Chapter 1 Introduction

1.1 Background to the study

1.1 Since the reforms of the Common Agricultural Policy (CAP) in 1992, set-aside has played a major role in the Arable Area Payments Scheme (AAPS). All significant producers of cereals are required to set aside a proportion of their land in order to be eligible for arable area payments. This is referred to as 'obligatory' set-aside. The rationale for set-aside became increasingly questioned with the development of a strong world market in the mid 1990s, and the initial proposals for Agenda 2000 provided for a zero default rate of set-aside. However, weaker markets in the late 1990s again put pressure on the EU, and the mechanism has been retained with a default rate of 10 percent. There is now provision for this to apply until 2006. This is so despite the regular criticisms that have been made of the approach by economists as being inefficient, by environmentalists as being a wasted opportunity, and by the public as paying farmers for doing nothing. The CAP cereals regime is due to be reviewed in 2002 and so it is appropriate at this time to reassess the role of set-aside in agricultural policy.

1.2 The evaluation of set-aside is a complex issue. When first introduced, the objective for set-aside was essentially one of supply control. However, other objectives have been introduced, particularly that of environmental improvement. Further objectives too have been suggested, although perhaps never formally prescribed, such as promoting restructuring and the production of industrial crops. Not all farmers are required to adopt set-aside, and the details of the requirements involved have changed through time. It was introduced alongside a number of other policy changes under the MacSharry reforms and, as we will see, farmers' responses to it appear to have altered over time. It has implications for a number of different interests, both financial and environmental. We have therefore approached the evaluation from a number of perspectives.

1.3 In this report, we review the impacts of set-aside on supply control, on agriculture, on the environment and on government. In doing so we address a number of questions:

- To what extent are the rationale and objectives of set-aside still valid?
- To what extent are the objectives being met?
- What has been the impact of set-aside on the UK arable sector?
- What alternative scenarios are there for policy?

1.4 In our evaluation, we have undertaken a number of separate pieces of analysis. The first element was a literature review by McNally (2001) which can be found in Appendix 2. Between 1993 and 1998, the Rural Business Unit (RBU) within the Centre for Rural Economic Research (CRER) co-ordinated a series of Special Studies for the Ministry of Agriculture, Fisheries and Food (MAFF) of the economics of cereal production. These covered nearly 400 farms in Great Britain. Details of the

methodology of this study can be found in Appendix 1. This dataset has been extended by means of a telephone survey of co-operators covering the characteristics of set-aside, industrial crops, farm-level impacts, willingness to undertake set-aside in various contexts and responses to a number of alternative policy scenarios. These data have provided us with information on the farm-level impacts and on possible responses to alternative policy scenarios.

1.5 We have also undertaken an analysis of data from the Farm Business Survey (FBS). This is an annual voluntary survey of a stratified random sample of about 2,700 farm businesses in England and Wales above eight economic size units. We have also used data from the equivalent survey undertaken in Scotland in the Farm Accounts Survey (FAS). While the survey fails to cover the smallest holdings and so cannot be taken as representing the agricultural sector as a whole, it does represent the circumstances of the farms producing the major proportion of agricultural production. This analysis provides us with information on the impacts of set-aside on farm productivity, efficiency and restructuring.

1.6 A wide range of organisations have firm views as to the role of set-aside as a policy mechanism. We have therefore undertaken a survey of a number of stakeholders, reflecting the variety of interests involved. The organisations contacted were in both the private and public sectors, and included organisations with production, environmental and public expenditure interests. This survey has provided information on views as to the environmental impacts of the current arrangements for set-aside, together with perspectives on alternative policy scenarios.

1.7 Finally, in addressing the environmental impacts of set-aside, we have assembled evidence from a number of sources. A major review of the environmental impacts of set-aside was undertaken by the Centre for Ecology and Hydrology in 1998 (CEH, 1998). We have drawn on this and discussed the conclusions with the researchers involved. We have also sought views of the farmers themselves and the stakeholders.

1.8 As a means of reviewing the options for policy we have developed a number of alternative policy scenarios, including complete liberalisation, a zero set-aside, competitive set-aside targeting supply control and environmental benefits, and a whole farm scheme. We have discussed these scenarios with farmers and stakeholders and have assembled evidence on their possible impacts and implications in our survey work. We conclude our report by outlining our conclusions and by sketching out some possible directions for policy.

Chapter 2 Underlying Rationale, Theoretical Concerns and Practical Implementation of Set-Aside in the EU

Chapter Summary

The main objective of set-aside is to control the surplus production of cereals in the EU. Secondary objectives can be found in the promotion of environmental improvement and the production of industrial crops

There is a potential for the objectives to conflict. This depends on the relationship between the productivity of land and its environmental sensitivity.

There are a number of concerns about the ability of set-aside to achieve its supply control objective. In addition, economic theory suggests that it is an inefficient method of supply control.

The rules governing set-aside are reproduced and a brief description of their implementation in the UK is given.

2.1 Introduction

2.1 This chapter is organised into four sections. The first reviews the (initial and evolving) rationale for set-aside under the three broad headings of supply control, environmental benefits, and promotion of industrial crops. The second section provides a conceptual framework for analysing the effectiveness of set-aside in meeting its objectives. It looks at the different types of relationship that may exist between the various objectives and draws conclusions for the design of set-aside to maximise programme performance. It also looks at the sources of a phenomenon which has become known as 'slippage', i.e. the discrepancy between the percentage reduction in the cropped area and the percentage fall in crop output. The third section is largely descriptive. It reviews the operation of set-aside policy in the UK in the light of the evolving programme objectives, with a brief description of the characteristics of set-aside on UK farms in the final section.

2.2 Rationale

2.2.1. Supply control

2.2 Supply control has been a concern to agricultural policy makers in Europe since the early 1980s when the combination of high support prices, EC enlargement and rapid rise in agricultural productivity, brought about the switch in the European Community's agricultural trade position from being a net importer of most products to a net exporter. The 1980s was the period during which the budget costs of supporting the CAP grew rapidly. Indeed, the policy of supporting commodities in export surplus at prices well above levels of export parity, which were themselves trending downward, caused increases in government expenditure such as to strain political acceptability of the CAP. Hence, most major changes in the CAP during the 1980s, such as the imposition of dairy quotas in 1984 or the introduction of budget thresholds, arose through the pressures of public expenditure to the point of budget exhaustion.

2.3 It is in this context that the first set-aside programme, the Five-Year Voluntary Set-Aside Scheme, was introduced in 1988. Under this scheme, producers who retired from an arable rotation 15% or more of the land for a period of five years received a rental payment from the EU budget. In one year of the operation of the scheme those signing up were also excused co-responsibility levies. This made the scheme very attractive, and sign up for that year was unusually high. Under the voluntary scheme there was no limit to the area of land that could be set aside, and some farmers chose to idle all their land. However, uptake represented a relatively small proportion of the total cereals area.

2.4 Falling and volatile world prices of most major commodities during the 1980s, stagnation of trade and changes in market shares (at the expense of US exports), and a widening gap between internal and world prices caused the Uruguay Round of trade negotiations to give formal attention to agriculture, resulting in the 1993 Uruguay Round Agreement on Agriculture (URAA). This stipulated significant reductions in the level of support under three main headings: internal support, import access and export subsidies. The general pattern of agreements has been a reduction in stages over a six-year implementation period beginning in July 1995, below a base period in the late 1980s:

- internal support to be reduced by 20%;
- tariffs and tariff equivalents to be reduced by 36%;
- volume of subsidised exports to be reduced by 21%; and
- expenditure on subsidised exports to be reduced by 36%.

2.5 The supply control rationale of the obligatory set-aside scheme, introduced as part of the 1992 MacSharry reforms of the CAP, must be seen in the light of the URAA: set-aside has been the main instrument for the EU to ensure compliance with its URAA commitments relating to the volume of, and expenditure on, subsidised exports. A high price adjustment gap (i.e. difference between internal and world prices) necessitates high set-aside rates if the EU is to stay within the agreed limits on the expenditure on subsidised exports.

2.6 Clearly, the problem in the EU has been one of oversupply caused mainly by prices which were in excess of the market price. Economists would argue that the most efficient way to overcome this problem would be to cut prices. If this were to happen there would be no need for set-aside as a supply control instrument. However, it is clear that within the EU there has been a lack of will to undertake such price cuts for a number of reasons, but largely out of concern for the perceived impact on the rural community. Therefore set-aside can be seen as a way of achieving the necessary supply control whilst avoiding further price cuts.

2.2.2 Environmental benefits

2.7 The period of the classic CAP from 1968 to 1992 saw the steady rise in *internal* criticisms. Politically, important internal opposition to the CAP has come from environmentalists. The perception is that the CAP has stimulated structural and technical change in agriculture which has brought with it the now familiar trio of environmental problems: pollution of soil, water, atmosphere and food; reduction of

biodiversity through loss of habitats; and the loss of treasured features in the cultural landscape. The existence of these problems is now widely acknowledged by natural scientists. Currently, attention is being extended to the prospective applications of new techniques of biotechnology, in particular the genetic modification of crops. This is not the occasion to catalogue the rising tide of environmental criticisms. See for example the European Environmental Agency's (1995) Dobris Report as an indicator of this literature.

2.8 The criticisms have taken on an even greater force when they are combined with concerns about animal welfare and the perception that the resulting food is unsafe or less safe, especially after the BSE crisis. It should be recognised though that these criticisms are not voiced to the same extent in all member states. Generally, they are expressed more vociferously in the northern states than in the south (Buckwell, 1999). Environmental groups have been lobbying, with growing success, for redirecting money from production grants into conservation schemes. Even so, with around 5% of the agricultural budget devoted to environmental measures, agri-environmental policy as yet continues to be an 'accompanying measure' to a largely commodity-based CAP, despite the erection of the second pillar of rural development.

2.9 While set-aside had been introduced with the supply control objective in mind, it quickly became apparent that land diverted from production also delivered environmental benefits. These benefits are now well documented and will be reviewed in some detail in Chapter 7.

2.10 From the point of view of environmental groups, the political attraction of set-aside lies in the fact that, as an attachment to a commodity-based policy, it is not bound by the same budgetary limitations as generally apply to the agri-environmental measures. In other words, set-aside offers the opportunity to harness for environmental purposes some of the core money from the agricultural budget. The introduction of set-aside in 1993 was indeed welcomed by many environmental groups. The RSPB, for example, noted in the political consultation process that 'rotational set-aside is, in effect, a means of reintroducing fallows into the countryside' (House of Lords, 1992, p.53). They emphasised the benefits to wintering birds of fallows and weedy stubble as well as the reduced use of pesticides and fertilisers as fallows are reintroduced into rotations. However, environmentalists' support for set-aside was not unanimous. The CPRE argued that 'set-aside (as opposed to a long-term environmentally driven land diversion policy) raises real environmental problems as well as providing occasional benefits to some forms of wildlife. It is imperative that the damage the new set-aside policy could inflict on the environment is minimised' (House of Lords, 1992, p.49). Such damage could arise from increased leaching caused by the ploughing up of the fallow land at the end of the set-aside period. There is also the potential for damage to the landscape through the inappropriate siting of set-aside.

2.2.3 Promotion of industrial crops

2.11 Farmers can grow crops for industrial purposes on set-aside land and receive the annual set-aside payment. In the UK, the main crops grown on set-aside land are industrial oilseeds and energy crops (short rotation coppice). Set-aside has been a key driver for the growth of non-food crops. De Baere (2001) estimates that, in the whole

of the EU, up to one million hectares of set-aside land per annum have been used to grow non-food crops. The European Renewable Raw Materials Association (ERMA) estimate that 5% of arable land in Europe is used for producing crops for industrial markets. Clearly, set-aside has boosted the speed with which the sector has developed. While the advancement of industrial and energy crops was not an explicit objective initially, considerable interest has been building up behind it (De Baere, 2001).

2.12 The promotion of industrial crops may be deemed appropriate for a number of reasons. For example, if there are some non-market benefits to be had from industrial crops then some form of subsidy through set-aside may be warranted. For renewable energy crops it may be reasoned that their part in reducing harmful emissions from fossil fuels may be considered a benefit that is not captured by the market. This may also be valid for materials that are recyclable or bio-degradable. Finally, even for products where there are no non-market benefits the infant industry argument may be valid. If set-aside enables the setting up of a sustainable industrial crop sector (that can continue unsupported in the future) then this has a number of benefits – from creating employment in the wider economy through to providing an alternative for producers to the production of food crops that may not be profitable in a freer market.

2.3 Theoretical problems with set-aside

2.13 This section reviews some of the potential concerns of using set-aside. First, the question is asked whether, and under what conditions, the twin objectives of supply control and environmental improvement are conflicting. Second, the sources of slippage are discussed, and finally the possible sources of economic inefficiency of set-aside are briefly considered. This discussion provides the conceptual framework for the empirical analysis in later chapters of the report. A full discussion of the literature surrounding set-aside can be found in Appendix 2, which reproduces the work of McNally (2001).

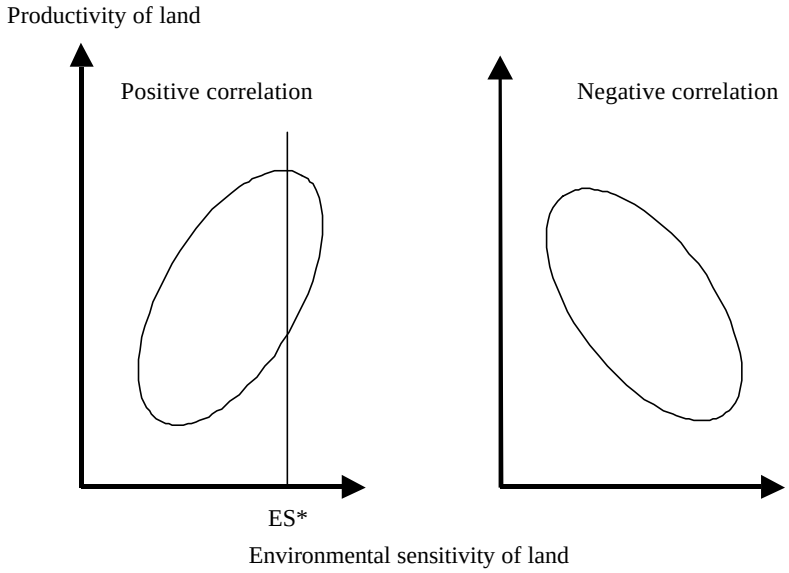
2.3.1 Relationship of objectives and the scope for spatial targeting of set-aside

2.14 Agriculture is a spatial industry. Environmental attributes of the land vary in space as do crop yields. This has important implications for the relationship of the twin objectives of supply control and environmental improvements and the way in which set-aside might be targeted to maximise its effectiveness in achieving its objectives. The relationship between environmental sensitivity and productivity of land is crucial in this respect. Figure 2.1 illustrates the type of relationships that may exist between these two attributes of the land. The left-hand panel shows a 95% confidence interval (confidence ellipse) for the case in which environmental sensitivity and productivity of the land are positively correlated.[1] A positive correlation (left-hand panel) means that the higher yields are achieved mainly on environmentally more sensitive land, and vice versa. A negative correlation (right-hand panel) means that high yields coincide with environmentally less sensitive land. If one thinks of 'environmental sensitivity' as the 'potential of the land to generate environmental benefits if set aside', then it is obvious that, in the case of a positive correlation, set-aside should be targeted on the land that generates the greatest

[1] The confidence ellipses can be thought of as circumscribing 95% of all observed combinations of the two attributes.

environmental benefits if set-aside, for example beyond ES* in Figure 2.1 As this is also the highest-yielding land, both objectives are achieved simultaneously. Spatial targeting, in such circumstances, can clearly enhance the effectiveness with which set-aside meets both objectives.

Figure 2.1. Joint distribution of environmental sensitivity and agricultural productivity of land



2.15 If, in contrast, productivity and environmental sensitivity are negatively correlated (as in the right-hand panel), a trade-off must be made between achievement of environmental objectives (by targeting the environmentally sensitive, but less productive land) and supply control (by targeting the more productive, but less environmentally sensitive land). It is not clear *a priori* whether spatial targeting of set-aside is worthwhile in such circumstances - if both objectives have equal weighting.

2.16 In assessing potential environmental benefits in this context, it is important to take account of the environmental value-added through set-aside; i.e. the extent to which the quality of the environment is enhanced. Thus it is not clear *a priori* whether the added benefit will be greatest by targeting land of already high environmental quality or land substantially degraded by intensive production.

2.17 The type of relationship between the two attributes depends largely on the environmental attribute considered. According to Firbank (2001), the relationship is most likely positive for farmland birds. That is, setting aside high-yielding, intensive arable land is likely to be more beneficial to birds than setting aside marginal, low-yielding land – partly because of the plentiful feed resources in the arable landscape. A similar relationship holds for water quality. On balance, the potential of high-yielding, intensively farmed land to generate water quality benefits if set aside is greater than that of less productive or marginal land (Firbank, 2001). Under these circumstances, there is a clear case for spatial targeting of set-aside which would improve the achievement of both objectives.

2.18 In contrast, the correlation between botanic diversity (rare plant species) and productivity is probably negative. In high-yielding, intensive arable areas, the ecological infrastructure may be largely destroyed, and there may be very little left in the seed bank. It would be more appropriate then to set aside less intensive, perhaps marginal land with more capacity for regeneration and more adjoining interfaces (Firbank, 2001). However, this would conflict with the supply control objective of set-aside, and the appropriate strategy would depend on the relative weights given to the two objectives. This highlights the difficulty of trying to achieve multiple objectives with a single policy instrument. Under these circumstances a more appropriate course of action would be the development of precise policy mechanisms for the conflicting objectives. This follows Tinbergen's (1952) reasoning that for each policy objective there should be a policy tool.

2.3.2 Set-aside and supply control

2.19 Set-aside works as an input control rather than a control on the final output. Therefore its impact on the level of production is uncertain and it is not an ideal measure to ensure that production is maintained at a given level. This is particularly the case because climatic variations can lead to considerable differences in yield from year to year. Therefore a given area set-aside can have very different impact on supply control. However, as noted by Sturgess (1997), it would be difficult to place an output quota on cereals because of the myriad distribution channels available. This is in contrast to milk and sugar where, due to the 'bottleneck' provided by dairies and sugar factories, output quotas are easier to implement and more effective than input controls.

2.20 A possible major problem with the ability of set-aside to achieve supply control is the existence of slippage. Slippage exists when a requirement to set aside a particular percentage of land produces a lower percentage reduction in output supplied. Slippage arises primarily because farmers have an incentive to minimise the reduction in production subject to meeting the requirement in terms of land area.

2.21 The main cause arises from variations in land quality. Farmers will face an incentive to set aside their poorest-quality, or more specifically least profitable, land. Slippage is less of a problem with rotational set-aside. Assuming all land is included at some time, the quality of land in set-aside would tend towards the average quality of all land, thus reducing the possibility of slippage.

2.22 A number of programme characteristics may be expected to increase the propensity for slippage. In general, provisions allowing farmers to transfer set-aside obligations will increase slippage.

2.23 In the United States, the effect of set-aside on cereal prices is also seen as a source of slippage (Ervin, 1988). The reduction in supply may be expected to increase price levels. At higher prices, farmers will face an incentive to bring new land into cereal production and to increase the intensity of production. The relevance of this particular mechanism in the European context is less straightforward. Where the output prices received by farmers are determined by market intervention mechanisms, the price is determined politically so that reduced supply may not impact on price. However, there may be a political effect to the extent that the presence of set-aside

reduces the exchequer costs of oversupply, relaxing the political constraints on the level of price set. Clearly, where farm gate prices are determined through the market, reduced supply may be expected to increase prices as in the United States. The increasing influence of world markets since the 1994 Uruguay Round Agreement will increase the relevance of this argument. The extent of the effect will depend on the elasticity of demand in the world market.

2.24 A further argument is that farmers who are required to set some of their land aside may choose to increase the intensity of production on their remaining cereal land. Some economists tend to argue against this as a significant effect on the grounds that farmers may be expected to maximise their profits on each area of land; taking one area out of production without affecting either output or input prices will not affect the profit maximising intensity. However, in practice the position is less straightforward. Changes in the land area cropped may affect the opportunity costs of the resources used on the farm or constraints on their use. Thus for instance, the total quantity of labour available on a farm may be fixed – at least in the short term. The introduction of set-aside may reduce the overall demand for labour and the extra labour available may be directed towards increasing intensity of production. Perhaps the most obvious impact might be on the timeliness of operations on the remaining cereal area increasing production levels.

2.25 It will thus in particular be difficult to predict the impact of rotational set-aside on production. Rotational set-aside may be used as an effective fallow where it may be expected to increase yields in following crops. In this case, we may expect that set-aside could replace unprofitable break crops in the arable rotation rather than cereals, and thus even potentially increase total cereal output.

2.3.3 Set-aside and economic efficiency

2.26 The main economic criticism of set-aside is that it targets the symptoms of the problem in the EU cereal sector, excess supply, and not the cause, high support prices. It is at the very most a second-best solution to the problem of oversupply. A more direct solution would have been the removal of price support.

2.27 In comparison with a perfectly competitive market, the regulation to set aside land causes a distortion for at least four reasons. First, producers can no longer combine inputs in the most efficient way, given a restriction on one factor of production. Second, a welfare loss arises if all producers are obliged to set-aside the same proportion of land. Bourgeon *et al.* (1995) explain that this is caused by the fallowing of efficient areas. Third, any expenditure needed to finance the set-aside scheme is likely to impose further welfare costs due to the effect of raising distortionary taxes.[2] Fourth, set-aside will restrict supply and thus increase price, imposing a cost on consumers.

2.28 However, compared to the already distorted market in the EU at the time of the MacSharry reforms the impact of set-aside is not so clear. First, set-aside may reduce taxpayer costs if the savings in intervention costs and export subsidies outweigh the expenditure on compensation payments and the administrative costs of the scheme.

[2] For example, income tax is distortionary because it affects the individual's labour/leisure decision.

Second, as support prices were higher than market prices, set-aside itself is likely to have had little impact on consumer prices. Third, as excess resources were attracted into agriculture through the high prices, the fact that set-aside reduces the inputs into agriculture will be beneficial to the overall level of efficiency in the economy.

2.4 The implementation of set-aside in the EU

2.29 Compulsory set-aside was introduced as part of the MacSharry reforms of the CAP in 1992. The principal features were that a significant proportion of total support for cereals, oilseeds, proteins and beef was switched from price support to direct payments. At the same time, systematic supply control for the main arable crops was introduced in the form of obligatory set-aside. In principle, set-aside of a given fraction of the area under cereals, oilseeds and proteins was made a prerequisite of obtaining direct payments from the Arable Area Payment Scheme. However, producers with a land area under supported crops below specified limits, in England 15.6 hectares, are exempt. In general, the land set aside cannot be used for other commercial purposes but there is an exception made for specified crops grown for industrial purposes, most commonly oilseed rape grown for producing fuel additives but including woodland coppice for biomass purposes. Details of the set-aside scheme introduced in 1993 are set out in Box 2.1.

