and an evaluation of the environmental impact of the strategy and operations referred to above in accordance with the principles of sustainable development in agreement with provisions of Community law in force'. These two Articles make reference to the environmental profile that Member States should provide to the Commission under Objective 1 (Article 8.4) and Objective 5b (Article 11a.5).

13. The Agri-environmental measures are based on Council Regulation (EEC) No 2078/92 of 30 June 1992 on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside. The reasoning for adopting this regulation can be read from the following statements: 'the requirements of environmental protection are an integral part of the common agricultural policy; (...) measures to reduce the agricultural production in the Community must have a beneficial impact on the environment; (...) an appropriate aid scheme would encourage farmers to serve society as a whole by introducing or continuing to use farming practices compatible with the increasing demand of protection of the environment and natural resources and upkeep of the landscape and the countryside'. In the following two articles the intentions of this regulation are formulated and farmers' activities eligible for payments under this aid scheme are described.

Article 1

A Community aid scheme (...) is instituted in order to (...) contribute to the achievement of the Community's policy objectives regarding agriculture and the environment. The Community aid scheme is intended to promote (among others):

- the use of farming practices which reduce the polluting effects of agriculture;
- an environmentally favourable extensification of (...) farming, including the conversion of arable land into extensive grassland;
- ways of using agricultural land which is compatible with protection and improvement of the environment, the countryside, the landscape, natural resources, the soil and genetic diversity;
- the upkeep of abandoned farmland and woodland where this is necessary for environmental reasons because of natural hazards and fire risks, and therefore avert the dangers associated with the depopulation of agricultural areas;
- long-term set-aside of agricultural land for reasons connected with the environment.

Article 2 (1)

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

- (a) to reduce substantially their use of fertilizers and plant protection products, or to keep to the reduce they already made, or to introduce or continue with organic farming methods;
- (b) to change, by means other than those referred to under (a) to more extensive forms of crop, including fodder 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 area;
- (d) to use other farming practices compatible with the requirements of protection of the environment and natural resources, as well as the 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 the public access and leisure activities.

14. In Council Regulation (EEC) No 2080 of 30 June 1992 instituting a Community aid scheme for forestry measures in agriculture, it is argued that 'afforestation of agricultural land is especially important both from the point of view of soil use and the environment and as a contribution to reducing the shortage of forestry products in the Community and as an accompaniment to the Community's policy for controlling agricultural production. Therefore, an Community aid scheme is instituted in order to (among others) 'contribute towards forms of countryside management more compatible with environmental balance'. Afforestation as an alternative use of agricultural land is promoted by stimulating the development of forestry activities on farms. Member States shall implement the aid scheme by means of national or regional multiannual programmes which set out in particular (among others) the conditions for granting aid, and the measures taken to evaluate and monitor environmental impact and compatibility with land use criteria.
16. Organic farming (CR No 2092/91) is stimulated because 'this type of production may contribute towards the attainment of a better balance between supply of, and demand for, agricultural products, the protection of the environment and the conservation of the countryside'. Plant protection products, detergents, fertilizers, and soil conditioners, allowed in the organic production method are precisely defined in an Annex of the Regulation.