Box 2.1: Details of set-aside under the Arable Area Payments Scheme

Obligatory set-aside. Under the rules of the Arable Area Payment Scheme (AAPS), farmers who are not 'small producers' (under 15.6 ha) must set aside a certain percentage of the area of their AAPS claim. This percentage has varied between 5% and 17.5 % over the years to reflect changing market conditions. The current default rate is 10%. Obligatory set-aside may be left in the same place or rotated on the farm. From 1997 there has been a single obligatory set-aside rate, replacing the previous rotational and non-rotational set-aside rates. Farmers may enter additional land into **voluntary set-aside -** up to a maximum of 50% of the area on which AAPS payments are claimed. This option is also open to 'small producers'. There was also the option of **guaranteed set-aside** whereby producers undertook to set aside the same land for five years in return for a guaranteed payment rate. This option is now closed. New EU rules allow Member States to introduce a **multi-annual set-aside** option as of 2001.

Only land eligible under the AAPS can be set-aside. Each individual set-aside plot must cover an area of at least 0.3 hectares. Farmers are encouraged to set aside strips of land along permanent water courses or lakes as well as field margins and headlands – with a minimum width requirement of 20 metres and subject to the 0.3 hectares rule.

During the set-aside period, which runs from 15 January to 31 August, the land may not be used for any form of agricultural production other than the production of non-food crops which itself underlies strict rules. However, set-aside land may be used for temporary storage of produce from the holding such as bales of straw or sugar beet. Also, certain agricultural uses are permitted on permanent set-aside after the end of the set-aside period. Farmers may not in any case damage, destroy or remove certain features (including traditional buildings, stone walls, hedges, trees, watercourses, ditches, archaeological remains) sited on or immediately next to land which is set aside.

Farmers must have established a green cover by the start of the set-aside period to minimise nitrate leaching. It may be created through natural regeneration, through sowing of suitable cover or, in the case of land in set-aside the previous year, by maintaining the existing cover. The cover must be maintained until 1 July. Selective, non-residual herbicides may be used at any time to control weeds. The green cover must not be put to any commercial use. This means that it must either be cut short between 15 July and 15 August, with the cuttings being left on the ground, or it must be destroyed completely by 31 August. From 15 July, crops may be sown on land that is not returned to set-aside in the following year. For land that *is* returned to set-aside, there are restrictions on the use of the cover after the end of the set-aside period, between 1 September and 14 January. There are other constraints on managing set-aside land including restrictions on the application of fertilisers, manures and wastes. Farmers may apply for exemptions from the rules, for example to follow their own management plan or for environmental reasons (e.g. cutting later to benefit particular birds or other wildlife). Organic farmers or those in conversion are eligible for some exemptions from the general set-aside management rules. They may, for example, cultivate the land to control weeds from 1 May.

Farmers may grow certain crops for non-food and non-feed uses on set-aside land. The rules for crops for which there is no food or animal feed use (e.g. short rotation coppice or miscanthus) are simple: no contracts are required, and farmers must undertake to use the crop for one of the approved non-food purposes. In addition, farmers cannot receive any other EU financed aid on non-food crops grown on set-aside land. Farmers are allowed to set aside up to 100% of the area of their AAPS claim provided *all* of a farmer's set-aside land is used for the production of multi-annual biomass crops (e.g. short rotation coppice).

Farmers who wish to use set-aside land to produce non-food crops for which there are potential food or animal feed uses must have a valid signed contract with a collector or first processor. The crops grown must be processed within the EU into an approved non-food product, and the value of the non-food end product must be greater than the total value of all the by-products destined for food or feed and produced from the same processing. After harvest, farmers must deliver the entire crop to the collector or first processor. Payments are made at the normal set-aside rate once the required documentation has been received from the farmer and the collector/first processor.

Source: MAFF (2000): Arable Area Payment Scheme Explanatory Guide: Part II.

2.30 The recognition of environmental benefits on set-aside land has been reflected in rules governing the management of land set aside. In the UK, the receipt of Arable Area Payments, including set-aside payments, has been made conditional on farmers obeying certain conditions for the management of land diverted from production. These are designed mainly to protect habitats and species in cropped landscapes. Conditions include the retention of traditional field boundaries adjoining set-aside land, and restrictions on the timing of certain operations on the land, including ploughing and spraying, in order to protect ground-nesting birds and other species which breed or feed on set-aside land (Dwyer *et al*, 2000; MAFF, 2000).

2.31 Environmental objectives were emphasised further when in 1995, and following representations from the UK in particular, the scheme was amended to allow eligible land entered into environmental (20-year) set-aside or under the Farm Woodland Premium Scheme to count as part of the set-aside requirement.

2.5 Characteristics of Set-Aside in the UK

2.32 As part of the evaluation process a survey of cereal producers (described in Appendix 3) collected information on the management practices for set-aside in the UK. This section presents a brief descriptive analysis of the practical implementation of set-aside in the UK.

2.33 In England and Wales 26 per cent of survey set-aside was permanent (had been or was likely to be in the same location for three years), 20 per cent voluntary and three per cent in agri-environment schemes. In Scotland there was more permanent set-aside (42 per cent), less voluntary (13 per cent) and two per cent in agri-environment schemes. Over 50 per cent cited convenience (i.e. to avoid penalties, to make complete fields, to run farm economically) as a reason for choosing voluntary set-aside, with about one-third choosing it because they had low productivity land or wetlands. The reason for the national differences in choice of set-aside is not entirely clear. Differences in topography, land quality variation or the remoteness of particular fields may exist that mean that farms in Scotland are more likely to have areas from which they attain greater benefits from permanent set-aside as opposed to rotational.

2.34 In England and Wales, over two-thirds of survey farmers thought that crop rotations and productivity of land were the major factors when considering set-aside location; this equated to over 80 per cent of the set-aside area. Environmental sensitivity, slope of land or remoteness of land were all considered to be factors of little importance. There were some differences between Scotland and England and Wales, with a greater proportion of Scottish respondents citing productivity of land as being very important. This ties in with the fact that more land is permanent set-aside in Scotland. However, it should be noted that the remoteness and slope of land were not deemed important factors in the decision where to site set-aside in Scotland.

2.35 Table 2.1 presents information on the composition of set-aside area by the type of cover established and whether set-aside was part or whole field.

2.36 It is clear that the preferred option is the setting aside of whole fields. This ties in with the fact that a high proportion of survey farmers considered that crop rotations were an important factor when considering set-aside location. Survey farms in Scotland had more part-field and field margin set-aside (36 per cent) than in England and Wales (20 per cent). Again this can be related to the fact that Scottish farms placed more importance on the productivity of land when choosing the location of set-aside.

Table 2.1: Set-aside characteristics and management

	Natural regeneration	Sown grass	Industrial crops	Other	Total
England and Wales					
Whole field %	56	13	9	2	80
Part field %	11	2	1	1	15
Field margin %	3	1	0	1	5
Total %	70	16	10	4	100
Scotland					
Whole field %	32	27	3	2	64
Part field %	11	11		3	25
Field margin %	4	6		1	11
Total %	47	44	3	6	100

2.37 The Table also highlights differences in the choice of cover for set-aside land. In England and Wales the vast majority (70 per cent) is left to natural regeneration. Farms in Scotland made more use of sown grass. Industrial crops were more prevalent in England and Wales.

2.38 Unsurprisingly given the differences in the level of grass cover there were significant difference in the way set-aside land is cleared between England and Wales and Scotland. In England and Wales nearly two-thirds of respondents sprayed with 32 per cent cutting or ploughing. Set-aside was cleared mainly between May and July. In contrast only 25 per cent used sprays to clear set-aside in Scotland with the vast majority cutting or ploughing (71 per cent). Set-aside was cleared later with a majority (57 per cent) between July and September. The timing and methods of clearing suggest that farms are complying closely with the stipulated regulations for set-aside management.

Chapter 3 The Effectiveness of Set-Aside

Chapter Summary

Slippage has not significantly reduced the effectiveness of set-aside in the UK. The area set aside has consistently been above the official rate. There is also no evidence of other forms of slippage.

In the EU, the small farm exemption had the potential to lead to a high degree of slippage. However, the existence of voluntary schemes has meant that the areas set aside have been consistently above the official rate.

Set-aside has been effective in reducing supply. However due to variations in yield the degree of supply control has been variable. For the majority of the period since its inception this has not been a problem as favourable world market conditions have meant that the need for strict supply control to enable the EU to honour its URA commitments was reduced.

Set-aside has produced environmental benefits though it is clear that these have not been maximised and are dependent on the management strategies of individual land operators.

Set-aside has led to the development of and industrial crop sector, though the variable nature of set-aside has made it difficult for these industries to plan.

3.1 Introduction

3.1 In the previous chapter a number of concerns were raised about the ability of set-aside to achieve its objectives. This chapter provides a quantitative assessment of the impact that set-aside has had on supply control, the environment and on industrial crop production.

3.2 Set-aside as a supply control instrument

3.2.1 Uptake of set-aside in UK

3.2 Table 3.1 presents summarised information of the percentage of eligible land set aside in the UK between 1993 and 1999. The proportion set aside always exceeds the minimum requirements - by nearly four percentage points in 1999. Any possible slippage occurring through the exemption of small producers is outweighed by the options available to farmers to voluntarily set aside more than the required area.[3] This

[3] We refer to the exemption of small farmers from the set-aside requirements as 'area slippage', although some might argue that this should perhaps be referred to as 'policy slippage' on the grounds that the effect arises from the way in which the policy is implemented rather than from the way in which farmers and the market respond.

is to be expected as though high in terms of number of holdings, exempt farms represent a small proportion of the eligible area (around five per cent).

Table 3.1: UK rates of set-aside

Year	Official Rate	Actual
1993/94	15	15.1
1994/95	15/17.5	16.5
1995/96	12/15	14.9
1996/97	10	11.9
1997/98	5	7.1
1998/99	5	7.1
1999/2000	10	13.7

Source: Financing the CAP

3.3 The importance of voluntary set-aside can be seen in Table 3.2 which reports the adoption of the various types of set-aside available to producers (described in Box 2.1). The Table also highlights that before the removal of the distinction between rotational and non-rotational set-aside, up to 45 per cent of area was non-rotational.

Table 3.2 Areas set aside under schemes implemented since the 1992 Reforms

	1993/4	1994/5	1995/6	1996/7	1997/8	1998/9	1999 /2000
			000 ha				
Total	568	662	597	485	296	295	582
Rotational	568	534	328	-	-	-	-
Non-rotational		126	269	-	-	-	-
Fixed	-	-	-	410	209	205	408
Voluntary	-	-	-	75	87	90	173
			per cent				
Non-rotational (%)	-	19	45	-	-	-	-
Voluntary (%)	-	-	-	15	29	31	30

Note: excludes five year set-aside
Source: Financing the CAP

3.4 Although introduced in 1996, voluntary set-aside became more important in the UK when set-aside rates were reduced to just five per cent a year later. Evidence from the farmer survey suggests that this occurred because farmers were keen to maintain the rotational benefits of set-aside in addition to avoiding the difficulties of setting aside part fields. In addition, farms that had taken out some of their less productive land may have been reluctant to bring it back into production. Despite the official rate increasing again in 1999, to 10 per cent, voluntary set-aside also increased. The main cause of this is likely to be the lower returns available from cereal production.

3.5 The series of cereal surveys (see Par 1.4) run between 1993 and 1998 highlight the high proportion of cereal growing farms that have set aside land (Table 3.3).[4] Seventy-seven per cent of holdings in the survey set aside land in the first year of the

[4] For details of the methodology see Appendix 1

MacSharry reforms, representing 92 per cent of the eligible area. These figures had risen to 82 and 96 per cent respectively by 1998. Although a significant proportion of surveyed farms did not set aside land, they clearly represent a small proportion of the total eligible area. Table 3.3 shows that there are however clear differences between countries. In England, consistently over 81 per cent of holdings set aside land, whilst in Wales this percentage fell as low as 27 in 1995.

Table 3.3: Percentage of surveyed holdings (Hdgs) setting aside land and percentage of eligible area covered

Year	1993		1994		1995		1996		1997		1998	
	Hdgs	*Area*	Hdgs	*Area*	Hdgs	*Area*	Hdgs	*Area*	Hdgs	*Area*	Hdgs	*Area*
England	81	*92*	84	*97*	86	*97*	84	*96*	83	*95*	85	*96*
Wales	42	*74*	31	*72*	27	*71*	34	*76*	35	*78*	44	*77*
Scotland	72	*94*	80	*97*	79	*97*	81	*97*	80	*98*	n/a	*n/a*
GB	77	*92*	79	*96*	81	*96*	80	*95*	79	*95*	82	*96*
Northern Ireland	12	*24*	n/a	*n/a*	n/a	*n/a*	n/a	*n/a*	n/a	*n/a*	n/a	*n/a*

It should be noted that Farms growing less than five ha of cereals were exempted from the survey
Source: GB Cereal Survey, Cambridge

3.6 The majority of farmers not setting aside land were eligible for and had entered the simplified scheme. However, the majority of the small area not covered by set-aside was accounted for by those who opted out. The evidence from the survey highlights that in England and Scotland the slippage that occurred because of non-participation was minimal, as on average around 96 per cent of the eligible area was subject to set-aside. In Wales, however, the proportion of eligible area subject to set-aside was considerably smaller. This was in part to do with the size structure of farms but also the greater use of cereals as forage area which enables qualification for the livestock premium payment.

3.7 The cereal survey by definition only covers part of UK farming. Analysis of FBS and FAS data provides information on the impact of set-aside across the broad spectrum of UK farming. This data highlights considerable variation in the importance of set-aside both across country and farm type. In the FBS, 98 per cent of all land eligible for Arable Area Payments (and thus potentially eligible for set-aside) is located in England, leaving only two per cent of eligible land in Wales. Within England and Wales, about 88 per cent of eligible land is within those farm types classified as 'Cereals', 'General Cropping' or 'Mixed' farms.[5] In the Scottish survey, 84 per cent of eligible land is within those same farm types.

3.8 Table 3.4 indicates that although a similar percentage of farms in England and Scotland have some land eligible for Arable Area Payments (AAP), a much higher percentage of English farms enter land into set-aside (i.e. 46 as opposed to 28 per

[5] MAFF categorise farms in the FBS into eight "robust types". So if the farm is classified as "Cereal", this should be interpreted that most of the farms revenue comes from this type of activity, though it does not imply that there is no other type of enterprise on the farm (MAFF, 1997).

cent). Furthermore, there are many more farms classified as specialist arable farm types and on average they have a much larger land area than their Scottish counterparts. Eligible land accounts for 85 per cent of total land area (on average) in England for farms classified as 'Cereal' or 'General Cropping', compared to 66 per cent in Scotland. In absolute terms, the average area of land set aside is also higher in England.

3.9 By any measure, the importance of set-aside and specialist arable farming is very low in Wales relative to either England or Scotland. After 1993, only 4 per cent of surveyed Welsh farms participate in set-aside. Less than one per cent of farms are classified as a specialist arable farming business, where we expect set-aside to have the strongest impact.

3.10 The above information suggests that set-aside is likely to have had a stronger impact on farm businesses in England than in either Scotland or Wales.

Table 3.4: FBS characteristics: 1993-97

	England	**Wales**	**Scotland**
% farms with eligible land for AAP*	62%	23%	58%
% farms entering set-aside	46%	4%	28%
% farms classified as 'Cereal or General Cropping'	30%	0.8%**	17%
Average land area for Cereal/General Cropping (standard deviation)	212 ha (176)	126 ha (80)	136 ha (109)
Eligible land as a % of total land area on Cereal/General Cropping farms	85%	42%	66%
Average ha set-aside for participants on Cereal/General Cropping farms (standard deviation)	21 ha (19.8)	20.4 ha (16.9)	13.5 ha (15.9)

* Arable Area Payments; ** only nine farms are thus classified in Wales.

3.11 Information from the FBS and the FAS shows that, on average, farms did set aside approximately the required percentage of land (Table 3.5). Of those farms that are observed in set-aside, voluntary set-aside (defined arbitrarily as set-aside of land at five per cent above the official rate) is observed on five per cent of FBS farms and about nine per cent of Scottish farms. In both cases, the extent of voluntary set-aside has increased through time. It is also more likely to be observed on those farms entering land into non-rotational or flexible set-aside. In the FBS data, large cereal farms are not likely to be entering voluntary land into set-aside (in comparison with other farm types).

Table 3.5: Percentage of eligible land set aside on Cereal and General Cropping farms

	Set-aside requirement (higher % for non – rotational/flexible)	FBS Rotational	FBS Non-rotational/ Flexible	FAS All
1993	**15%**	13.8% (4.04)	--	15.5% (4.4)
1994	**15%/17.5%**	14.5% (3.9)	16.7% (6.2)	16.5% (4.2)
1995	**12%/15%**	12.6% (4.0)	15.7% (5.4)	14.6% (6.1)
1996	**10%**	9.7% (3.0)	12.3% (4.5)	11.2% (3.0)
1997	**5%**	5.8%* (3.0)	--	6.8% (3.9)
1998	**5%**	--	--	8.3% (7.4)

Note: in the FAS, the number of Cereal and General Cropping farms entering land into non-rotational/flexible set-aside is very small. So they are not distinguished here. The figures do not change if we exclude the farms participating in non-rotational/flexible set-aside.

3.12 The above analysis highlights that throughout the period of obligatory set-aside the area set aside in the UK has been above the official rate. It can therefore be concluded that the exemption of small producers and the fact that the policy is to some extent optional has not led to policy or area slippage. In fact the availability of various options such as voluntary set-aside has meant that by 1999 the actual rate of set-aside was nearly four percentage points greater than the official rate.

3.2.2 Yield slippage

3.13 The extent of area slippage is relatively easy to measure. The extent to which other forms of slippage have undermined the supply control objective is harder to gauge.

3.14 A first stage involved analysis of yields attained by farms taking part in the cereal survey between 1993 and 1998. This found that although yields do vary within the sample of farms, set-aside does not appear to be a significant factor. There appears to be no statistically significant differences in levels of and changes in cereal yields over the period between farms that set aside land and those that did not. This suggests that set-aside is not leading farms to attain higher average yields either through setting

aside their worst land or positive benefits from effectively introducing a fallow into the rotation.

3.15 To investigate further, an estimate was made of the level of yield slippage. This work follows that of Love and Foster (1990) and is based on the reasoning that if yield slippage is occurring because farms are setting aside their low-yielding land then, holding everything else constant, average yield should increase as the area of set-aside increases. After accounting for weather differences between years and differences in variable input usage, the results do appear to suggest that average yield increases as the proportion of the land set aside increases, and vice versa. However, whilst statistically significant, the figure is actually very low, suggesting that a 10 per cent increase in the proportion of COP area set aside leads to a 0.1 per cent increase in yield. This can be compared with the work of Love and Foster who found slippage rates of over 50 per cent in the US. The following paragraphs offer explanations for the low level of yield slippage observed for the UK.

3.16 Evidence from the farmer survey indicates that the vast majority of farm businesses (74 per cent in 2000) rotate set-aside. As discussed in Chapter 2, this would lead to the lost yield on set-aside land tending to the average. In addition, 80 per cent of respondents in England and Wales set aside whole fields rather than parts of fields or field margins, indicating they are not systematically targeting the lowest yielding areas.

3.17 Examination of cereal survey data highlights no significant changes in input use on land not set aside as the rates of set-aside changed over the 6 years. This is confirmed by analysis of data on specific inputs such as fertiliser gathered from the British Survey of Fertiliser Practice. It is therefore concluded that intensification of production has not occurred on the land remaining in crop production as a result of set-aside. This supports the conclusion drawn by Barnes (1998) based on farmer feedback.

3.18 There is though some evidence that producers consider the productivity of land when deciding which areas to set aside, though the high proportion of rotational set-aside may indicate that it is not an over-riding consideration.

3.2.3 Rotational slippage

3.19 A further consideration is the extent to which farms have altered their rotations to minimise the impact of set-aside. Evidence from cereal farm rotations indicates that set-aside and cereal areas are closely tied. Throughout the period in England for example, the combined set-aside and cereals area has remained very consistent at around 70 per cent of the rotational area. It does not appear that a general increase in the share of cereals in the rotation occurred that might reduce the supply control impact of set-aside.

3.20 On the basis of the above analysis it is concluded that slippage has not been a major factor with the implementation of set-aside in the UK. It is therefore argued that set-aside in the UK has been effective at achieving the given desired supply reduction in each year as determined by European Policy.

3.2.4 Estimated supply reduction for the UK

3.21 Table 3.6 provides an estimate of the reduction in cereal production as a result of set-aside between 1993 and 1998. Two estimates of the yield potential of the land set aside are used. One is that on the set-aside land the yield was similar to the lowest yielding land on the holding as indicated in the 1998 survey. This relative difference between the average and worst yielding land was assumed to hold for the other years of the survey. The other estimate is based on the assumption that the yield on set-aside was equal to the average yield of each holding suggesting zero yield slippage.

Table 3.6: Estimated reduction in cereal area and cereal production as a result of set-aside in the UK

Year	Area	Production at low yield	Production at average yield
		Per cent	
1993	12.9	11.4	13.6
1994	15.5	13.4	16.0
1995	13.0	11.5	13.4
1996	9.9	6.4	9.1
1997	6.2	5.0	6.3
1998	6.2	3.9	6.2

1998 excludes Scotland

3.22 The estimates suggest that set-aside has been effective in reducing cereal production in the UK. In the following sections, the effectiveness of set-aside in reducing supply at the EU level is considered.

3.3 Supply control at the EU level

3.3.1 Cereal production in the EU

3.23 Cereal production in the EU is concentrated among a small number of member states, with just five (France, Germany, Spain, Italy and the UK) accounting for over 80 per cent of production. These countries also account for over 90 per cent of the area set aside under the various EU schemes. Table 3.7 presents areas, yields and production levels for cereals in the EU during the 1990s. In the EU12, in the three years prior to the instigation of the MacSharry Reforms and rotational set-aside, production averaged 173 million tonnes.

Table 3.7: Area, production and yield of cereals in the EU 1990 to 1999

Year	Area		Production		Yield	
	EU - 12	EU - 15	EU - 12	EU - 15	EU - 12	EU - 15
	m ha	m ha	m tonnes	m tonnes	t/ha	t/ha
1990	35.8	n/a	170.2	n/a	4.8	n/a
1991	35.9	n/a	181.3	n/a	5.1	n/a
1992	35.2	n/a	168.6	n/a	4.8	n/a
1993	32.3	35.2	165.4	178.1	5.2	5.1
1994	31.9	34.8	162.1	174.3	5.1	5.0
1995	32.7	35.6	165.1	177.7	5.0	5.0
1996	33.9	37.0	191.8	205.9	5.7	5.6
1997	34.9	38.1	190.9	205.7	5.5	5.4
1998	34.1	37.4	197.7	210.9	5.8	5.6
1999	33.3	36.5	188.5	201.4	5.7	5.5

Source: 1991 to 1999 Eurostat, 1990 figures HGCA

3.3.2 Area slippage

3.24 Given the heterogeneous nature of agriculture within the EU, it is likely that the impact of the policy will vary between countries. Of particular importance in a European context is the fact that very different size structures of cereal holdings exist. Taking information from the time of the implementation of set-aside, we see that the average cereals area per holding in the main producing countries ranged from around four hectares in Italy up to 41 in the UK (Table 3.8).

Table 3.8 Average cereal area on holdings with cereals, EU12, 1993

Country	Number of holdings 000	Total cereals area 000 ha	Average cereals area ha	Average UAA ha	Per cent cereals against UAA
Germany	411.5	6206	15.1	36.3	41.6
Spain	468.5	6320	13.5	31.9	42.3
France	473.7	8448	17.8	50.6	35.1
Italy	925	4063	4.4	9.5	46.3
UK	74.6	3043	40.8	109.9	37.1
EU 12	311.7	32165	10.3	26.8	40.0

Source: EU Structures survey 1993

3.25 The impact of the exemption of small producers on the effectiveness of set-aside therefore varies between countries. The results of the 1997 structural survey show that in a number of countries a very high proportion of producers were below the size threshold in place for setting aside land (Table 3.9).

Table 3.9: Structure of cereals production on holdings with cereals, EU15, 1997

	Hectares per holding							
Country	<1	1-2	2-5	5-10	10-20	20-30	30-80	≥80
	per cent							
France	5	7	16	17	20	10	18	6
Spain	21	12	18	14	12	6	11	5
UK	1	2	10	13	18	11	26	18
Germany	8	10	21	20	20	8	10	3
Italy	26	22	28	13	7	2	2	0
EU 15	20	15	22	15	12	5	8	3

Source: Eurostat

3.26 The preponderance of small producers in some of the major producing countries meant that area slippage caused by producers entering the simplified scheme rather than the general scheme was much greater for the EU as a whole than for the UK. In 1993 only 70 per cent of EU land entered into IACS was under the general scheme. This ranged from 33 per cent in Italy to 92 per cent in the UK (Table 3.10).

Table 3.10: Proportion of land entered under General Scheme 1993 to 1996

Year	Germany	Spain	France	Italy	UK	EU 12
1993	74.9	68.1	80.6	32.9	92.3	70.1
1994	79.1	75.0	83.4	35.7	93.4	73.7
1995	80.3	79.4	84.0	38.4	93.5	74.9
1996	82.4	82.2	85.2	43.0	94.0	76.5

3.27 The impact of the high proportion of exemptions can be seen in the change in EU cereal area that occurred after the introduction of rotational set-aside. The total area of cereals fell by only eight per cent although the set-aside rate was set at 15 per cent of eligible area (Table 3.11).

Table 3.11: Change in cereals area, production and yield in the EU, 1990 to 1999

Year	Area		Production		Yield	
	EU - 15	EU - 12	EU - 15	EU - 12	EU – 15	EU - 12
			per cent change			
1990/91		0.3		6.6		6.3
1991/92		-1.8		-7.0		-5.1
1992/93		***-8.3***		***-1.9***		***7.3***
1993/94	-0.9	-1.2	-2.1	-2.0	-1.4	-1.4
1994/95	2.1	2.7	1.9	1.9	-0.2	-1.0
1995/96	3.9	3.4	15.9	16.1	11.8	12.5
1996/97	3.1	3.0	-0.1	-0.5	-3.4	-3.5
1997/98	-2.0	-2.2	2.5	3.6	4.6	6.0
1998/99	-2.4	-2.4	-4.5	-4.6	-2.0	-2.2

Source: Eurostat

3.28 The overall change when disaggregated by country highlights large differences with cereal areas initially falling by as little as 4 per cent in Germany and Italy compared to around 13 per cent in Spain and the UK (Table 3.12).

Table 3.12 Change in cereal areas in major producing EU countries 1990 to 1999

Year	France	Germany	Italy	Spain	UK
			per cent		
1990/91	1.8	-5.6	0.1	3.4	-4.3
1991/92	1.2	-0.7	-4.4	-5.2	-0.4
1992/93	***-8.7***	***-4.5***	***-4.2***	***-12.8***	***-13.1***
1993/94	-4.3	0.2	0.7	0.7	0.3
1994/95	1.6	4.7	3.1	3.4	4.6
1995/96	6.6	2.8	1.3	0.3	5.6
1996/97	4.2	4.6	-1.9	3.2	4.6
1997/98	0.3	0.4	-2.9	-6.1	-2.7
1998/99	-3.2	-5.7	2.8	1.2	-8.2

3.29 Taking these results at face value appears to indicate a high degree of area slippage (45 per cent in 1993) even before consideration of possible yield slippage. However, it must be remembered that 1993 was not the beginning of set-aside. If we look at the total level of set-aside as a proportion of eligible area, a different picture emerges (Table 3.13). In 1993, the actual set-aside rate was very similar between countries ranging from just over 15 to just under 17 per cent.

Table 3.13: Actual rates of set-aside by main producing counties and EU

Year	Germany	Spain	France	Italy	UK	EU12/15
1993/94	15.2	16.1	15.7	16.8	15.1	15.6
1994/95	18.1	20.5	17.5	16.6	16.5	18.0
1995/96	17.2	20.2	15.8	14.4	14.9	17.3
1996/97	14.9	17.6	12.3	10.9	11.9	14.4
1997/98	9.8	14.6	8.1	6.9	7.1	7.6
1998/99	9.5	17.7	7.8	6.4	7.1	10.4
1999/2000	13.6	18.4	12.1	10.9	13.7	14.1

Source: Financing the CAP

3.30 The fact that differences in the areas entered into the general scheme highlighted in Table 3.10 did not appear to be reflected in areas set aside is due, in part, to differences in the take up between countries of the previous voluntary 5-year set-aside scheme. In Italy, for example, 80 per cent of the area set aside in 1993 was under the 5-year scheme with only 20 per cent as part of the MacSharry rotational set-aside. This can be compared with France and the UK where adoption of 5-year set-aside had been relatively low and rotational set-aside had considerably more impact (Table 3.14).

3.31 Table 3.14 highlights that just over a quarter of the land set aside in 1993 was under the 5-year scheme. It is not known how much of this land would have been set aside if the five-year scheme had been discontinued. However, it is clear from Table 3.10 that, given the proportions of land entered for the general scheme, overall area slippage would have been reasonably high (around 30 per cent in 1993 for the EU12). The existence of 5-year set-aside and, in subsequent years, other forms of voluntary

set-aside have meant that the effective rate of set-aside has always been above the nominal rate.

3.32 Table 3.14 also highlights the differences in the uptake of the various options of set-aside. The UK, for example, initially maintained a much higher degree of rotational set-aside than France or Germany, when the option of non-rotational set-aside was offered. It is also clear that uptake of voluntary set-aside has varied between countries. The choice of type of set-aside adopted is likely to be influenced by differences in the productivity of the land as well as the profitability of cereals in the individual countries. This issue needs to be considered when evaluating the supply control impact of set-aside and the possible existence of yield slippage.

Table 3.14: Distribution of set-aside by type 1993/94 to 1996/97

Year	Type of set-aside	Germany	Spain	France	Italy	UK	EU12	EU15
				Per cent				
1993/94	5-year	28.3	9.2	12.4	79.8	16.1	26.3	
	Rotational	71.7	90.8	87.6	20.2	83.9	73.7	
	Total	100.0	100.0	100.0	100.0	100.0	100.0	
1994/95	5-year	13.8	4.8	8.9	74.7	11.5	17.8	
	Rotational	43.8	70.6	52.4	21.3	71.3	52.1	
	Others	42.5	24.6	38.7	4.0	17.2	30.1	
	Of which voluntary	*n.a.*	*20.4*	*4.6*	*n.a.*	*n.a.*	*8.2*	
	Total	100.0	100.0	100.0	100.0	100.0	100.0	
1995/6	5-year	9.4	2.8	6.8	66.2	5.8	12.3	11.3
	obligatory	82.4	75.4	78.0	33.8	93.7	76.6	78.5
	voluntary	0.0	21.9	7.8	0.0	0.0	7.0	6.4
	extraordinary	8.2	0.0	7.4	0.0	0.5	4.1	3.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996/7	5 year	6.0	1.9	3.3	49.9	3.0	7.3	6.6
	obligatory	59.0	50.2	76.9	46.5	79.0	63.3	61.4
	voluntary	34.7	47.9	19.8	3.6	17.0	29.3	31.9
	extraordinary	0.3	0.0	0.0	0.0	1.0	0.2	0.1
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Impact Analysis of CAP reform (1998) DG VI

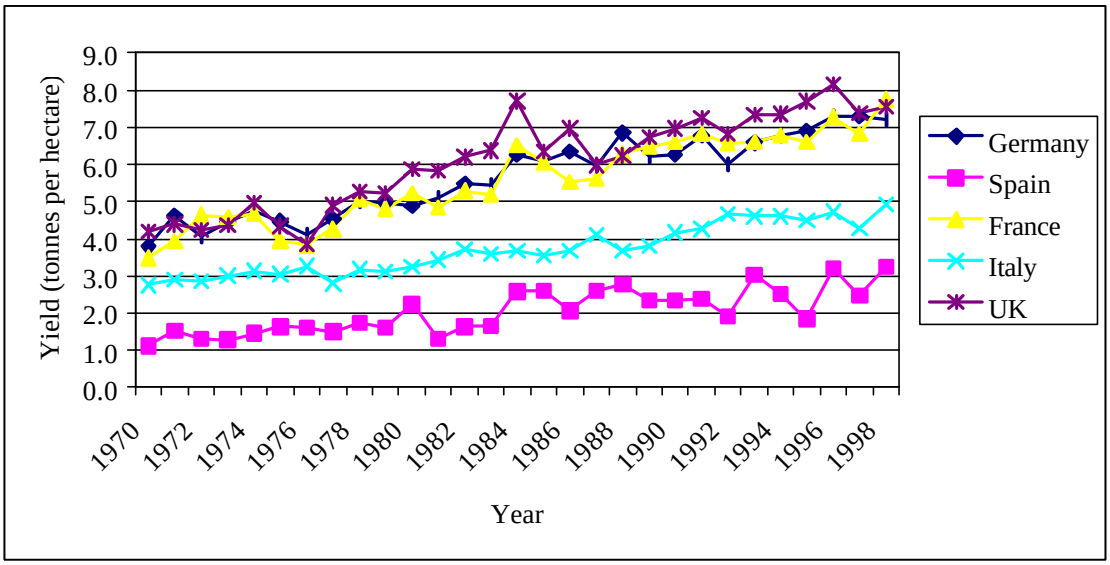
3.3.3 Yield slippage

3.33 The possible extent to which the effectiveness of set-aside has been undermined by yield slippage is now examined. At the European level there has been a rise in average cereal yields since 1993. For example, the three-year average yield for cereals centred on 1992 was 5.1 tonnes per hectare, whereas the three-year average centred on

1998 was 5.56 tonnes per hectare. However, these changes have to be put into the context of continual yield improvements brought about by technological progress.

3.34 Figure 3.1 shows the longer-term trend for wheat and does highlight that yields have generally increased after 1993 (Spain shows a more varied pattern as the result of drought problems). However, these yield increases do not seem out of place when compared to the longer-term trends, and the figure does not appear to highlight a clear break at the time of the introduction of set-aside.

Figure 3.1: Wheat yields of major EU producers 1970 to 1998



Notes: Germany relates only to West Germany before 1990
Source: Eurostat

3.35 The relationship between the introduction of set-aside and yields was examined using time series data (see Appendix 3.2 for a description of the model used). The analysis was undertaken for the two main cereal crops (wheat and barley) and related yield to variable input use and the area sown to the crop. A number of results arise from this analysis:

- There were no discernible differences before and after 1993 in the rate of change in yields.
- The area sown to wheat or barley does not appear to alter significantly the average attained yield.
- There was no marked increase in the average application of variable inputs per hectare after set-aside was introduced. This refutes the existence of a 'halo' effect'. In fact, the evidence suggests that in a number of countries average variable input usage per hectare fell after the introduction of set-aside. This was probably because the implementation of set-aside occurred at the same time as a fall in output prices in many EU countries.
- Trends in yields between France, Germany and the UK all appear similar despite apparent differences in the type of set-aside adopted.

3.36 The analysis does not suggest a high degree of yield slippage. Broadly similar aggregate analysis in the US has revealed yield slippage rates of over 50 per cent.

This difference between the EU and US experience with land retirement is likely to be in part a result of the way in which set-aside was implemented in the US. In general it was voluntary and had no rotational requirements. It would therefore seem likely that the lowest-yielding land would be attracted into the US schemes.

3.37 Thus far our analysis has shown that area slippage was in-built into the rotational set-aside policy introduced in 1993 as a result of the small producer exemptions. However, the operation of five-year set-aside reduced this impact and in fact in all member states the effective rate of set-aside was higher than the official rate. In addition, analysis of yield changes gives no clear indication of a change in average yields as a result of set-aside suggesting that the level of yield slippage was not excessive. The following section estimates the extent of supply control associated with set-aside.

3.3.4 Estimates of supply control

3.38 Two alternative methods of estimating the degree of supply control are adopted here. The first (method 1) uses information on the areas set aside, yields and the crop rotations for each member state between 1993 and 1999. The assumptions used and the methodology applied are described in Appendix 3.2. The estimates from this approach are presented in Table 3.15. Initially the combined impact of all types of set-aside is measured. The implication of different types of set-aside will be considered in more detail later.

Table 3.15: Supply control impact of set-aside 1993 to 1999, EU12/15[1] Method 1

Year	Area set aside[2]	EU production	Estimated production	Difference	Per cent reduction in prod'n	Actual set-aside rate	Official set-aside rate
	000 ha	000 t	000 t	000 t	%	%	%
1993	6267	165448	191385	25937	13.6	15.6	15
1994	7291	162123	190556	28433	14.9	18	15 /20
1995	7537	177703	206498	28795	13.9	17.3	12 /17
1996	6022	205939	230550	24611	10.7	14.4	10
1997	3983	205652	221971	16319	7.4	10	5
1998	4207	210851	228206	17355	7.6	10	5
1999	5751	201445	223843	22398	10.0	14.1	10

Note 1: EU 15 from 1995
Note 2: Figures from 1997 exclude 5-year set-aside.

3.39 The table shows that between 1993 and 1999 set-aside was responsible for an estimated reduction of some 164 million tonnes of cereals. The estimated reduction by country is shown in Table 3.16.

Table 3.16 Percentage reduction in production by EU country 1993 to 1998[6]

Year	Germany	Spain	France	Italy	UK	EU15
1993	15.7	10.0	14.3	15.7	14.8	13.6
1994	16.0	14.5	15.7	14.9	15.9	14.9
1995	16.1	14.6	14.8	12.1	13.8	13.9
1996	12.8	13.0	10.5	7.8	10.6	10.7
1997	8.8	9.0	7.2	5.6	7.2	7.4
1998	8.8	9.8	7.3	6.3	7.4	7.6

3.40 The estimates of supply control appear somewhat large given the changes in cereal areas that occurred between 1992 and 1993, even allowing for the existence of 5-year set-aside. This is particularly the case for Italy and Germany. The situation in these two countries is complicated by the fact that as a result of the whole range of CAP reforms, arable area actually increased markedly between 1992 and 1993. For example in Germany, although over one million extra hectares were set aside between 1992 and 1993, under half of this appears to have come out of existing cropping. The real question when assessing the supply control impacts of set-aside is whether this 'new' land would really have come into cereal production or not. The above estimates implicitly assume that it would and therefore produce high estimates of the degree of supply control. If we examine Germany in particular it does appear as if this extra land is 'real' as it entered into cereal production as the restrictions on set-aside were relaxed. For example by 1998 cereal area in Germany was some eight per cent higher than in 1992 despite the fact that around 10 per cent of eligible area was set aside. In Italy, however, the new land largely disappeared by 1995.

3.41 The second approach (method 2) to examining the impact of set-aside on production involved the construction of a supply response model using aggregate panel data from EU countries. This model (also described in Appendix 3.2) related the change in cereal area to changes in cereal prices (represented by wheat price), changes in oilseed prices (oilseed rape price), and changes in arable area. This model was constructed based on information from 1973 to 1992 and was then used to predict cereal areas in 1993 in the absence of set-aside. From these areas the level of production change were calculated in a similar way to the first method. The estimated supply reduction is shown in Table 3.17.

Table 3.17: Comparison of estimated percentage supply reduction associated with set-aside by EU country 1993

	Germany	Spain	France	Italy	UK	EU12
Method 2	10.5	11.0	10.1	13.4	13.7	10.2
Method 1	15.7	10.0	14.3	15.7	14.8	12.1

[6] For consistency in estimates between countries, the UK figures reported here are calculated based on aggregate data. They are slightly higher than those obtained for the UK using the cereal survey data as reported in Table 3.6. This may be due to slight differences in the rotations or level of yields between the surveyed farms and the national averages.

3.42 This approach assumes that particularly in Germany, France and Italy a smaller proportion of the land set aside would have been in cereal production. If this argument is followed through for the rest of the period then a lower estimate of the degree of supply control of around 120 million tonnes (as opposed to 164 million tonnes) is obtained.

3.43 In fact a further argument could be put forward that the degree of supply control associated with set-aside would be even lower than the above estimates and that it has diminished in line with the world price. Thus the land that had been in cereals when the price was £100 per tonne may very well not be put back into cereals at a price of £60 per tonne, even if AAPs are available. In fact some findings from the models used in this study show that the predicted production in the absence of set-aside was by the late 1990s very similar to actual production. This implies that set-aside may have had very little impact on cereal production. However, because of the simplicity of the model (it only deals with the cereal sector) and the general problems of forecasting, not too much weight can be placed on these findings.

3.44 In order to assess the effectiveness of obligatory set-aside, the earlier figures (from method 1) are adjusted.[7] The analysis suggests that obligatory set-aside as a proportion of all set-aside fell to a low of 45 per cent in 1998 (Table 3.18). These figures clearly point to the increasing importance of voluntary set-aside schemes. Without voluntary set-aside it may be argued that the supply control impact of set-aside at the EU level may well have been only half as effective in the late 1990's.

3.45 The fact that such a large part of the area set aside in the EU is voluntary highlights the precarious nature of set-aside as a supply control policy. For example, an improvement in the financial returns from cereal production may lead to this land reverting back to cereal production, considerably reducing the degree of supply control. Though at the same time it may be argued that if world prices rise sufficiently, the need for supply control to enable the EU to meet its WTO obligations might be reduced.

3.46 A clear problem with set-aside as a means to achieving a set amount of supply control is the unpredictability associated with cereal yields. Set-aside has to be determined in advance and therefore can only relate to an average expectation of yields. In addition, technological progress tends to lead to yields increasing and hence if demand is not growing in line with yields then the rate of set-aside will, *ceteris paribus*, have to be continually increased. If we look at the period since 1993, we see that there is some 12 per cent difference in the average EU yield for cereals between the highest and lowest yielding years.

[7] Here obligatory relates to the area of land that had to be set aside in order to be eligible for payments. The remainder relates to 5-year set-aside, voluntary set-aside and extraordinary set-aside.

Table 3.18: Share of 'obligatory' set-aside in total set-aside

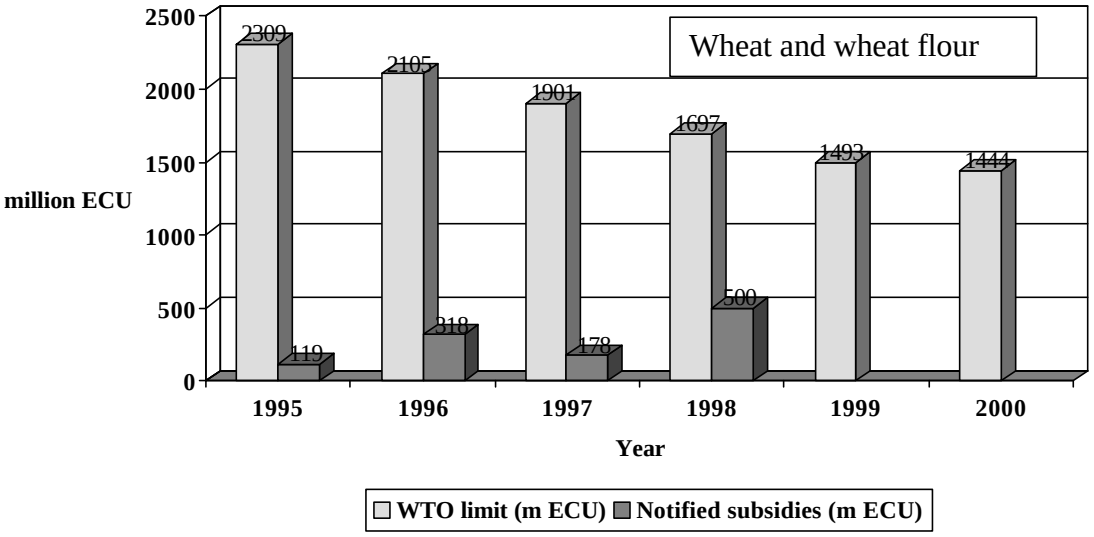
Year	'Obligatory' set-aside	Share of total set-aside
	000 ha	Per cent
1993	4640	73.8
1994	5995	74.0
1995	5928	74.8
1996	3882	65.1
1997	1998	50.2
1998	1893	45.0
1999	4098	71.3

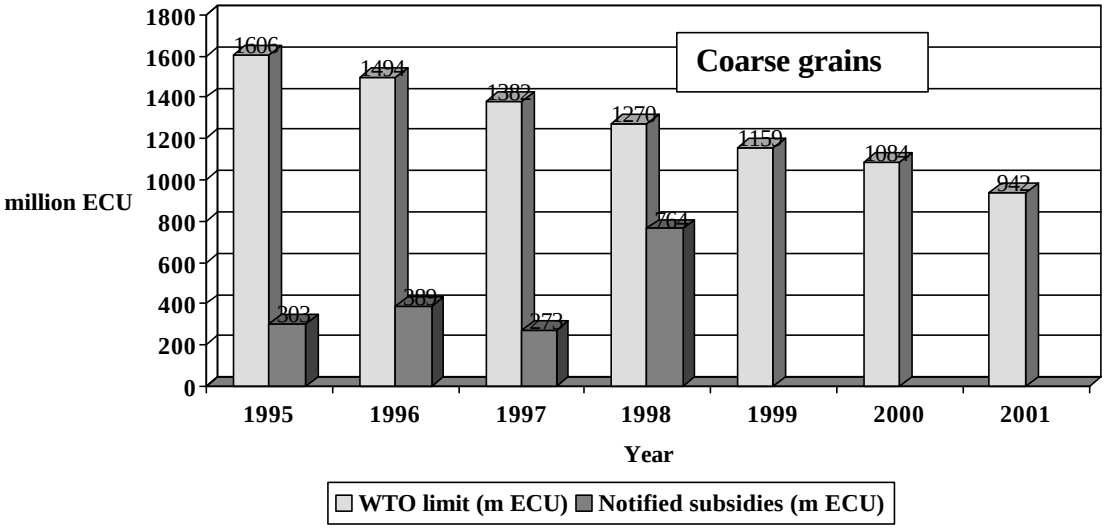
3.3.5 Set-aside and WTO commitments

3.47 In the previous chapter it was argued that set-aside has been instrumental in enabling the EU to honour its commitments under the URA. In this section, we assess the extent to which set-aside has been successful in achieving this objective.

3.48 Figure 3.2 shows the EU's notified *expenditure on subsidised exports* vis-à-vis the limits of the URA for wheat and coarse grains.

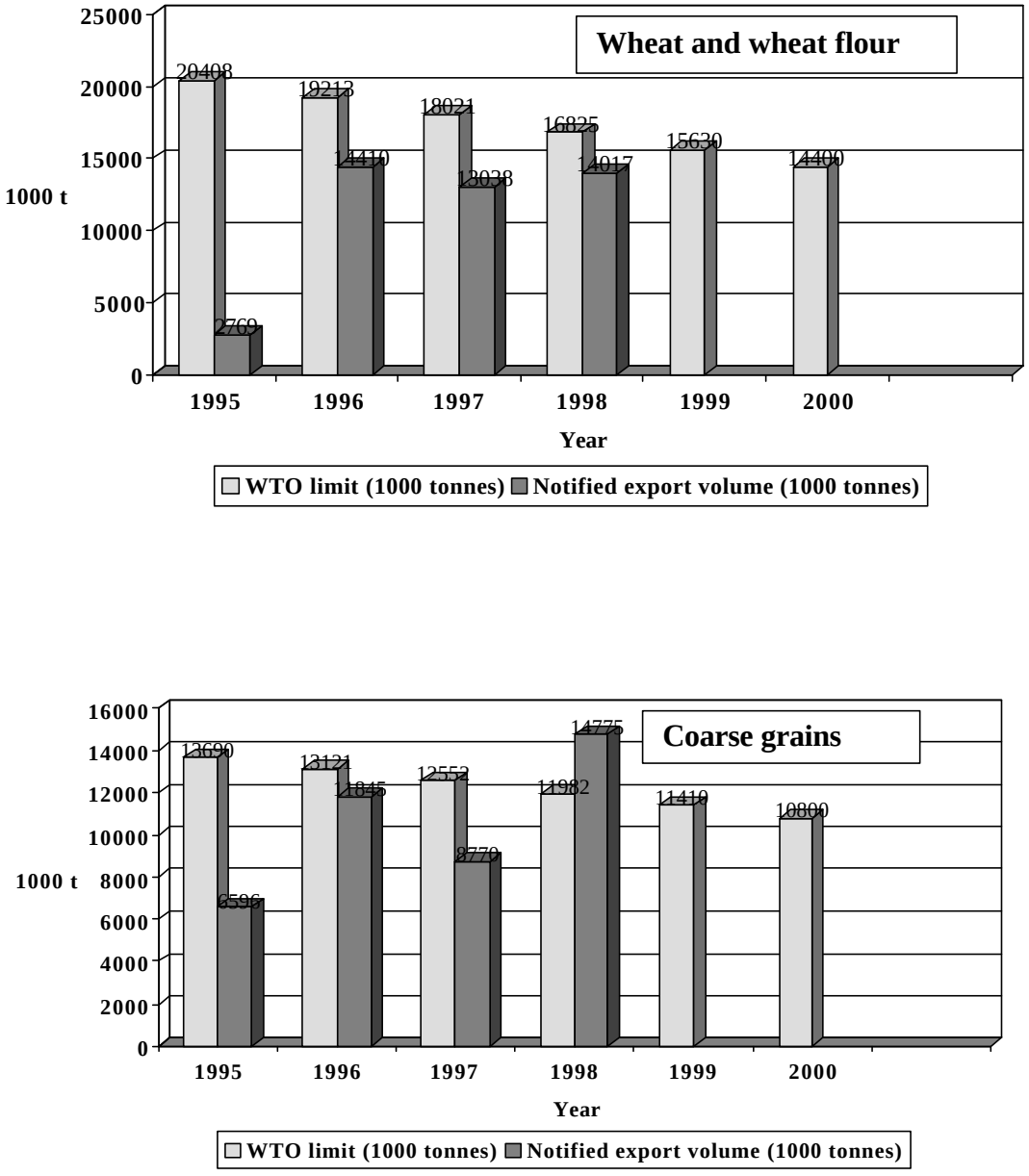
Figure 3.2: EU's notified *expenditure* on subsidised exports vis-à-vis WTO limits





Source: WTO (2000a), WTO (2000b)

Figure 3.3: EU's notified *volumes* of subsidised exports vis-à-vis WTO limits



Source: WTO (2000a), WTO (2000b)

3.49 Figure 3.3 depicts the EU's notified *volume of subsidised exports* in relation to the agreed volume commitments. It is clear from the two figures that, in general, volume commitments have been putting greater constraints on policy than expenditure commitments. The limits on the volume of subsidised exports were exceeded for coarse grains in some years of the URA implementation phase. It is interesting to note that subsidised exports of wheat have never reached any of the limits, partly because the EU has been able to export significant quantities of wheat without subsidies. The share of unsubsidised wheat exports was particularly high during years of high world prices such as 1995/96 when it reached a record level of 75 per cent (Tangermann, 2001).

3.50 The fact that the EU has largely managed to achieve the targets set under the URA may be considered to indicate that set-aside has been successful. However, it is clear that very favourable world market conditions and increased domestic utilisation caused by cereals becoming more competitive with substitute feeds has helped the EU to stay within the agreed limits. It should also be noted that up to 1999 the use of export subsidies beyond the WTO limits had not constituted a breach of the agreement because countries were allowed to carry over 'credits' from years in which the commitments were over fulfilled to years where the limits were exceeded. Since 2000, however, such transfers may no longer be made.

3.4 Conclusions on supply control

3.51 At the UK level, set-aside had very little area slippage as a result of the small producer exemptions. At the EU level, however, the potential for a high degree of slippage with the scheme existed because of the different size structures of cereal enterprises. Despite this, overall effective rates of set-aside have tended to be higher than nominal rates because of the operation of other forms of set-aside. In particular, voluntary set-aside, introduced to give farmers flexibility in their cropping plans, accounts for a very large percentage of the set-aside area.

3.52 The available data do not point to a high degree of yield slippage occurring with the EU policy.

3.53 If the target is a given percentage reduction in production then, as there is little real evidence of slippage, set-aside as implemented in the EU has been able to achieve this objective. However, if the aim is to keep production at a given level then, given the variability of yields, set-aside will have problems in achieving this. Nevertheless, set-aside has enabled the EU to honour its WTO commitments on the expenditure on subsidised exports and, to a lesser extent, its commitments on the volume of subsidised exports.

3.5 Set-aside as an environmental policy

3.54 Whilst it has been argued that the main objective of set-aside has been to control supply, the secondary goal of delivering environmental benefits has received increasing attention over the years. This section reviews the available evidence as to the impact of set-aside on the environment to assess how effectively set-aside has been in delivering environmental benefits.

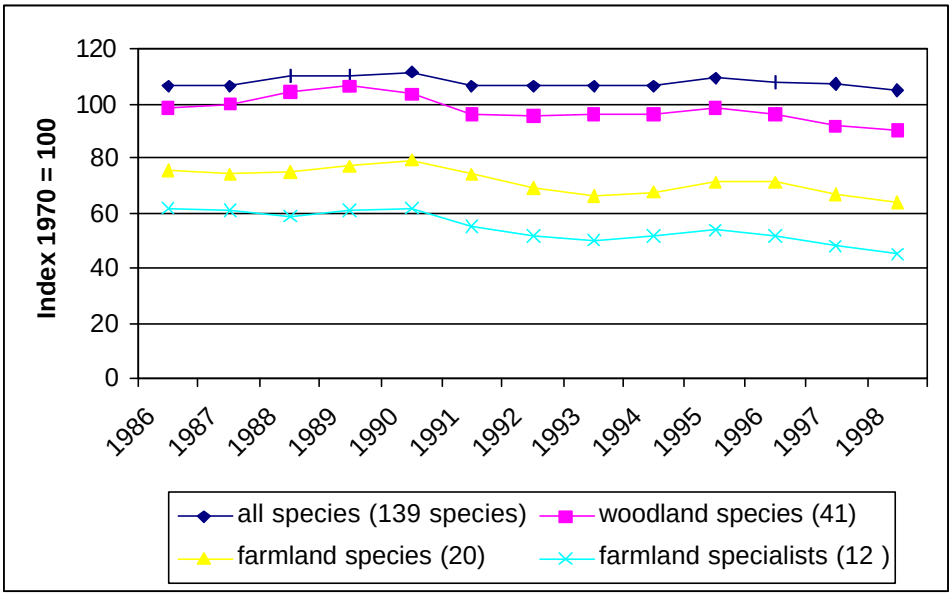
3.5.1 Environmental impacts of set-aside: an overview

3.55 The literature on the environmental impacts of set-aside has been reviewed by McNally (2001), reprinted in Appendix 2. This summary is based on the literature and on discussion with Dr Les Firbank, Centre for Ecology and Hydrology, who led a major study on the topic. Here we simply offer an overview of the impacts of set-aside on various elements of the environment.

3.56 *Birds* Much attention has been given to the impact of set-aside on birds. Set-aside provides a network of habitat and feeding areas for birds in the arable landscape. A nine-fold increase in breeding bird numbers has been observed over cereal land.

This is due to a congregation effect as birds tend to congregate on set-aside land. It is not known whether set-side has affected bird populations nationally. The study by the British Trust for Ornithology suggests that bird numbers have not increased since the introduction of set-aside (Figure 3.4).

Figure 3.4: Key bird populations in the UK



Source: British Trust for Ornithology (Adapted from Agriculture in the UK, MAFF, 2000)

There is evidence that set-aside has attracted more breeding birds to arable areas. There may be some preference for rotational set-aside over permanent set-aside as it mimics weedy stubble or badly managed crops which provide good conditions for breeding birds. Maintaining set-aside as a pseudo-crop (regularly disturbed) is generally better for birds than natural succession. However, some species using grassland increase on non-rotational set-aside as it can come to be semi-natural grassland within five years of the cessation of regular disturbance.

3.57 Mammals The effect of set-aside on mammals is not as significant as that on birds. Some farmers have used set-aside to create habitat for game animals. Grassland and longer-term set-aside is better for mammals than rotational set-aside. In particular short-tailed voles and harvest mice benefit from uncut non-rotational set-aside. This presents benefits to animals further up the food chain such as birds of prey. Rotational set-aside is viewed as having virtually no benefits for mammals. Long term set-aside has been used in a few cases to create conditions for otter holts by restricting access to land and so reducing risk of disturbance.

3.58 Invertebrates Set-aside could be expected to help butterflies and bumblebees, but there is no empirical evidence of the impacts. There is evidence of the dramatic spread of the Brown Argus butterfly and anecdotal evidence of huge populations of butterflies using non-rotational set-aside. Such species could be targeted with the right seed mix to encourage the growth of plants providing nectar. However, in the absence of this there is unlikely to be a source of nectar.

3.59 Botanical interest The impact of set-aside on rare plants is very localised. There are relatively few important rare plants on set-aside land, except where they existed anyway. This is because generally in intensive arable areas, very little remains of the seed bank, although an exception might be the case where a set-aside area was contiguous with a nature reserve. This said there are records of rare arable plants on rotational set-aside which have provided the first opportunities to develop seedbanks in the absence of herbicides. One important effect though is that set-aside helps to maintain the presence of 'common weeds'. There is also circumstantial evidence that buffer strips help water and wetland species. The buffering of environmentally sensitive areas in general is an important aspect of set-aside.

3.60 Soil erosion Soil erosion tends not to be of widespread concern across the UK, and thus there are likely to be limited advantages from set-aside. This could be a more significant benefit in Mediterranean countries. Much would depend on the cover and choice of specific sites. A non-rotational grass cover provides the greatest erosion control benefits.

3.61 Water quality Set-aside has limited effects on nutrient leaching. Potential benefits are through the choice of an appropriate cover, but there is the risk that leaching rates are increased when the cover is ploughed up at the wrong time. An advantage of set-aside is that it reduces the use of inorganic fertiliser. Set-aside can reduce the negative impact of surface run-off, especially when it is used to create permanent buffer strips alongside watercourses.

3.62 Landscape Set-aside may be seen as introducing diversity into the arable landscape, thus improving its amenity value. On the other hand, some may feel that the uncropped areas make the landscape look untidy and unattractive. Landscape character can be weakened by the inappropriate siting of set-aside. This can happen both with whole field set-aside where the field texture and colouring may be different to the typically managed or more uniform appearance of surrounding land or with badly situated blocks or margins. Set-aside can be used to introduce colour into the landscape, for instance through flowers, for example poppies, and butterflies in species-rich field margins or wildflower meadows. This reinforces the point that land should be managed to achieve particular environmental objectives.

3.63 Archaeology. Arable cultivation has been recognised as the major threat to sub-surface archaeological remains, which may be severely damaged as a result of insidious soil loss and ever-deeper cultivation. Set-aside offers at least temporary respite from this threat, with long-term set-aside obviously offering greater protection.

3.64 Public access The question here is whether public access should be avoided or encouraged. There would be a few instances where it could be appropriate to restrict access, such as to protect otter holts or stone-curlew nests. But in general, public access is unlikely to be harmful to the environment. However farmers tend to dislike public access and any requirement would affect take-up rates.

3.65 Air quality There are limited implications for air quality. There could be advantages for carbon storage, although, as with nutrient emissions, the benefits risk being lost with subsequent disturbance.

3.66 On balance, it seems that set-aside provides positive environmental benefits. Concerns raised when set-aside was first formally proposed, about the potential detrimental effects on the landscape appear to be less often expressed. At the same time, expectations that set-aside would lead to consistent and significant reductions in chemical emissions seem not to have been borne out. Breeding birds are amongst the main beneficiaries, (though wintering birds and invertebrates also gain significantly) and the benefits are greater within a relatively intensive arable landscape. For most other environmental aspects, as discussed above, the buffering function of set-aside is probably more important than the direct impacts.

3.67 There may be some benefits to nature conservation in linking sites although the benefits can sometimes be exaggerated. While there are advantages there can be disadvantages too; networks can assist the spread of rapid disperors which are often pests, such as ragwort.

3.68 While it had probably generally been assumed that permanent set-aside would be preferred to rotational set-aside, the comparison is not straightforward. There may be benefits to short-term set-aside, which decline over a period as the area degenerates to scrub (though scrub in the right place can itself be a valuable addition to habitat diversity). However, in the longer term, perhaps 20 years or so, benefits may increase again as a more valuable habitat develops. Clearly, much depends on the management and the targeting.

3.69 The evidence indicates that the environmental impacts of set-aside depend largely on how the land is managed. However, despite the fact that most set-aside has not been managed specifically for bird conservation, rotational set-aside in Europe seems to have had very positive consequences from this point of view. Positive effects of set-aside have been reported for a range of plant and invertebrate species, although rotational set-aside can have negative consequences for water quality unless it is managed carefully.

3.5.2 Environmental issues and management: evidence from the farm survey

3.5.2.1 Location of set-aside

3.70 Non-rotational set-aside in England and Wales was most often located alongside woodland (38 per cent) with 18 per cent on a hillside, 17 per cent on light soils and 16 per cent backing on to an open body of water. In Scotland the results were very similar, with 42 per cent alongside woodland and 18 per cent each for the other three categories. This might indicate that set-aside is offering some environmental gains as it is acting as a buffer or an extension of habitat. However, overall the survey found that the environmental sensitivity, slope of land or remoteness of land were all considered to be factors of little importance in the determination of the location of set-aside. In addition only about three (two) per cent of set-aside was involved in agri-environmental schemes in England and Wales (Scotland).

3.5.2.2 Management practices

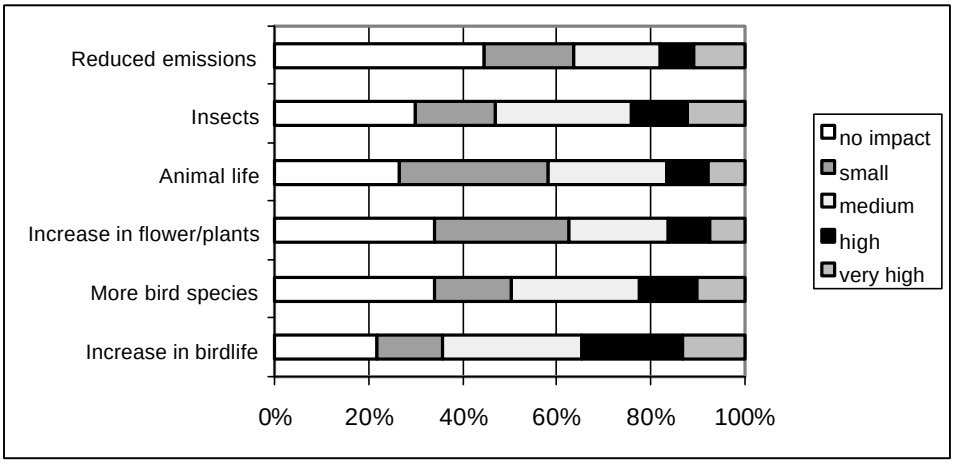
3.71 In the 1998 cereals and set-aside survey, farmers were asked if they had used any environmentally-friendly practices on set-aside in addition to those legally required.

The most frequent practice was the provision of wildlife food or cover, often primarily for rearing game birds, where 22 per cent of the sample had participated. Eighteen per cent felt that their timing of grass mowing was environmentally friendly and 14 per cent cited their control of spraying. In Scotland the timing of grass mowing was identified as the most frequent environmentally friendly practice (reflecting the higher proportion of grass cover sown on set-aside in Scotland), followed by control of spraying and provision of wildlife food and cover.

3.5.2.3 Farmers'perceptions of environmental impacts

3.72 The main areas where farmers seemed to notice benefits were with birds and insects (Figure 3.5). For example, over 60 per cent of respondents felt that set-aside had at least a medium impact on bird numbers.

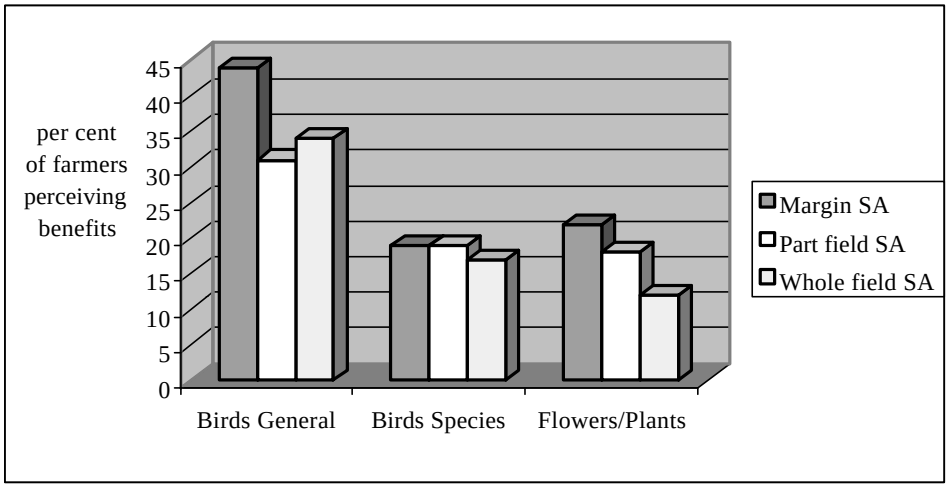
Figure 3.5: Farmers' impressions of environmental benefit of set-aside



3.73 Farmers' perceptions appear to vary depending on the type of set-aside (Figure 3.6). Overall, those with margins or part fields set-aside either enjoy more wildlife benefits or perhaps are more aware of their environment.[8]

[8] This was also true for other groups not shown in the figure: animals, insects and chemical emissions, although for the last two categories the proportion who had no idea or thought there was no impact was much higher at over 50 per cent.

Figure 3.6 Respondents' perception of environmental benefits by set-aside category



Note: Figure shows percentage of respondents who felt that set-aside had a high or very high impact

3.74 Comments made by farmers in the survey in respect of the environment, are mainly concerned with three issues:

- They feel it is unfair that those who have been environmentally active for many years are not accepted for stewardship schemes as there is little that can be added. Without some assistance they feel that they will not be able to afford the same level of environmental input in the future.
- Farmers near urban areas suffer from the public, the majority of whom they see as being ignorant of appropriate behaviour in the countryside. They feel that they should not be penalised for unwillingness to participate in the provision of environmental benefits.
- They have a perception that wildlife prefers a stable habitat. Therefore voluntary set-aside should remain and there should be long-term contracts available, essential to secure maximum environmental benefits.

3.5.3 Stakeholder views on the impacts on the environment

3.75 Most stakeholders commented that any environmental benefit was totally due to the way the land was managed. One farm could be creating diverse habitats and food sources while the farm next door could be attracting no wildlife whatsoever, or even worse, be detrimental to the environment.

3.76 The management of set-aside was seen by the majority of stakeholders as a crucial issue and one where there was great potential for improvement. In general, set-aside was seen positively by stakeholders, as a "way in" for environmental interests. Work carried out by organisations such as RSPB and English Nature have shown environmental gains but there was comment that encouraging results had not had a high profile.

3.77 The Countryside Agency and FWAG particularly mentioned buffer strips as having a strong environmental impact especially 10 metre strips along rivers, but that 5 metre strips around fields would also be very advantageous if allowed. Buffer strips provide generalised resource protection, for example from spray drift. Over-wintering stubbles were also seen as a beneficial result of set-aside although a few commented that other sown cover, for example mustard, provided a better habitat for birds.

3.78 The effect of set-aside on the landscape was felt to be minimal and certainly not as bad as some had predicted. Regulations regarding topping and spraying had helped in this respect, although when sprayed off, the field could look worse than it did before. A few large areas (whole farm set-aside) alongside major roads showed no signs of good farming practice or of a good wildlife environment. It was felt that the transitional nature of set-aside does not encourage good management.

3.79 There was general consensus among stakeholders that set-aside was not the ideal measure to achieve environmental benefits, but because it was so widespread there had been definite gains, particularly in birds, arable flora and invertebrates. Some stakeholders felt that the policy was now redundant as a supply control measure and that its main focus should be environmental improvement. A similar proportion argued that it should never have become linked with environmental and rural issues and there should be separate measures to achieve these objectives.

3.80 However, no respondents wanted to see set-aside disappear without a replacement policy. It was felt that set-aside had been particularly beneficial as an environmental tool for arable farmers who do not have much else available. Most were of the opinion that set-aside had an advantage over any new measures because it was widespread, accepted by farmers, easy to understand and in place.

3.81 There was though a strong feeling from the majority of stakeholders that opportunities have been missed and that the potential of set-aside has not been maximised to achieve greater environmental benefit.

3.5.4 Conclusions on environmental benefits

3.82 Overall it is generally accepted that the net effect of set-aside on the environment is positive. However it is also widely recognised that the gains from set-aside are very sensitive to the management practices of the landowner. This would suggest that set-aside, if managed properly, may have the potential to provide even greater gains to the environment. The possibility of designing a system that can achieve this will be discussed in later chapters.

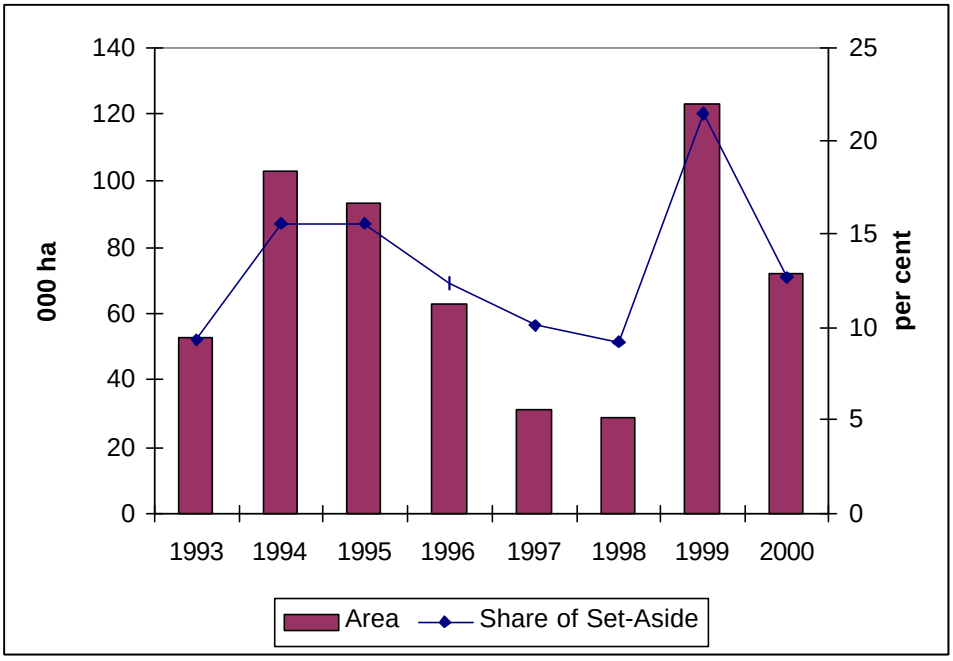
3.6 Industrial crops

3.83 A final rationale discussed for set-aside was the promotion of industrial crops. In this section, the available data are used to assess the importance of set-aside to the development of industrial crops.

3.6.1 Prevalence of industrial crops

3.84 Europe-wide it is estimated that around one million hectares of land is planted to industrial crops. In the UK, the main industrial crops are oilseed rape and linseed. The uptake of the industrial crop option can be seen in Figure 3.7. It is clear that production is closely tied to the set-aside rate. The farmer survey found that industrial crops were grown on around ten per cent of set-aside in the UK and that oilseed rape accounts for over 90 per cent of the area down to industrial crops. The survey evidence indicates that the existence of other types of crops on set-aside is very limited. This may suggest that set-aside is not at present widely used for the production of renewable energy crops.

Figure 3.7 Industrial linseed and oilseed rape areas in the UK 1993 - 2000



Source: Adapted from Agriculture in the UK, MAFF

3.85 Results from farms that took part in both the 1998 and 2000 surveys appear to indicate that the number of farmers growing industrial crops is diminishing. In 1998, 23 farms had oilseed rape on set-aside with four farms growing linseed. In the survey year 2000, 15 were growing oilseed rape and only one linseed. However, those who had continued growing industrial crops had generally increased their area in line with the change in the set-aside rate. In 1998, the 200 farms responding to the survey grew a total of 311 hectares of industrial crops. This area rose to 434 hectares by 2001, an increase of 40 per cent. However, the total set-aside area had more than doubled.

3.86 Evidence from the cereal surveys indicates a relatively high turnover of industrial crop producers.

3.6.2 Reasons for growing industrial crops

3.87 The motivations of farmers were assessed by means of scoring a number of possible reasons for growing industrial crops on a scale of one to five (with 5 representing very important). Sixty-five percent indicated that rotational benefits were important (scoring this reason as a 4 or 5). Improved profitability was clearly also an important factor, although a slightly lower percentage (57 per cent) scored this reason as a four or five. There is clearly still a feeling against leaving land idle; 60 per cent cited a dislike of unproductive land as a major reason for growing industrial crops. The fact that industrial crops might utilise fixed resources such as labour and machinery more fully was not judged important to the decision to grow (only 20 and 25 per cent indicated that to make better use of labour or machinery was important).

3.88 The relative profitability of industrial crops in relation to leaving land idle was considered by Lewis (1998). A summary of the results is reproduced in Table 3.19. He concluded that two-thirds of industrial oilseed rape growers achieved a margin greater than that from leaving the land idle and the premium group achieved margins considerably higher. He contrasts this finding with an earlier survey of industrial linseed production where he found that in that particular year the vast majority would have been better off by not growing linseed on set-aside.

Table 3.16 Output, costs and margins for industrial oilseed rape on set-aside land, 1996 harvest year

		Average	Top 25 %	Bottom 25 %
Output	Oilseed	401.3	488.7	317.6
	Area Subsidy	337.9	338.6	337.2
	Total	739.2	827.3	654.8
Variable Costs		236.1	213.7	261.3
Gross Margin		503	613.6	393.6
Fixed Costs		410.9	378.9	454.6
Net Margin		92.1	234.7	-61

Source Lewis, 1998

3.89 In addition to those currently growing industrial crops a further 20 per cent of respondents had grown such crops in the past and had now ceased to. It is interesting that, whilst those currently growing the crop cited a number of reasons for their decisions, those who had stopped mainly cited the lack of profitability (78 per cent). This was also the main reason given for never having grown industrial crops. Other factors such as machinery or labour constraints, soil type or difficulties with contracts were not regarded as important.

3.6.3 Importance of set-aside to industrial crop production

3.90 The dependence of industrial crop production on set-aside is clearly high. When farmers were asked their likely reaction in terms of crop planting decisions to a

removal of the set-aside restriction, the area of industrial crop production was cut dramatically by around 42 per cent. This highlights that a major attraction of industrial crops is the ability to get a return over and above that from the set-aside payment. If this land could be used for other crops then it is clear that at current prices industrial crops struggle to compete. For example, in the study by Lewis in 1996, the average net margin generated by industrial oilseed rape was some £380 per hectare lower than that of conventional oilseed rape. Even allowing for differences in the area payments there was still over £270 difference in the net margin attained.

3.91 This would suggest that some serious consideration would have to be given to how to promote industrial crops if set-aside was removed. This is discussed in more detail in Chapter 8.

3.92 The increased use of compensatory payments rather than price support for the arable sector will benefit the industrial sector because processors will not have to offer such high prices to attract growers.

3.6.4 Stakeholders views

3.93 The non-food crops industry has seen set-aside as a key driver for the growth of their sector although the variable rate was not good for multi-annual crops. Doubt on the future of set-aside has caused problems with investment and therefore set-aside is now seen as an unsatisfactory base for support. The RSPB support bio-fuel as part of the renewable energy obligation, but would not like to see it concentrated on set-aside at the expense of other environmental opportunities. Most stakeholders agreed there was an argument for supporting developing markets but not for more than a few years. The Game Conservancy Council suggested that once an industrial plant was established to take the crops, farmers in the vicinity would respond to the opportunity. Farmer response leaves no doubt that if set-aside is abolished they will not grow industrial crops with the existing returns.

Chapter 4 Impact of Set-Aside on the Agricultural Sector

Chapter Summary

Farm level analysis indicates that set-aside did have a major impact on output at a level very similar to the obligatory set-aside rate.

Set-aside has had a detrimental impact on farm-level technical efficiency. However, empirical evidence suggests that this has not been as large as expected.

The method by which set-aside has been implemented has been detrimental to the sector as a whole because the policy makes no allowances for differences in the profit-earning capacity of the land. Considerable gains could be made by targeting set-aside at the least profitable producers.

Profitability was adversely affected when compared with the MacSharry reforms with a no set-aside scenario. However, set-aside led to a much smaller fall in income than that which would have occurred if a price cut had been implemented.

It is not clear whether set-aside has had a significant impact on structural change in the industry.

4.1 Introduction

4.1 Set-aside has been effective in taking land out of production and reducing the level of output. However, as discussed in Chapter 2, there are a number of concerns surrounding the use of supply control and in particular set-aside in controlling production. In this chapter, the impact of set-aside on the agricultural sector is considered with a view to evaluating whether concerns about the effect of set-aside on the productivity and efficiency in the cereal sector are founded. The efficiency of set-aside can be viewed in a number of ways. First, there is the question of farm-level technical efficiency which relates to the ability of a producer to maximise output from a given set of inputs. The second relates to allocative efficiency, that is the impact of set-aside on the ability of farmers to combine inputs in the most efficient way to produce a given output. The final way relates to the overall efficiency of the set-aside policy in achieving supply control. The main question here is whether set-aside could have been implemented in a more efficient way.

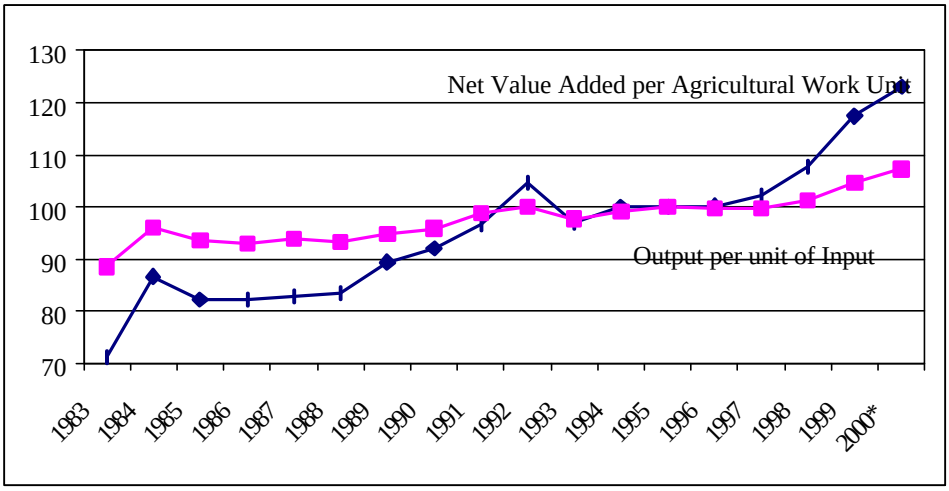
4.2 Set-aside and productivity in the agricultural sector

4.2 Set-aside has the potential to reduce the overall productivity of the cereal sector. For example, if there are increasing returns to scale in cereal production then forcing farms to operate on a smaller scale may lead to a reduction in productivity. In

addition, if farms are unable to adjust their other inputs in line with the restriction on land, productivity (as expressed by the ratio of outputs to inputs) may fall.[9]

4.3 Aggregate productivity measures for UK agriculture report a decline in productivity at the time of the introduction of the MacSharry reforms (Figure 4.1). Both labour productivity and the ratio of outputs to inputs declined in 1993. In the following sections, farm-level data is used to assess whether this reduction was related to the introduction of set-aside. The main considerations relate to the impact of set-aside on the level of output and the use of inputs.

Figure 4.1: UK agricultural productivity



Source: Agriculture in the UK, MAFF

4.2.1 Impact of set-aside on output

4.4 Analysis of FBS data shows that for cereal and general cropping farms set-aside did have a major impact on the level of output from the farm business. In most years, the estimated reduction in output due to set-aside is remarkably close to the percentage of 'obligatory' set-aside for those farmers entering into the main scheme (see Appendix A3.1 for a full description of the methods used and Table A3.1 for the results). For example, in 1994, the set-aside rate was set at 15 per cent and 17.5 per cent for rotational and non-rotational set-aside, respectively. The simple specification of the output supply equation in Table A3.1 suggests that in this year, rotational and non-rotational set-aside led to a reduction in crop output of 16 per cent and 19.7 per cent, respectively, for cereal and general cropping farms.

4.5 Similar analysis for Scottish farms, using FAS data, highlights that in the first two years of the scheme, the estimated reduction due to set-aside is also fairly close to the official rate (also shown in Table A3.1). While the coefficients are not significant at conventional levels, it should be borne in mind that the sample size is considerably smaller than for the FBS. However, from 1995 on, there is no observable supply control effect of set-aside for this sub-sample of farms. This is also true if we estimate

[9] It should be noted that set-aside could in theory lead to improvements in productivity. For example, if farms were operating at a point of decreasing returns to scale then set-aside may actually improve productivity.

the regression using other sub-samples of the data, or indeed for the full sample of farms. One possible explanation is that Scottish arable farms may have more heterogeneous land quality. In this case, farmers will have more scope for selecting out low-quality fields to enter into set-aside. Furthermore, in comparison with English arable farms, equivalent farms in Scotland set aside a smaller number of hectares (Table 3.4). Also, eligible land for the AAP scheme is a smaller proportion of total land area. Such characteristics may mean that set-aside simply has a much smaller impact on the overall value of crop output produced on the farm.

4.6 Finally, results estimated on the sub-sample of Mixed farms in the FBS data are reported. Set-aside in general (whether rotational or non-rotational) has a smaller effect in reducing crop output than on farms classified as 'Cereal' or 'General Cropping' In addition, it appears that on Mixed farms non-rotational/flexible set-aside is completely ineffective in reducing output. The possible reasons for this difference are the same as those discussed above for the Scottish farms.

4.7 Set-aside therefore had a significant output-reducing effect for cereal and general cropping farms in the FBS, a smaller effect for mixed farms and a short-term effect in Scotland. However, as mentioned above, this reduction in output may not necessarily lead to a reduction in productivity if input use had fallen to the same extent or more.

4.2.2 Impact of set-aside on input demand

4.9 To assess the impact of set-aside on input use, simple demand functions for various inputs in the sub-sample of Cereal and General Cropping farms in the FBS were estimated (see Appendix 3.3 for details of the method adopted).

4.10 The results show a strong negative impact of the policy on fertiliser demand in each year (apart from 1997). The interpretation is that in the years 1993 to 1996, entry into set-aside had the effect of reducing fertiliser expenditure by between 13 per cent and 18 per cent. These results show that producers reduced their fertiliser input in line with the reduction in area, suggesting little change in the productivity of this input.

4.11 However, for fixed or quasi-fixed inputs, a different picture emerges. For example it appears in 1993 that there was relatively little change in overall demand for hired labour and own machinery. This is despite the large reduction in output reported above. This supports the argument that productivity was affected by set-aside. The results do show that there was a downward revision in hired labour and owned machinery in 1994 as farms adjusted to the policy (and the aggregate figures seem to show an improvement in productivity in 1994). Though the fact that the productivity index did not return to its previous situation suggests that this revision was not complete. Thereafter, the policy had no significant impact on the demand for quasi-fixed resources. However, probably more significantly, the index will also be influenced by the failure to reflect the removal of land from production with the introduction of set-aside.

4.12 Similar analysis was undertaken for Scottish farms. In general, the results suggest that set-aside did not have a great impact on the demand for various farm resources. There is only one significant result. This shows a negative relationship

between whether the farmer had land in set-aside in 1995 and the value of owned machinery.

4.13 Partial measures of productivity (i.e. the ratio of the value of crops to labour, machinery and land respectively) are related to whether the farmer puts land into set-aside. One-year effects are controlled for, 'within group' estimation indicates a negative association between whether land was put into set-aside and both the output/labour ratio and the output/machinery ratio for Cereal and General Cropping farms in the FBS.[10] There is no clear relationship between the output/land ratio and whether land was put into set-aside for these farms. There is also no clear or strong relationship between partial measures of productivity and entry into set-aside for farms in the FAS.

4.14 The findings of Asby and Renwick (2000), as reported in Table 4.2 lend support to the hypothesis that set-aside may have had a detrimental effect on productivity on Cereal and General Cropping farms. When questioned about the impact of set-aside on their farm business, the vast majority of cereal producers felt that set-aside had little impact on their levels of machinery investment and labour usage.

Table 4.2: Changes to farm business as a result of set-aside

	Increased	Decreased	No Change
		Per cent of farmers	
Machinery investment	2.2	2.5	95.4
Use of contractors	2.2	2.8	95.1
Diversification	3.7	0.3	96.0
Livestock enterprises	0.9	1.8	97.2
Off-farm activity	3.4	0.3	96.3
Full-time labour	0.3	5.6	94.1
Part-time labour	0.9	4.9	94.1
Casual labour	1.3	6.6	92.2

Source: Asby and Renwick 2000

4.15 In conclusion, the introduction of set-aside may explain in part the decline in aggregate productivity witnessed in agriculture in 1993. Analysis of FBS data suggests that productivity was likely to have been detrimentally affected by the introduction of set-aside, as farms did not initially adjust labour and machinery in line with the decline in output. However, as the rate of set-aside was reduced (and hence the impact on output fell) and farms altered their use of inputs, the impact of set-aside on productivity has also fallen. It should be noted that if output reduction had been achieved by a greater cut in support prices rather than by set-aside, there would have been no decrease in productivity. In fact, aggregate productivity might well have increased as relatively less efficient producers left the sector.

[10] Within group estimation means that for every farm business, each variable is subtracted from its average value over the time that the farm is observed in the survey. The effect of this procedure is to remove the influence of all time-constant variables from the regression. Therefore we can be confident that the coefficients on the set-aside dummies reflect the true impact of the scheme.

4.3 Returns to scale and productivity

4.16 A crucial issue as to the impact of set-aside on the agricultural sector is whether there are economies of scale in cereal production. If these exist then forcing farms to operate on a smaller scale will lead to inefficiencies. Analysis of cereal and general cropping farms in the FBS highlights that for both farm types, there are small increasing returns to scale (under the particular specification for the production function). The coefficients on all inputs (i.e. land, labour, machinery and variable inputs) sum to over one in the production function. The evidence from the cereal surveys is slightly more ambiguous. Whilst it is clear that the largest cereal enterprises are generally the most profitable, the gains tend to come from the fact that they achieve higher yields rather than enjoying marked economies of scale.

4.4 Impact of set-aside on technical inefficiency

4.17 A related issue is whether set-aside has increased the level of technical inefficiency in cereal production. Technical inefficiency could be defined as failure to produce maximal output, given the set of inputs used (Schmidt and Sickles, 1984). Potentially, a set-aside policy could generate technical inefficiency since farmers who are obliged to reduce land area may have over-capacity in other fixed (or quasi-fixed) inputs (e.g. capital and labour) if these inputs are complementary to land and cannot be revised downwards in the short term. However, in the medium term, it is likely that this source of inefficiency will disappear as farmers adjust to the new optimal levels of output and input use, given the set-aside restriction.

4.18 Economic models were developed using data from the FBS (full details of the methods adopted and results are reported in Appendix 3.3). The fact that not all farmers entered land into set-aside enables the effect of the policy to be identified. Our methodology takes account of the fact that scheme participants have very different characteristics from non-participants. The results indicate that, on average, the effect of set-aside was to decrease the value of crop output by about 2.6 per cent due to the effect of the policy on technical inefficiency.[11] Results are qualitatively similar if we use different specifications (e.g. using the fact that farmers entered different amounts of land into set-aside).

4.19 The production functions were re-estimated, with the influence of set-aside on production modelled as a shift parameter that varies over time and by type of set-aside (i.e. rotational or non-rotational). Effects are only significant for Cereal and General Cropping farms. Under this specification, set-aside only has a strong negative effect on output (through its impact on technical inefficiency) in the early years of the scheme. In later years, the effect is much smaller. This is likely to reflect the decreasing set-aside rate and farmer adaptation to the policy.

4.20 For Scotland, a similar analysis could find no evidence of a reduction in farm-level technical efficiency attributable to set-aside. This is not surprising given the small supply control effect of set-aside on such farms (Section 4.2.1). However, less

[11] Specifically, the interpretation is that relative to farmers who did not enter land into set-aside, the value of crop output was 2.6% lower (on average over the survey period) for scheme participants due to the effect of the policy on farm-level technical inefficiency.

confidence can be placed in the production function specification generally for these farms since the information on inputs was not as detailed.

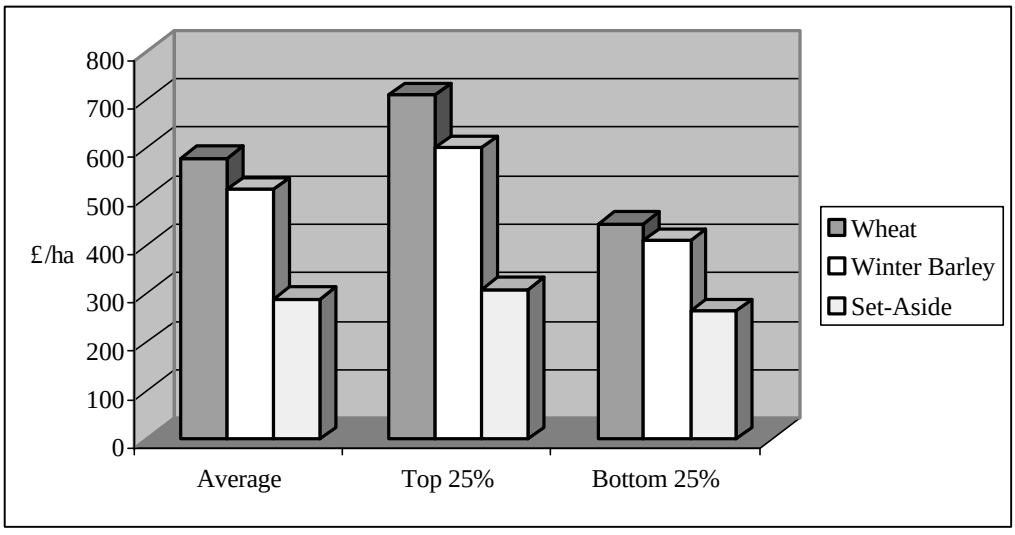
4.21 It should be noted that we have not attempted to model the potential effect of set-aside on allocative efficiency (i.e. the efficiency with which farmers combine different inputs to produce a given output). This is a more difficult issue, both conceptually and empirically. It is clear that the set-aside restriction will force farmers to use a different combination of inputs (i.e. land, labour, fertiliser etc.) to produce a given output. This is especially true in the short term, before farmers are able to adapt to the policy by revising downwards their demand for fixed or quasi-fixed inputs. However, the set-aside restriction could be thought of as raising the shadow cost of land. It may be expected that farmers will optimise their use of inputs accordingly. It is debatable whether such re-optimisation should be considered as 'inefficient'. We should also note that this analysis says nothing about the potential gains from re-allocating resources between farms. This adjustment is restricted by the operation of set-aside.

4.5 Impact of set-aside on farm profitability

4.22 A major difficulty with evaluating the impact of set-aside on farm profitability is that its introduction was attached to a major package of reforms. It is clear that these reforms and the subsequent changes in world prices and currency movements had a very large impact on the profitability of cereal farms in the UK. This has been reviewed in Barnes (1997) in their evaluation of the MacSharry reforms. Some idea of the relative returns from set-aside as compared to cereals can be seen in Figure 4.2 where the gross margins as estimated in the 1998 survey are compared.

4.23 An attempt to analyse the direct impact of set-aside on farm profitability is made by estimating the gross margin forgone on set-aside land. These estimates are based on the assumption that the alternative to set-aside would have been the IACS system on all eligible area. The exact method is described in Appendix 3.2, here it suffices to note that two estimates are made of the impact of set-aside on profitability. These are based on the assumptions made about the potential yield of set-aside land as discussed in the previous chapter.

Figure 4.2: Gross margins for wheat, barley and set-aside (1998)



4.24 Table 4.3 presents the results of this analysis. By 1994 when the area of set-aside was at its highest, our estimates suggest that the overall gross margin from the COP area was reduced by nearly 10 per cent (assuming that the land set aside was of average quality). If lower-yielding land had been set aside then a smaller reduction of just under eight per cent would have occurred. As the set-aside rate was lowered so the impact of set-aside on profitability fell; to just an estimated two and a half per cent reduction by 1998.

Table 4.3: Estimated reduction in gross margin (GM) from eligible area as a result of set-aside

	1993	1994	1995	1996	1997	1998
			Per cent			
Change in GM (average yield	8.5	9.5	8.5	6.4	3.3	2.5
Change GM (low yield)	7.4	7.7	7.2	5.6	2.6	2.0

4.5.1 Impact on holdings by size of cereal, oilseeds and pulses (COP) area

4.25 The distributional impact of set-aside is highlighted in Table 4.4. Here, estimates of the reduction in attained gross margin for farms with different COP crop areas are presented for just the first year of the introduction of set-aside. Not surprisingly the largest holdings, those that have to set aside the greatest absolute area, have a considerably greater absolute reduction in gross margin. However, because set-aside operates as a percentage of total area, the proportional reduction in GM is similar for all size groups over 20 hectares.

4.26 The estimates presented may overstate the loss to farmers, as they are based on the assumption that set-aside had no impacts on the price paid for inputs or the price received for cereals. To highlight the impact of possible changes in input and output prices, simple sensitivity analysis is conducted. The initial assumption of no change in input or output prices is relaxed and unitary price elasticities for the demand for the output and supply of inputs are assumed. That is, a 10 per cent change in output supply (input demand) will lead to a similar percentage change in the price of cereals (inputs).

4.27 This analysis highlights that if the increased production occurring as a result of the removal of EU set-aside policy led to a proportionate fall in output price, then producers would be slightly worse off than with set-aside. If prices for inputs were to rise proportionately to the increased demand they would still benefit from the removal of set aside. However, they would be markedly worse off if both the price for cereals fell and the price of inputs rose proportionately.

Table 4.4: Estimated impact of set-aside on gross margin from eligible area for farms of different sizes (1993)

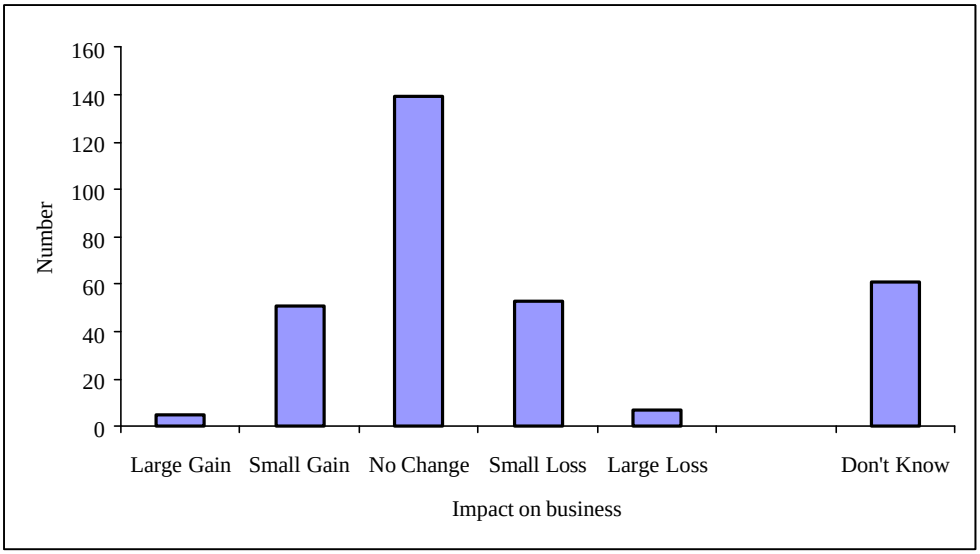
Country	COP Area			
	< 20 Ha	20 to 80	80 to 200	>200
England		Loss of GM in £ per farm		
Average Yield	0	2791	7399	24573
Low Yield	0	2166	5947	20309
Wales	< 20 Ha	20 to 80	> 80	
Average Yield	0	3204	6597	
Low Yield	0	2738	5516	
Scotland	< 20 Ha	20 to 80	80 to 200	>200
Average Yield	0	1308	7598	19626
Low Yield	0	1118	6509	16457
UK	< 20 Ha	20 to 80	80 to 200	>200
Average Yield	0	2036	7555	20682
Low Yield	0	1843	6137	17023

4.28 Whilst we have shown that the implementation of set-aside, in respect of the continuing payment of AAPs, has imposed a financial cost on farms and that this has been greater on larger farms, this finding depends on the counterfactual (i.e. the assumption about what would have happened in the absence of the policy). For example, it may be reasonable to argue that if set-aside had not been implemented then some other way of controlling supply would have been. Clearly the most economically efficient method for controlling supply would have been to cut the price. Using the panel data from 1993 and 1998, a supply response function is estimated for the cereal sector. Here production is expressed as a function of the expected price of cereals, the arable area, the arable area payment, and the set-aside rate. The results from this analysis suggest that the supply elasticity for cereals after the MacSharry reforms is around 0.5. Therefore to achieve the same supply control effect as set-aside between 1992 and 1993 it is estimated that average price would have had to have been cut by roughly 30 per cent (on the assumption that Arable Area Payments were introduced). All other things equal, this would have led to a 23 per cent fall in gross margin from the COP area for the UK as a whole. Therefore, the just under nine per cent loss in profitability associated with set-aside (as shown in Table 4.3) was actually a major advantage of set-aside to farmers when compared to the alternative of a price cut.

4.5.2 Farmers' view of change in profitability

4.29 As part of the 1998 cereal and set-aside survey, co-operators were questioned as to their view of the impact of set-aside on the profitability of their business. Figure 4.3 presents the findings. It is clear that the vast majority felt that set-aside had little impact on their profitability. Whilst every effort was made to question farms about the direct impact of set-aside, it is not certain that they would be able to differentiate out set-aside from the impact of the other changes to policy, exchange rates and prices. This may mean that farmers are looking at the situation pre and post the MacSharry reforms rather than with or without set-aside.

Figure 4.3: Farmers' perception of the impact of set-aside on profitability



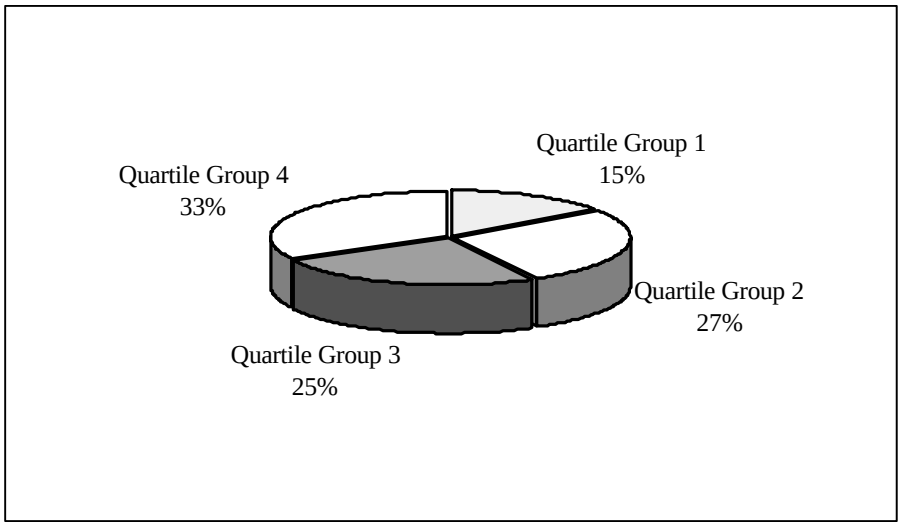
Source: Asby and Renwick (2000)

4.5.3 Impact of set-aside on farms grouped by profitability

4.30 A major problem with 'obligatory' set-aside is that it takes no account of differences in the physical and economic performance of holdings. Given that farms are likely to face different costs and revenues it is likely in an economic sense to be inefficient to require that all farms set-aside land. For example, the 1998 cereal survey showed that there was a difference of some £140 per hectare in the profitability of farms in the upper most income quartile group compared to the average.

4.31 Figure 4.4 highlights that set-aside is not equally distributed between farms grouped according to their profitability (as measured by net margin attained). It is clear that the most profitable group (Quartile group 4) account for a high share of set-aside. This reflects the fact that the largest farms tend to be the most profitable.

Figure 4.4: Share of set-aside area by farms grouped by profitability



4.32 Given that the most profitable producers tend to be the lowest-cost-per-tonne producers, this suggests that set-aside as implemented is likely to be having a detrimental effect on the overall efficiency of the cereal producing sector in the UK. For example, Asby and Renwick (2000, p 30) show that in 1998 there was some £25 per tonne difference in the cost of producing a tonne of wheat between the top and bottom quartile groups (in the cereal intensive counties of England). A way of highlighting the extent of the inefficiency is to assess the possible gains that could be achieved if set-aside were targeted at the least profitable producers. This is considered next.

4.6 An efficient set-aside policy: an analysis

4.33 If the aim of the policy is to remove a certain amount of land from production then it would certainly be more economical to remove the less profitable land. Even if the aim was a certain reduction in production then it may well be more efficient to remove a larger area of less productive land. For example to achieve a 10 per cent reduction in production it might be better to set aside 15 per cent of low-yielding land rather than 10 per cent of all land. A simple analysis highlights the inefficient nature of a policy that results in low-cost and high-cost producers setting aside land (details of the model developed can be found in Appendix 5).

4.34 The analysis was initially conducted on the assumption that all producers had 5 per cent of their land set aside (5 per cent was the official set-aside rate in 1998). Set-aside was then reallocated from the more profitable producers to the less profitable producers. The level of set-aside was then increased up to 10 and then 20 per cent. Moving set-aside between holdings has very little impact on the costs per hectare of production (Table 4.5). This is to be expected given that costs per hectare vary

relatively little between producers.[12] However, targeting set-aside leads to a significant increase in profitability of the sector ranging between 4 and 16 per cent depending on the rate of set-aside. This increase in profitability is due in part to differences in yield, and we can see that production would be greater under the targeted scheme as compared to the blanket set-aside policy. This has important implications regarding the ability of set-aside to control supply. To look at it another way, the final column shows that the effectiveness of set-aside as a supply control policy would fall by up to 3 percentage points at the 20 per cent set-aside rate. It has been assumed for the purpose of this analysis that the price of output has not fallen as a result of these changes in the level of production. We return to this issue in a discussion of trading in Chapter 6.

Table 4.5: Change in cost, profit and production as a result of 'efficient' set-aside

Set-aside rate	Change in cost	Change in profit	Change in production	Reduction in supply control
		Per cent		
5 per cent	-0.08	4.6	1.3	-1.3
10 per cent	-0.53	8.2	2.2	-2.0
20 per cent	-1.14	15.2	3.5	-2.9

4.7 Set-aside and structural change

4.35 Set-aside may also be impacting on the efficiency of cereal production in the UK if it is interfering with the process of structural change that might be leading to a more efficient scale of production. Again, this depends on the existence of economies of scale. However, for a long period in the UK we have seen the process of increased specialisation and growth in enterprise size suggesting that there are gains to be had.

4.36 Set-aside may be impacting on the process of structural change in a number of ways. First, it may be argued that the fact that farmers can be paid for set-aside places an artificial floor in the land market. In times of low returns from cereals it might be expected that land prices would fall. However, if farms are able to set-aside a large proportion of their land they are unlikely to accept a lower price for land than they can get for setting it aside. This may increase the costs for those wishing to expand and reduce the competitiveness of the sector.

4.37 It is not clear that there should be any relationship between whether the farm enters land into set-aside and farm growth. Barnes (1997) reported that farmers in their survey did not think the AAP scheme had affected their decision to increase or decrease land area. A standard growth equation (e.g. Weiss, 1999) for farms in the FBS and FAS respectively, relates the annual change in utilised agricultural area to the initial level of utilised agricultural land area, the initial level of set-aside (measured in hectares) and a number of other variables. However, there is no evidence of a relationship between the area of land in set-aside and farm growth.

[12] Targeted set-aside would though reduce the average cost *per tonne* produced in the UK, though the amounts are relatively small. An estimated 3 per cent for a set-aside rate of 10 per cent.

4.38 Farmers may use set-aside as a means of giving up farming. If they are setting aside land rather than selling up, it will hinder the development of other farm businesses. This of course depends on the relative profitability of set-aside and cereals and also the proportion of the farm that can be set aside. In the 1998 study of the economics of cereals and set-aside it was found that the average *net* margin for set-aside was comparable with winter barley but lower than wheat and spring barley. However, under the Agenda 2000 reforms the set-aside payment has been considerably reduced. This is likely to have lessened its attractiveness compared to either selling or renting out the land for cropping.

4.39 It is difficult to collect information on those farmers who might use set-aside as a means of giving up farming. For example, around a quarter of the farmers who left the cereal survey retired. It is not known, however, what they did with their land. The majority of those leaving the cereal survey stated that they were too busy to participate rather than retiring from farming. It was concluded that the characteristics of non-respondents would not provide reliable insights into farmers giving up cereal production or retiring from agriculture in general.

4.40 The relationship between land in set-aside and the probability of exit from the survey for both the FBS and the FAS is also investigated. Exit is identified for individual farm businesses. We assign a value of one if the farm is in the survey in the current year but is not observed in the survey the following year. For example, 'exit' in 1993 indicates that the farm did not participate in the survey in 1994.

4.41 The probability of exit is associated with a number of variables in the individual surveys (Appendix 3.4). For Cereal and General Cropping farms in the FBS, a negative relationship between participation in set-aside and exit from the survey is suggested, though this is only significant in the first year of the scheme. For farms within this classification in the FAS, a negative relationship is also suggested, though the coefficients on the set-aside variables are not significant. If exit from the survey is associated with exit from the farm sector, these results suggest that the AAP scheme may have helped retain farms in the sector that would otherwise have left. However, a different story emerges if estimates are made for all Scottish farms. Here results indicate that participation in set-aside is positively associated with exit from the survey. A possible explanation is that scheme participation is positively associated with some unobserved attribute of farms or farmers. For example, farmers with poor land quality may be more likely both to enter land into set-aside and leave the survey. It is not possible to control for unobserved characteristics of farms/farmers here in the way described in the above sections.

4.42 Although such results are of some interest, exit from the survey is not the same as exit from the farm sector (as already seen from the cereal survey data) and some relevant variables are missing from our data. Hence, at best, these regressions suggest the potential impact of set-aside, and the issues may be worthy of investigation in other research projects.

4.8 The influence of reforms to the arable sector on off-farm labour decisions

4.43 Of some interest is the impact that set-aside has on the decision of farmers to work off-farm to supplement their income. This may be advantageous to the sector as it allows farmers to diversify their income and become less reliant on support payments. Though it might be seen as disadvantageous if this outside income is used to support a less than efficient cereal enterprise. One would expect reforms to the arable sector to affect off-farm labour decisions through changes in support prices, the introduction of set-aside and Arable Area Payments. In particular, it is difficult to empirically separate the effect of set-aside of agricultural land and receipt of Arable Area Payments. While the impact of set-aside is to reduce the marginal product of on-farm labour, and thus increase the probability of off-farm participation (and hours of off-farm work), the income effect associated with receipt of Arable Area Payments is likely to reduce off-farm labour supply.

4.44 An analysis of these effects forms part of another report to MAFF (Hodge, McNally and Kiddle, 2000). There is also a separate on-going academic study of these effects using FBS data, since the analysis raises a number of complex issues. Hence this work will not be discussed in detail here. The results suggest that reforms to the arable sector have had a small negative effect on off-farm labour decisions. Though, this is most evident for small farms, where set-aside is likely to be less of an issue. The results of analysis of Scottish Data can be found in Appendix 3.

4.9 Conclusions

4.45 Aggregate UK data indicate a decline in productivity at the time of the introduction of the MacSharry reforms. Analysis of farm-level data suggests that this may be linked to the introduction of set-aside as the reduction in output was not matched by an equal reduction in quasi-fixed inputs such as labour and machinery and neither was an adjustment made in the index for changing land input.

4.46 Further analysis shows an impact on individual farm-level technical efficiency of the UK cereal sector. Efficiency was reduced in the early years of set-aside. However, the fact that set-aside rates were reduced and farmers were able to adapt to the policy means that this impact on technical efficiency declined after 1995.

4.47 Our analysis highlights the fact that set-aside has led to a reduction in the overall profitability (as measured by gross margin) of the COP enterprises when compared to the alternative of zero set-aside. However, set-aside has led to a much smaller reduction in profitability than would have occurred if a similar level of supply control had been attained by a greater cut in prices.

4.48 The introduction of set-aside has been inefficient as it makes both profitable and unprofitable holdings set aside land. Due to the relationship between size and profitability, the most profitable quartile group account for around a third of total set-aside, whilst the least profitable farms account for only 14 per cent. Analysis suggests that supply reduction targeted at the least profitable producers would lead to the policy having considerably less impact on the profitability of the sector. In addition, the unit costs of cereal production would fall, enhancing the competitiveness of the sector.

4.49 It is not clear from the available evidence whether set-aside has maintained farms in the sector. If it has, this may be deemed beneficial on social grounds but less so on economic grounds as it may have hindered the development of a more competitive size structure. There is some evidence of advantages in size in cereal production, suggesting that any policy which reduces the scale of production will be inefficient and lead to a reduction in the competitiveness of the cereal sector.

Chapter 5 Impacts of Set-Aside on Taxpayers and Consumers

Chapter Summary

Between 1994 and 1999 it is estimated that it cost the EU 47 ECU to deal with each surplus tonne of production. This compares favourably with the cost of set-aside in preventing production, which is estimated at over 80 ECU per tonne over the same period. The figure of 47 ECU is largely a result of favourable market conditions during the mid-nineties, which reduced the cost to the EU of disposing of its cereal surpluses.

When compared to an uncompensated price cut, the MacSharry reforms placed a very high cost on taxpayers and consumers, but considerably benefited producers.

A simple analysis for 1993 suggests that the net impact of instigating the MacSharry reforms rather than an effective price cut was some 450 million ECU.

5.1 Introduction

5.1 As discussed in Chapter 2, the imposition of set-aside, when compared to a free market situation, is likely to impose costs on taxpayers and consumers. However, it is clear that set-aside in the EU was implemented in an already distorted market. Therefore the budgetary and consumer impacts are not so clear cut. A simple analysis is conducted to highlight the costs to taxpayers and consumers of implementing the MacSharry reforms as opposed to an uncompensated price cut.

5.2 Budgetary implications

5.2 In Chapter 3, the quantitative outcome of set-aside in terms of supply control has been discussed. This section analyses the budgetary implications of set-aside. Given the uncertainties of how set-aside has impacted on world markets and in particular on the world price, it would be invalid to attempt to provide a definitive estimate of the costs or benefits of set-aside. Instead a broad picture of the budgetary implications of set-aside is given.

5.3 Table 5.1 reproduces the direct payments for set-aside[13] in the period between 1993 and 1999 and relates them to the area set aside and also the estimated curtailed production. The cost per tonne curtailed varies quite considerably, this is related partly to the change in the set-aside payment rates which rose between 1993 and 1995. However, the cost per tonne also relates to the yields achieved in each year. As 1996 was a high-yielding year, the cost per tonne curtailed fell from its 1995 value. For the period as a whole it is estimated that, in current terms, the average cost in terms of direct payments per tonne curtailed, works out to around 83 ECU.

[13] These figures exclude 5–year set-aside.

5.4 This only relates to the direct payments and does not account for the costs of administering the policy at the national level nor does it include the costs of evaluating the system. The IACS is a fairly bureaucratic system and it is clear that there are high administration costs. However it might be argued that the marginal cost of set-aside as part of the IACS is minimal. That is, if set-aside was abolished the cost of running IACS would be unlikely to change significantly.

5.5 The direct costs to the EU budget of set-aside payments are relatively easy to measure. However, the benefits of the scheme are somewhat harder to determine. A 'second-best' argument for set-aside is that if the costs of disposing of each extra tonne outweighs the costs of preventing it being produced, then set-aside may produce a 'gain' to taxpayers. In this light it is of some interest to consider the costs of the cereals regime over the period (Table 5.2).

Table 5.1: Estimated direct expenditure associated with set-aside

Year	Land set-aside	Production curtailed[2]	Total expenditure	Estimated payment per hectare	Payment per curtailed tonne[2]
	000 ha	000 t	Million ECU	ECU/ha	ECU/t
1993	4640	19712	1312	283	67
1994	5995	23883	1713	286	72
1995	6411	23612	2413	376	102
1996	5567	22888	2271	408	99
1997	3983	16319	1904	478	117
1998	4207	17355	1263	300	73
1999	5751	22398	1294	225	58
2000			1702		

Notes 1: EU 12 up to 1995, EU 15 from 1995.
Notes 2: Estimates based on Method 1. The lower level of supply control estimated by Method 2 raises the cost per tonne curtailed by about 18 per cent.

Table 5.2: Budgetary expenditure under the cereal regime 1993 to 1999

	Total cost of regime	Export refunds	Storage costs	Exports	Average refund
	Mill. ECU	Mill. ECU	Mill. ECU	000 tonnes	ECU/t
1993	6630	2848		32000	89
1994	7342	1513.2	186.7	32047	47
1995	9362	1092.7	61	24526	45
1996	10826	312.8	-46.9	26694	12
1997	12165	532.3	71.5	22854	23
1998	13341	478.9	1083.9	22267	22
1999	13144	883	712.7	29683	30

5.6 The picture of the possible savings to the EU budget as a result of preventing excess production is complicated. It is clear, however, that in every year since the

reform, domestic supply has continued to outstrip domestic demand. Therefore, the costs of extra production need to be considered in terms of the way in which excess production is handled.

5.7 The main options taken by the EU in dealing with surpluses have been through exports with refunds or storage. If a crude comparison is made between the export refund and the estimated cost per tonne of set-aside, it appears that only in 1993 were the export refunds greater than the set-aside payments. However, this takes no account of the impact of a near doubling of exports on the world price. With the EU accounting for a considerable part of world trade, this impact would not be negligible. Or, to put it another way, the export refunds that the EU had to pay on existing production were lower because of set-aside. Therefore set-aside produces a budgetary gain. In addition it is assumed that a market could be found for the extra production.

5.8 From 1995, with the implementation of the URA and its restrictions on subsidised exports, it might also be reasoned that not all of this extra production could have been exported and hence would have ended up in storage. However, the unusually high world prices in 1995 and 1996 would have alleviated this to some extent (assuming that prices would still have been relatively high in the absence of set-aside). In fact, world prices rose to the extent that for a short period EU exports were taxed to prevent the internal price rising above the world price.

5.9 This rise in world prices can in part be attributed to the 1993 reforms as the lower price encouraged increased internal utilisation of cereals in feed. This, coupled with the supply-reducing impacts of set-aside, led to a sharp reduction in the EU surplus and hence in its supply on to the world market. Stocks in other major producing countries fell, leading to the cost of export refunds falling to an average of only 12 ECU per tonne in 1996 (in fact much was exported without the need for any subsidy) compared to 89 ECU in 1993.

5.10 In addition storage costs were actually negative in 1996 as profits on sales were achieved. As explained in Chapter 2, the rationale for supply control is largely to do with the need to comply with URA commitments on subsidised exports. The fact that the EU could basically export excess production unsubsidised undermined most of the underlying arguments for set-aside, especially as by 1996 it was costing an estimated 100 ECU per tonne to curtail production. If the extra production is assumed to have needed the 12 ECU export refund, the cost of preventing production exceeded the potential disposal costs by 1.9 billion ECU, equivalent to 87 per cent of the total set-aside payments.

5.11 An alternative view of the relative costs and benefits can be gained by relating the total cost of dealing with surplus production and the level of surplus reduction. It is estimated that EU production outstripped demand by around 146 million tonnes between 1994 and 1999. EU expenditure on intervention storage and export refunds came to 6.8 billion ECU during the same period. Therefore a very crude estimate can be made that each surplus tonne in the EU during this period was costing 47 ECU. This can be compared with the cost of set-aside which is estimated at around 80 ECU per tonne for the similar period.

5.12 This situation led to the reduction of the set-aside rate to enable the EU to take advantage of these relatively high world prices. It is clear though that the situation has changed since 1997 with many of the old problems returning. The amount of produce in intervention has risen and the costs of storage rose to one billion ECU in 1998. However, export refunds, though higher than in the mid-nineties, have been lower than prior to the reform as the internal EU price has fallen considerably.

5.13 The high prices in the mid-nineties basically undermined the supply control rationale for set-aside. Whilst it may be argued that these prices were in part due to reduced production through set-aside, it is probable that they would largely have occurred anyway due to the situation in other major producing countries. The lower world prices of the late nineties have resulted in EU expenditure on intervention storage and export refunds being once again more closely related to the costs of set-aside.

5.3 Set-aside and consumers

5.14 Within the EU, the operation of a mechanism of price support and the use of variable import levies has kept the price of many foodstuffs higher than would otherwise be the case. Therefore EU policy has implicitly placed a tax on food. The extent of this tax depends on the situation in world markets. The move under the MacSharry reforms towards cutting the level of price support is in effect cutting this tax and can therefore be seen as essentially consumer friendly.

5.15 Cuts in intervention price and the introduction of Arable Area Payments have shifted the burden of support of the CAP firmly towards the taxpayer. As Renwick and Hubbard (1992) highlight, this also has advantages in relation to the distribution of income. As food is a necessity, low income households spend proportionally more of their income on food and therefore bear a disproportionate share of the costs of supporting EU farmers. Although it must be remembered that in some EU countries, for example the UK, producer prices (for cereals in particular) did not initially fall as a result of this price cut. In the UK, the changing value of the pound and the strong world markets of the mid-nineties meant that by 1996 prices were actually considerably higher than before the reforms. However, since 1997 prices of cereals have fallen much below their 1992 levels.

5.16 Whilst the overall tone of the 1992 reforms can be considered beneficial for consumers, the impact of set-aside itself may be considered less so. The purpose of set-aside is to restrict production and this, all else being equal, will lead to a higher producer price than would be the case without set-aside. Higher producer prices would be expected to translate into increased consumer prices of cereal and livestock based products.

5.17 The exact impact of set-aside on the consumer depends on a number of factors:

5.18 In the absence of institutionally determined prices, the elasticity of the demand curve for cereals is clearly crucial. For example it may be argued that the UK is a small producer in world terms and that the extra production could have been disposed of on the world market with negligible impact on prices. This would imply that set-

aside would have little impact on consumers. However if we consider the EU as a whole, the impact of set-aside on world supply is clearly not negligible.

5.19 In fact, given that the EU operates an intervention system (at least for barley in the UK) the elasticity of demand may not be so important. Whilst cereal prices are above intervention price, extra production may reduce prices. However if cereal prices are around or below intervention price it is not clear that the extra production will reduce price and therefore produce a consumer gain.

5.20 The impact of slippage is also important. Whilst slippage can be seen as a 'bad' for taxpayers as it raises the marginal cost of supply reduction, it is actually of benefit to consumers. A high degree of slippage reduces the ability of set-aside to restrict supply and hence leads to a smaller impact on consumers in terms of possible price rises.

5.21 Finally the extent of price transmission is a major factor. That is the extent to which a fall in producer price caused by the abolition in set-aside would be passed on to the consumer. It is often assumed in analysis that the full impact (in absolute terms) of price changes at the producer level will be felt at the consumer level.

5.22 In a competitive situation, it may be expected that price changes at the producer level would lead to similar changes (in absolute terms) at the retail level (maybe with some time lag depending on the commodity). There are, however, a number of reasons why this may not be the case. For example, there may be economies of scale in the marketing chain such that if the price fall is caused by extra production then as throughput in the chain is increased so the unit cost of marketing falls and prices actually fall more in the retail market. Following the same reasoning, a price rise caused by a restriction on supply may lead to greater increases at the retail level. However, it is clear that the structure of the processing and retailing sectors does not necessarily fit the competitive model. They are sectors dominated by a few large firms. The impact of such structures on the prices paid by consumers has received much attention with work considering the 'stickiness' of prices under oligopoly and the idea of asymmetric price transmission whereby price increases are passed on more fully than price decreases.

5.23 With set-aside, the question is as follows. If supply were to increase (through the removal of set-aside), would any subsequent price falls be passed on to consumers or absorbed by the supply chain. In a non-competitive sector, it is possible to see a scenario where the fall in price is largely captured by the supply chain.[14] If it is absorbed it might be argued that the impact of set-aside on consumers is negligible. However, even if the 'gains' are captured by intermediate companies there will still be some gain. Profitability of these firms will increase and, as the price of their raw materials has fallen, their competitiveness compared to the rest of the world will improve. This is particularly pertinent to food processing industries.

5.24 A simulation exercise is undertaken to look at the sort of magnitude of figures that we might expect. The analysis concentrates on the UK and looks just at the major

[14] For a more detailed discussion of market structure and competition see Griffith (2000) or Renwick and VanSickle (1999).

cereal products of wheat and barley. In this analysis it is initially assumed that a one per cent increase in production will lead to a one per cent fall in producer price.[15] It is also assumed that price falls at the producer level are passed on fully to the consumers. A final assumption is that overall domestic consumption does not alter as a result of the increased supply. The figures in Table 5.3 reflect the impact of set-aside on consumer spending under the above assumptions.

Table 5.3: Simulated impact of set-aside on food expenditure (wheat and barley)

	1993	1994	1995	1996	1997	1998	1999
Increase in expenditure				£ million			
Price elasticity = 1	283	293	279	211	110	95	141
Price elasticity = 2	142	147	139	105	55	47	71
Total UK food expenditure[2]	40528	40559	42308	44517	45038	45376	45253
Impact on food expenditure				per cent			
Price Elasticity = 1	0.70	0.72	0.66	0.47	0.24	0.21	0.31
Price Elasticity = 2	0.39	0.40	0.36	0.26	0.14	0.12	0.18

Notes 1: Total domestic consumption of milling and feed wheat and barley multiplied by estimated price changes. It is assumed that changes in feed prices filter through to changes in the price of animal products.
Notes 2: Estimate based on the per person expenditure derived from the National Food Survey.

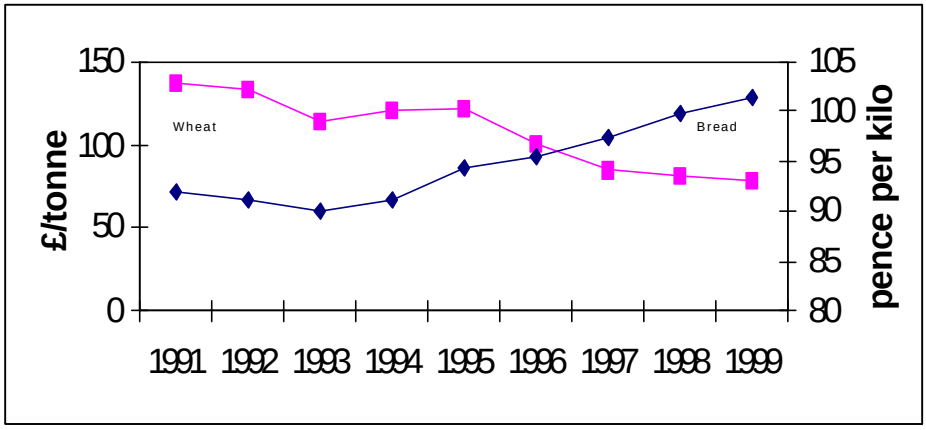
5.25 The purpose of Table 5.3 is not to provide a definitive estimation of the consumer costs of set-aside but to highlight the sort of magnitude of its possible impacts. Even if the producer prices for wheat and barley had been 15 per cent higher as a result of set-aside and the *full* price change had been transmitted to consumers this would have amounted to only a 0.7 per cent change in consumer expenditure on food in 1993. This falls to only 0.21 per cent in 1998 when set-aside was at its lower rate of 5 per cent. On the basis that expenditure on food is on average only 10 per cent of consumer expenditure we see that its impact is fairly minimal. Assuming a more elastic demand curve (price elasticity of two) halves the overall impact of set-aside on consumers.

5.26 If we examine UK bread and milling wheat prices in the nineties in more detail, we see that in the early 90s they seemed to follow a similar pattern in terms of price rises and falls. However since the wheat price has reduced considerably, bread prices have continued to rise (Figure 5.1). Simple regressions of price changes of bread and milling wheat price over time do not appear to indicate a strong relationship. This is also the same with milling wheat price and other cereal products including flour.

[15] A price elasticity of one may seem high given that the elasticity of demand in the UK is well below one. However it is assumed that, given that the UK is more than self-sufficient in cereals, the excess would go onto the world markets and that these would be more elastic in response to extra production even if production in the EU as a whole rises. For example if the EU's share of the world market is 10 per cent and the world price elasticity of demand is 0.1, then a 10 per cent increase in EU supply to the world market will lead to only a 1 per cent increase in supply on the world market and therefore a 10 per cent fall in price.

5.27 As mentioned above, there are a host of possible reasons for these findings other than the fact that the price changes are being absorbed. However, it does appear to show that the two prices are not closely linked and that it is not clear that changes at the producer level will be fully felt at the consumer level.

Figure 5.1: Price of milling wheat and bread 1991 to 2000



Conclusions on the impact of set-aside on consumers

5.28 In theory, set-aside will lower consumer welfare as it restricts production and increases the price of the product. Also, low-income households, which spend a greater proportion of their income on food, are likely to suffer a greater negative impact.

5.29 However, given the small proportion of consumer expenditure on cereals, even a considerable change in cereal prices would have a less than one per cent change in average expenditure on food.

5.30 Given the strength of the world cereals markets in the mid-nineties, it is not clear whether increased EU production would have had a marked impact on cereal prices, in which case set-aside would not have had much effect on consumer welfare.

5.31 The decline in world prices in the late 1990s has led to cereal prices which are now lower than intervention prices. It may be argued that intervention price is driving cereal prices. Therefore it is intervention and not set-aside that is impacting on consumers.

5.32 Given the market structure of the processing and retailing sectors it is not clear whether price changes that occur as the result of the abolition of set-aside would be fully transmitted to consumers. Given that the structure of the intermediate markets varies between EU member states, it may be expected that the degree of transmission might vary between countries.

5.4 Comparison with an equivalent price cut

5.33 The comparison of the costs and returns of set-aside with the possible scenario of the MacSharry reforms without set-aside may be deemed flawed for a number of reasons. First, the ability of the EU to reach agreement at the Uruguay Round was tied with the introduction of the Blue Box. Key to the acceptance of area aid payments into the Blue Box was the condition of set-aside. It may therefore be argued that set-aside (or some form of supply control) was necessary for agreement. In addition, in order for the EU to meet its commitments under the Uruguay Round (notwithstanding the high prices in the mid-nineties which could not have been foreseen), production may have to have been curtailed in some form.

5.34 Therefore the alternative is some other form of policy that would control supply or allow the EU to export without subsidies. Clearly, the most efficient mechanism for supply control is a price cut. To investigate this further, an analysis of the implications for the EU of choosing to introduce set-aside rather than a price cut will be considered. The analysis concentrates on the first year of the reform and assesses the impact of a price cut that would have achieved the same estimated level of supply control as all set-aside (namely a 14 per cent reduction).

5.35 A model was constructed using aggregate EU data (see Appendix 4 for a description). From this model an estimate of supply response for the EU as a whole of 0.62 is obtained. This means that in order to obtain a one per cent fall in supply of cereals, price would have to be cut by 1.4 per cent. Therefore to achieve the 14 per cent estimated reduction in supply, an effective 21 per cent price cut would need to be implemented. By 'effective' we mean one that is felt at the member states level. The price cuts that occurred under MacSharry had mixed effects largely because of exchange rate changes. For example, German wheat price fell by 16 per cent between 1992 and 1993, whereas in Italy prices actually rose by 14 per cent. This analysis is initially undertaken assuming that producers are not compensated (for example by area aid payments) for the price cut.

5.36 At the cereal enterprise level, the impact of an uncompensated price cut compared to the introduction of the MacSharry package is, not unexpectedly, large (Table 5.4). The results suggest an unweighted average fall in barley and wheat gross margins of 38 and 39 per cent, respectively, compared to falls of 8 and 9 per cent under the set-aside scenario.

Table 5.4: Impact of price cut compared to MacSharry reforms on wheat and barley gross margins 1993 (all figures show per cent changes)

Country	Barley gross margins		Wheat gross margins	
	Set-Aside	Price Cut	Set-aside	Price Cut
Germany	-6.3	-56	-8.1	-38
Spain	-6.1	-33	-6.4	-34
France	-6.8	-39	-7.6	-28
Italy	-11.5	-23	-13.8	-53
UK	-8.7	-40	-9.8	-42

5.37 It is reasonable to argue that such a policy of uncompensated price cuts would not be politically possible, however it does highlight the gains to EU cereal producers of the introduction of the 1992 reforms rather than a price cut.

5.38 A simple analysis highlights the possible overall impact of an uncompensated price cut compared to the MacSharry reforms with set-aside. The price cut is assumed to be fully transmitted to producers. This means that prices would have been lower than under the MacSharry reforms. It is estimated that an effective price cut of 21 per cent would have led to cereal prices been some 24 ECU per tonne lower in 1993 than they actually were with the MacSharry reforms.

Table 5.5: Comparison of uncompensated price cut with MacSharry reforms 1993

	Million ECU	
Taxpayer Gain		
No set-aside payment	1312	
No arable area payment	4000	
Lower export refunds	768	
Consumer gain		
Lower price	3648	
Total gain to consumers and taxpayers		9728
Producer Loss		
Lower price	3960	
Set-aside payments	1312	
Arable area payments	4000	
Total loss to producers		9272
Net Gain		456

5.39 The gains to the taxpayer of an uncompensated price cut are clear and relate directly to savings in area aid payments and also set-aside payments. In addition, export refunds would have been lower as the internal price would have been reduced. As production is assumed to be similar under both the set-aside and price cut scenarios, the storage costs can be reasonably assumed to be at the same level.

5.40 It is assumed that the full benefit of the lower internal price is passed on to consumers.[16] Producers would lose the Arable Area Payments and set-aside payments and would have also received a lower price.

[16] For the purpose of this analysis it is assumed that domestic consumption would have remained at the same level as occurred in 1993. It may be the case that the lower price would have further stimulated consumption, reducing the quantity exported and stored. This would have further reduced the taxpayer costs.

5.41 This simple analysis estimates that the net gain would have been somewhere in the region of 450 million ECU in 1993. This figure does not take account of the distortionary impact of raising taxation as discussed in the literature review in Appendix 2 or the extent to which farmers could have reduced costs.

5.5 Conclusions

5.42 It is estimated that the average cost of preventing production by the use of set-aside (an estimated 83 ECU per tonne) outweighed the average costs of dealing with the surplus production during the period of the MacSharry reforms.

5.43 The economic rationale for set-aside became increasingly undermined during the mid-nineties due to strong world prices. This led to export refunds falling to an average of 12 ECU per tonne in 1996 compared to 89 ECU per tonne in 1993 and also compared to a cost of nearly 100 ECU in direct set-aside payments.

5.44 If the desired level of supply control had been attained by an uncompensated price cut, a large saving to taxpayers and consumers would have been made initially. However, as world prices rose in the mid-nineties these gains would have been reduced considerably.

5.45 A considerable fall in producer incomes would have occurred in the initial year of the reform (estimated at a fall in total gross margin of up to 55 per cent for some producing nations), although this would have been ameliorated by the higher world prices of the mid-nineties.

Chapter 6 Alternative policy scenarios

Chapter Summary

Model results show that a voluntary set-aside policy has the potential to lead to a more efficient distribution of set-aside.

Trade in set-aside could lead to gains to producers. However, despite the possibility of such gains, survey respondents appear reluctant to consider trade.

Complete liberalisation would lead to a major reduction in cereal production.

The continuation of the current policy simply with the removal of set-aside was not popular with producers or stakeholders.

There is interest in competitive schemes for set-aside. However, the possible payments required are much higher than current payments.

6.1 Introduction

6.1 Earlier chapters have highlighted some of the drawbacks associated with compulsory set-aside as a supply control and environmental policy. First, it has a negative impact on productivity. Second, it is inefficient as it requires both high and low profit producers to set-aside land. In addition, whilst it has produced some environmental benefits these are by no means maximised.

6.2 This chapter examines a number of alternatives to the current policy. These are assessed in terms of their impact on producers and their acceptability to stakeholders. The policies range from a complete liberalisation of the sector with the removal of all support mechanisms and set-aside through to a competitive set-aside policy aimed at maximising environmental benefits.

6.3 In the first part of the chapter, the possibility of a set-aside scheme that is purely voluntary is discussed. In addition, the possible gains from allowing farms to trade their set-aside restrictions are considered.

6.2 Voluntary set-aside

6.4 The current situation of making each farm set aside land is clearly inefficient in terms of achieving a given level of supply control. Those farms that are more profitable are having to set aside land as much as those that are not. An alternative method may be voluntary set-aside. In this situation it might be reasoned that those farms that were least profitable would set aside land and that a given amount of set-aside could be achieved at lower cost not only to the taxpayer but also to the producers themselves.

6.5 The model for an efficient set aside discussed in Chapter 4 can be extended to examine the issue of voluntary set-aside. Taking the estimated costs and returns from

that analysis it is possible to evaluate the level of payment required to achieve a given level of set-aside. This is calculated for varying levels of set-aside (5, 10 and 20 per cent) and two levels of average wheat prices (£75 per tonne, which is the actual average for 1998, and £100). In this analysis, it is assumed that producers can set aside the whole of their eligible area.

Table 6.1: Estimated set-aside payment required to achieve given level of set-aside: no restriction on area set-aside per farm

Average Price per tonne	Actual 1998 payment	Set-aside rate 5 per cent	10 per cent	20 per cent
		£/ha		
£75	296	216	239	279
£100	296	282	348	402

6.6 If we consider the situation in 1998 with 5 per cent set-aside and an average wheat price of £75 per tonne, then it is estimated that the payment necessary to achieve this level of set-aside is £216 per hectare. This can be related to actual level of payment under the obligatory scheme of £296 per hectare implying a potential saving of £80 per hectare. Unsurprisingly with higher cereal prices or increased rates of set-aside the required payment also rises. For example, if the average price for wheat had been £100 per tonne and the required rate of set-aside 20 per cent, the level of payment required to achieve this level of set-aside would have been over £100 per hectare more than the actual payment in 1998. Clearly these results are subject to a number of caveats and as such need to be treated with caution. They do, however, highlight the fact that any type of voluntary set-aside will be highly dependent on changes in the profitability of cereals.

Table 6.2: Estimated regional change in area set-aside

Region	Set-aside rate 5 per cent	10 per cent	20 per cent
		Per cent change	
North East	100	3	-44
North	27	-35	-17
North West	41	221	468
East Midlands	-35	-18	6
East Anglia	-72	-83	-75
South East	30	-33	-30
South	67	42	70
South West	237	582	303
Wales	159	336	156

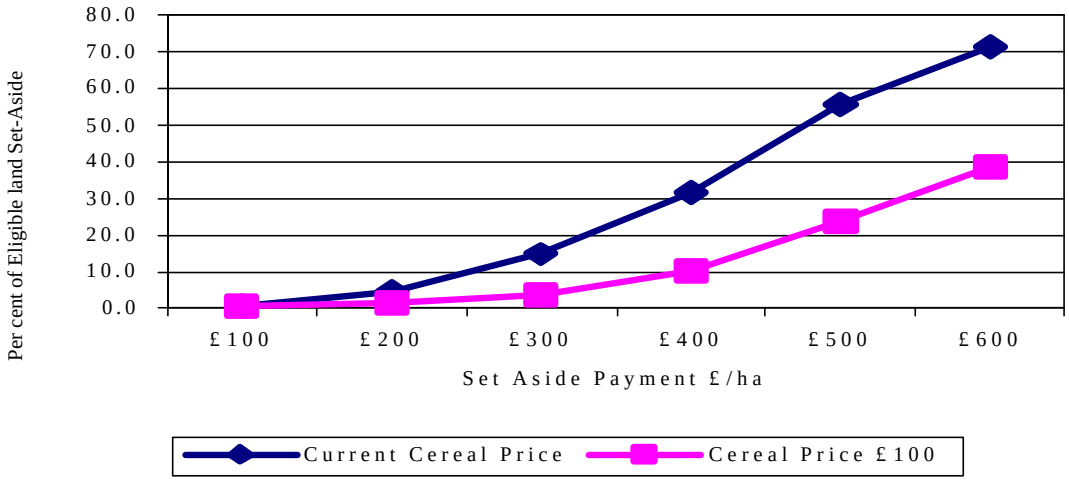
6.7 Our model suggests that voluntary set-aside will lead to a major change in regional distribution of set-aside. Table 6.2 reproduces estimates of the changes that would occur in area set aside in England and Wales. Again these results have to be treated with some caution given the small numbers of producers surveyed in some

regions. However, the results indicate in general a large swing in the area set aside from the East to the West of England and also from England to Wales. This reflects the relative profitability of cereal production. The results also show some changes as the set-aside rate alters.

6.8 The model appears to indicate that the level of set-aside in 1998 could have been achieved at lower cost under a voluntary scheme. The model also predicts that such a scheme would lead to a large change in the regional distribution of set-aside. These results can be compared with the findings of the farmer survey where co-operators were questioned about their willingness to enter a voluntary scheme.

6.9 Farmers were asked to indicate the proportion of land they would voluntarily set aside for different set-aside payments, if current price levels and cereal support payments remained the same. They were then asked to consider how much they would be willing to set aside if the cereal price was higher at £100 per tonne with support payments remaining at current levels. Figure 6.1 presents the offer curves derived from the co-operators' responses.

Figure 6.1: Voluntary set-aside offer curves



6.10 For simplicity, respondents were given discrete prices for set-aside. Therefore the curves in Figure 6.1 are really interpolations between points. The diagram does show, however, some interesting findings. In order to achieve 10 per cent set-aside at voluntary levels, a payment somewhere between £200 and £300 per hectare would need to be made. This is of course within the payment structure at the moment. With higher cereal prices the payment would have to be around £400 per hectare. This highlights the problem that if there are policy goals involved with set-aside then unless producers are tied into specific time frames (say 5 or 10 years) either the price will have to vary or producers will enter and leave the scheme, thereby offsetting some of the advantages of set-aside.

6.11 Of some interest is the relationship between profitability of cereals and the willingness to volunteer set-aside land. One would expect an inverse relationship. We examined this with the data from the 1998 cereal study. Surprisingly, we did not find a clear relationship between the price at which land was offered to set-aside and the profitability of the cereal enterprise. Roughly an equal number of farms were willing to set aside land within each income quartile. In addition, Table 6.3 highlights that there is no clear relationship between profitability and the proportion of eligible land offered at each payment rate. This may reflect that even the more profitable holdings have at least some land that is less productive or that farmers are keen to retain set-aside in the rotation.

Table 6.3: Per cent of eligible land offered for set-aside by income group (current cereal prices)

	Quartile group			
Payment rate	1	2	3	4
£/ha	Least profitable			Most profitable
	per cent			
100	0.6	1.1	0.9	0.1
200	2.3	4.1	3.8	5.7
300	9.2	13.8	16.0	16.6
400	25.2	26.5	35.8	34.1
500	42.1	53.4	57.1	61.2
600	62.5	68.4	82.8	67.4

6.12 Our model predicted that voluntary set-aside would lead to a concentration of set-aside in certain regions. In contrast, the results of the farmer survey suggest little regional variation in the willingness to set aside land.

6.13 Generally then, the survey results appear to suggest that there is very little relationship between the profitability, size and location of the cereal enterprise and the willingness of the farmer to offer land into voluntary set-aside.

6.14 There does not appear to be a major difference between the model and the survey results over the cost of achieving a given level of supply control through a voluntary scheme. However results vary considerably in terms of where set-aside would be located. The model based purely on financial figures from just the cereal enterprise may be failing to account for the importance of cereals to the whole farm business. In addition it clearly does not take into account possible motivations for farmers other than profit maximisation.

6.15 Some participants in the survey indicated that they would be prepared to put all their land into set-aside. In England and Wales, 69 per cent thought this would be a possibility with an average minimum payment of £512 per hectare, if support payments and prices remained at current levels. In Scotland, 73 per cent were interested and suggested an average minimum payment of £517 per hectare.

6.3 Trade in set-aside

6.16 Voluntary set-aside is just one possible method for achieving a more efficient distribution of set aside. Another method is to enable farms to trade set-aside. The economics of trade is discussed in more detail in this section.

6.17 A more liberal trading regime may be beneficial to the sector given the considerable differences in the profitability of the cereal enterprise between holdings. As we have already seen, the 1998 cereal survey highlighted a difference of some £25 per tonne in the average cost of producing a tonne of wheat between the most profitable and least profitable quartile groups of farms. Trade would enable the most profitable businesses to transfer their set-aside restriction to less profitable businesses. This would have the impact of targeting set-aside at the low-profit holdings, thus ensuring a more efficient distribution of set-aside. The more profitable businesses would not be constrained, and this would lead to a more efficient sector.

6.18 A simple example highlights how farms can benefit from trade in set-aside (Table 6.4). In this example there are just two farms (Farm 1 and Farm 2). Initially it is assumed that both farms have to set aside land and receive a payment of £300 per hectare. Farm 1 is more profitable than Farm 2. If it were able to grow an extra hectare of cereals it would get a net return of £500. Therefore it is some £200 worse off having to set aside land. Farm 2, in contrast, would only get a net return of £300 from an extra hectare of cereals, the same as the set-aside payment. They are assumed to be indifferent between setting aside the land and growing cereals. However, if Farm 1 were willing to make a payment on top of the set-aside rate then clearly Farm 2 would be better off taking set-aside from Farm 1. Farm 1 can make a payment of up to £200 and would still be better off. In this example it is assumed that the difference is split at £100. Therefore Farm 2 now takes the set aside from Farm 1 and receives the set-aside payment plus £100 from Farm 1. Farm 1 can produce cereals and receives the return from cereals minus the £100. Therefore it is possible to see that both Farm 2 and Farm 1 gain from the trade.

Table 6.4: Example of the gains from trading set-aside

	Farm 1	Farm 2
Return from set-aside	300	300
Return from extra hectare of cereals	500	300
Difference	-200	0
	After transfer of set-aside from Farm 1 to Farm 2	
Payment from Farm 1 To Farm 2	-100	+100
Income from extra hectare	400 (500 – 100)	400 (300 + 100)
Gain	+ 100	+100

6.19 A scenario can also be envisaged where Farm 2 would be willing to pay Farm 1 in order to take its set-aside requirement. This situation may arise if the return from set-aside was higher than that from growing cereals for Farm 2. However, this would only occur if Farm 2 were not able to set aside extra land voluntarily.

6.20 Despite the provisions for trading in the regulations governing set-aside and the large differences in the profitability of the cereal enterprise between farms, only six per cent of farmers in England and Wales in the survey, had participated in trade. Of those who had not participated the most important reason for not doing so was the complicated procedure (29 per cent), followed by the high penalties for mistakes (28 per cent) and areas of low productivity on the farm (18 per cent). However, another 33 per cent of respondents cited areas of low productivity on the farm as the least important reason. Other reasons given low importance were unawareness of scheme (59 per cent) and difficulty in finding a partner (38 per cent). In Scotland the proportion who had participated in trading was slightly higher at nine per cent. Here the most important reasons for non-participation were areas of low productivity (23 per cent), high penalties (20 per cent) and complicated procedure (16 per cent).

6.21 The system set up for trade has not been widely adopted. The complicated nature of the procedure and the fact that no real market exists causes problems. However, it is possible to envisage a system that overcomes many of the problems cited as reasons for not trading. For example, a system similar to that set up in Ontario for dairy quota exchange may be feasible. Here a central office collates bids from producers. Those wishing to purchase quota state the quantity and the maximum price they are willing to pay. Those wishing to sell quota state the quantity and the minimum price they are willing to accept. The price of quota is that which equates the quantity supplied with the quantity demanded. The advantage of this type of system is that it is efficient, inexpensive and accessible.

6.22 A similar system could be envisaged for set-aside even with the existence of voluntary additional set-aside. Here those wishing to reduce their set-aside restriction could tender the quantity of set-aside they wish to trade and the price which they would be willing to pay. Those interested in taking on more set-aside would quote the quantity they wished to take and the minimum payment that they would accept.

6.23 An indication of the possible leasing price of tradable set-aside can be obtained by extending the earlier analysis for an efficient set-aside. In this scenario, all producers initially have to set aside the required level of land and will obtain the set-aside payment, but then exchange is allowed.[17] The exchange considered is in effect a leasing market for set-aside, that is, it shows what producers would be willing to pay for the right to set aside land for one year. Given the uncertainties surrounding the existence of set-aside, it is unreasonable to consider a permanent exchange. The results of this analysis are shown in Table 6.5. If we examine the situation that existed in 1998 then we can see that a leasing price of set-aside of £80 emerges.[18] This occurs because, as shown above, the set-aside payment is greater than that necessary to achieve the 5 per cent of set-aside. Therefore at the margin producers are willing to pay in order to be able to set aside land and receive the set-aside payment. However, we see that as either the set-aside rate increases or the price per tonne of wheat increases, the price farmers are willing to pay to gain extra set-aside land falls. At a rate of 10 per cent and a wheat price of £100 tonne, a negative price emerges. That is,

[17] This analysis is undertaken with the assumption that there is no provision for farms to set aside extra land voluntarily.

[18] The availability of voluntary set-aside would place a limit on the trading price or maybe mean that one farm was not prepared pay another to obtain extra set-aside.

producers will be willing to pay someone to take their set-aside restriction so that they can produce more wheat.

Table 6.5: Equilibrium leasing price for set-aside

Average wheat price per tonne	Set-aside rate 5 per cent	10 per cent	20 per cent
		£/ha	
£75	80	57	17
£100	14	-52	-106

6.24 The predicted overall outcome of trade for the sector in terms of change in profitability and distribution of set-aside will be the same as that described for voluntary set-aside above. The difference in allowing trade is that the gains from more efficient production are kept within the sector and are not realised by taxpayers. Active trading would permit the government to pay a lower rate on set-aside and so realise some of the saving. The voluntary set-aside scenario enables the EU (and government) to capture some of the gains as they are able to pay less. Here the total cost to the taxpayer would remain the same.

6.25 Although our model suggests that there are clear gains to be had, there appeared to be strong resistance to considering trading set-aside at all. 72 per cent of respondents in England and Wales were not prepared to trade under any circumstances and slightly fewer in Scotland, at 68 per cent. Nearly half the sample (44 per cent) ranked dislike of more paperwork as the main reason and 33 per cent could see no perceivable gains from trade.

6.26 The resistance to trade could be the result of a number of possible factors. First, it may be the case that producers in the arable sector have little experience of such trade (unlike those in the dairy sector). However, before abolition, there was widespread trade in potato quota. Second, It might be the case that a market needs to be set up before producers can get a clear understanding of the potential benefits from trade. Some education may also be necessary for producers to get a clear understanding of the possible benefits.

6.4 Alternative policy analysis

6.27 As a means of exploring the potential for alternative policy approaches, we have developed a number of alternative policy scenarios. These range from full liberalisation to the implementation of new mechanisms for set-aside. The scenarios were used as a basis for questions to farmers, and stakeholders were asked to comment on them. In some cases our analysis has implications for particular policy approaches.

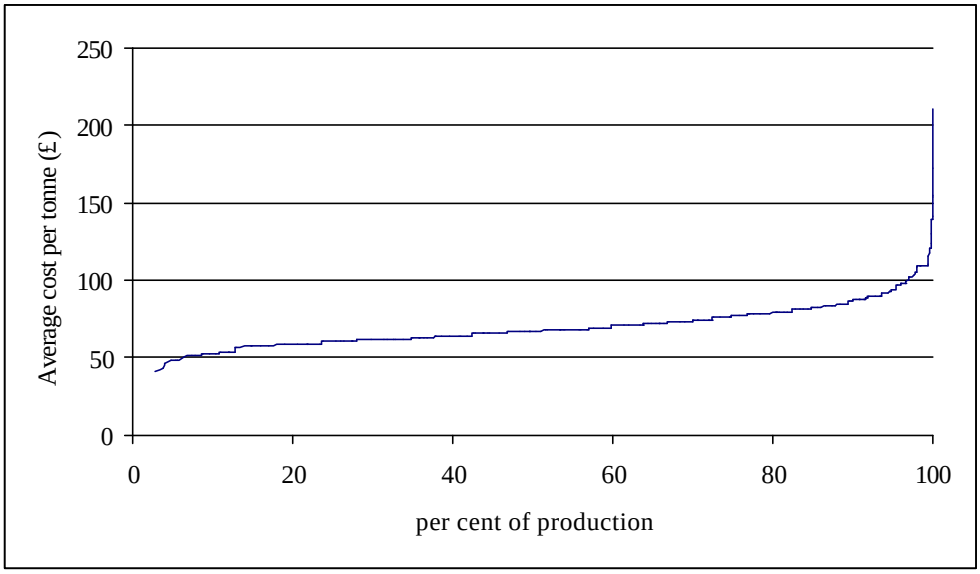
6.4.1 Full liberalisation

6.28 This policy scenario involves the removal of all policy support such that there would be no set-aside or arable payments and products would be traded at world prices. This would clearly present difficulties for many farmers who may be unable to continue in operation. However, we would anticipate that there would also be some

reduction in input price levels (especially rents) that might offset some of the loss of income. We have not attempted to estimate the extent of these subsequent changes and must anticipate that farmers themselves would not have done so either.

6.29 Figure 6.2 presents an analysis of average costs of production from the 1998 survey. In the figure, farms are ranked according to their average costs. The cumulative share of production is then plotted against average cost.[19] Only 40 per cent of production was produced at an average cost less than £65 per tonne (even excluding rent). It is clear that with the current price structures, complete liberalisation would have a major impact on production unless cereal prices were to rise considerably or input prices fall markedly.

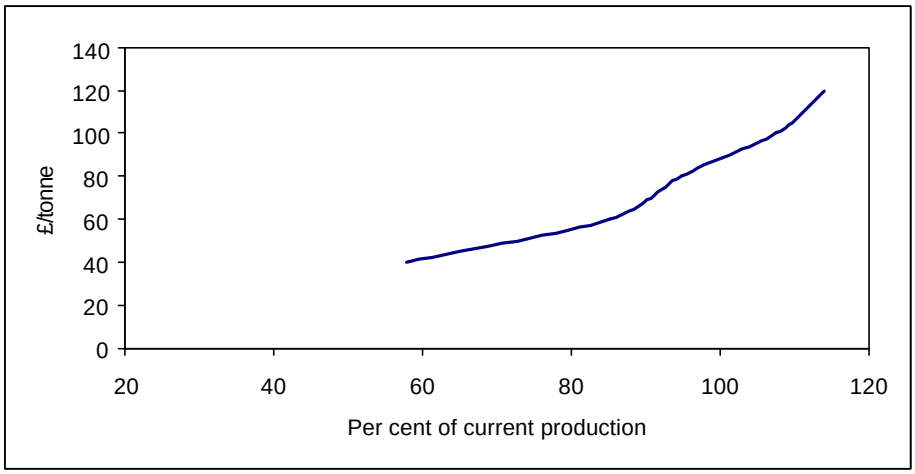
Figure 6.2: Average costs of production (excluding rent) 1998



6.30 The supply response from the farmer survey to full liberalisation is highlighted in Figure 6.3. Here farmers were given alternative prices for cereals in the wake of liberalisation and asked their likely change in production. The figure represents production relative to the current level. It is evident that if world price was above £100 per tonne cereal production would expand. However, at current prices there would be around a 15 per cent reduction. If prices fell as low as £40, production would fall by an estimated 40 per cent. These figures appear somewhat more optimistic than the cereal survey results. For example, even excluding the rental value of land, it is estimated that only 40 per cent of production was produced at an average cost of less than £65 per tonne.

[19] Marginal costs were estimated from the earlier model and show a very similar distribution

Figure 6.3 Cereal production under complete liberalisation



6.31 Most stakeholders saw complete liberalisation as impossible, especially in the short to medium term. Many raised the issue of other countries continuing to support their industry which would make global competition unfair. However, several stakeholders saw the option as a long term ideal, as long as there were no export restraints and with the proviso that the environment would have to be supported and farmers encouraged to do this. Otherwise they perceived the loss of all environmental benefit, although this perception may be questioned. If liberalisation led to lower prices, it is not clear that all land currently cropped would remain viable. Marginal areas may be left uncultivated and result in a greater area of land set aside than at present, but without management this land would probably not offer the same environmental benefits attributed to set-aside at present. Also, lower output prices are likely to lead to generally less intensive farming which may well benefit the environment.

6.4.2 Zero set-aside

6.32 This scenario simply removes set-aside while maintaining all other policy elements (arable payments and price support) at current levels. We also assume that prices remain at present levels.

6.33 The farmer survey showed the popularity of set-aside; over 70 per cent wanted set-aside maintained or increased. The impact on land use with zero set-aside would result in an increase of cereals, oilseed rape and legumes with industrial crops falling by 42 per cent. The impact on potatoes and sugar beet would be minimal. The main reasons why producers wanted the maintenance of set-aside appeared to be centred around the view that set-aside was better balancing supply with demand and thus was maintaining prices at a higher level than would be the case in its absence.

6.34 The results of the farmer survey indicate that between 70 and 80 per cent of land currently set-aside would revert back to cereals if set-aside were abolished. This finding supports the earlier estimates of the output control impact of set-aside.

6.35 The abolition of set-aside with no alternative policies was not popular with stakeholders because of the loss of environmental benefits.

6.4.3 Competitive set-aside targeting environmental benefits

6.36 This scenario proposes that set-aside would be operated with the objective of maximising the environmental benefits obtained from a given expenditure on set-aside payments. Farmers would tender bids to MAFF indicating the area of set-aside land offered, management system proposed, some basic characteristics of the land involved, and the payment required. Farmers know that MAFF would rank bids according to the ratio of an index of environmental benefits offered to the payment required. MAFF could use indicators of environmental benefits, such as management method, proximity to watercourses and nature reserves or woodland, and intensity of arable production within the local area for the ranking exercise. Successful bidders enter into a contract with MAFF. Contracts may be offered over different periods of time. It is thus a voluntary scheme. Arable area payments and prices remain at current levels.

6.37 Thirty per cent of farmers in the survey were interested in this scenario. They would be prepared to offer an average of 20 hectares for an average minimum payment of £385 per hectare. Not surprisingly most (80 per cent) would offer their least productive land while 20 per cent would offer average productive land. The main benefit provided would be bird/insect habitat (47 per cent), followed by over-wintered stubble (18 per cent) and ponds, hedges, trees, wetland (seven per cent). Less than three per cent of the sample offered any other benefits.

Table 6.6: Average payment required for environmental set-aside in relation to average returns from cereals

	£/ha
Average payment required	385
Average gross margin from cereals	552
Low gross margin from cereals	464
Average gross margin less fixed costs	355
Low gross margin less fixed costs	268

6.38 Several stakeholders saw this scheme as providing value for money and encouraging farmers to think in an environmental way. However, many thought it too bureaucratic and administratively expensive. There was also concern that it was not flexible enough and ordinary arable farmers would not have much to offer. Competitive schemes give the impression of asking the farmer for a lot of input with risk of rejection. There was also a perception that the Forestry Commission scheme that ranks applications does not serve the public well as it encourages applicants to propose inappropriate procedures to get the payments.

6.4.4 Competitive set-aside targeting supply control

6.39 The objective of the policy in this scenario is to achieve reductions in the volume of cereal production at minimum cost. The scheme would operate in a similar manner to the previous scenario, but in this case, MAFF would accept bids on the basis of who offers the lowest price per tonne of reduced cereal output, with no weighting given to environmental benefits. Rules on the management of set-aside land would continue as at present. Again, farmers would have to decide how much land, what land, and at what price to offer. In addition, they will also have to supply information on the yield potential for each parcel of land offered. MAFF could verify this information by comparing it against land classification or local data on cereal yields. The lack of local yield information may present a problem in verifying claims made by farmers. One approach might be to require farmers to declare their historic yield, which could, if questioned, be demonstrated in terms of sales in the relevant marketing year.

6.40 Over one third of the survey farmers (37 per cent) were interested in this option. Of these, 63 per cent were prepared to offer least productive land, asking between £200 and £400 per hectare. 66 per cent of those offering land of average productivity would ask between £300 and £500 per hectare; and 55 per cent of those offering their most productive land wanted between £400 and £600 per hectare. See Table 6.7 for details.

Table 6.7: Average payments required and average returns for competitive set-aside

	£/ha
Payment required to set aside:	
Most productive land	484
Average productive land	412
Least productive land	334
Average gross margin from cereals	540
Low gross margin from cereals	457
Average gross margin less fixed costs	347
Low gross margin less fixed costs	263

6.41 Although a couple of stakeholders saw this option as an opportunity to get the maximum amount of set-aside for the least price, in general it was not popular. It may have an attraction to marginal producers, providing they could compete with larger producers in the tendering system. Mostly, stakeholders saw this option as detrimental to the environment and worse than the present system.

6.4.5 Whole-farm set-aside plan

6.42 This scenario explores the possibility of a more detailed environmental planning approach. Individual farmers, together with a conservation officer would design a set-aside plan for their specific holding, targeting the environmentally most sensitive land on the farm. This would facilitate the achievement of environmental objectives at the landscape scale by taking account of the local context within which the farm is set, such as the creation of an ecological lattice, i.e. a network of set-aside land cutting across numerous holdings linking and buffering areas of conservation value. Contracts for the scheme would operate for 10 years. The scheme would be voluntary. Arable payments and price support would continue at current levels.

6.43 The collaborative approach appealed to 41 per cent of survey farmers, although it must be pointed out that 33 per cent of the sample replied positively to both this option and the competitive option to maximise environmental benefits. An average minimum payment of £398 per hectare was suggested.

6.44 This approach appealed to many stakeholders but they had reservations about the administration cost. An organisation such as FWAG would be well placed to administer it but they would need extra funds. The quality of the advice is seen as critical. Advisors would have to be knowledgeable not only in environmental matters but also in agricultural practices, or farmers would not be interested. There would

have to be more flexibility than in the current stewardship schemes which are seen as too prescriptive. A voluntary scheme, presenting farmers with a challenge, was seen by many stakeholders as more productive than imposing legislation. In this situation, policing would be less of an issue. It was felt that this scheme would not appeal to everyone but would be worth pursuing for a minority as the environmental gains could be considerable. This type of scheme would allow a holistic approach to environmental management and could be managed to address local issues. It has the potential to win back public support for farmers.

6.5 Analysis of positive respondents to competitive and whole-farm set-aside

6.45 It is of some interest to consider the nature of the farms that are willing to take part in the competitive schemes and whole-farm set-aside. In total around 63 per cent of farms responded positively to one of the three options. Around a third of these responded positively to all three. A slightly higher percentage responded positively to at least two of the options.

6.46 Tests were undertaken to relate the profitability of the holding to the willingness to take part in a competitive scheme. The only significant difference between groups ranked by profit was with the competitive scheme to maximise environmental benefits, where the low-profit holdings were less likely to tender. Other tests were conducted to compare the profitability of the holding and the tender price. There were no significant differences between the offer price and the profitability of the holding. There were some regional differences in willingness to take part in the scheme, although these were not along East-West lines. This would suggest that a competitive scheme would not lead to a marked change in the distribution of set-aside between the East and West. Enterprise size was similar between those interested and not interested in competitive set-aside

6.6 Scotland – results from the farmer survey

6.47 Responses to full liberalisation were very similar as were the impacts on land use for the zero set-aside option. The only exception to this was grassland, where there were no responses to decrease the area. A higher proportion (50 per cent) of Scottish farmers showed interest in competitive bidding for supply control but their tenders were in the same range. A slightly lower proportion (26 per cent) were interested in bidding to maximise environmental benefits. They also offered an average area of 20 hectares, but their suggested average minimum payment was lower at £324 per hectare. A similar proportion responded positively to collaborative (whole-farm) set-aside but with an average area offered of 26 hectares, double that for England and Wales. The average price per hectare requested was slightly lower at £373 per hectare.

Chapter 7 The Prospects for Set-Aside

Chapter Summary

The development of world cereal markets and the outcome of trade negotiations are crucial to the prospects of set-aside as a supply control instrument.

Favourable world market price predictions suggest that the EU will be able to export wheat without subsidies. The situation for some other cereals is a little less clear. However, it is generally argued that there will be no need for set-aside for supply control in the longer term.

Set-aside has environmental benefits and these will persist into the future. However, set-aside needs to be redesigned to maximise these benefits.

Set-aside is not a suitable mechanism for the promotion of industrial crops. If some form of support for these crops is warranted on public good or infant industry arguments, it should be more specifically targeted and not be a by-product of EU cereal policy.

7.1 Is there a continuing rationale for set-aside as a supply control instrument?

7.1 The prospects for the set-aside as a supply control instrument depend on two major factors: the development of world cereal markets and the outcome of the Millennium Round trade negotiations and its subsequent impacts on the CAP.

7.2 The Millennium Round on agriculture was started with a number of special sessions of the Committee on Agriculture in 2000. While in the face of the US presidential elections no serious negotiations have been conducted so far, the range of views and positions of different countries have become clear. This is not the occasion to review the different countries' position papers. The relevant documentation can be viewed on the WTO's web page (www.wto.org). The submissions can be found under symbol G/AG/NG/ using the online documentation search function.

7.3 While the views expressed in the position papers differ widely, it seems that none of the countries questions the rules and disciplines established under the URAA, nor disagrees, at least in principle, with the need for further reductions in the use of trade-distorting policies. This is a significant difference from the early phase of the Uruguay Round negotiations which, according to Tangermann (2001), raises the prospects that further cuts will be agreed under the three familiar headings: tariffs and tariff equivalents; domestic support (possibly with a focus on the blue box); and export subsidies.

7.4 Up to now, the EU has been able to comply comfortably with the URAA limits on tariffs and domestic support (Tangermann, 2001), while the limits on subsidised exports have been exceeded in some years of the URAA implementation phase. Further reductions of the tariff limits may force down internal prices in as much as the EU may no longer be in a position to shield intervention prices through variable import levies to the same extent as in the past. This situation is likely to arise when

world prices are low and, consequently, per-unit variable import levies are automatically increased. Forced cuts in the level of internal prices would reduce the need for set-aside as a supply control instrument for at least three reasons: (1) decreasing domestic production, (2) increasing domestic consumption, particularly of feed grains, (3) lower per-unit export subsidies as the gap between internal prices and world prices shrinks. The last would allow the EU to comply more comfortably with the WTO commitments on the expenditure of subsidised exports.

7.5 On the other hand, it looks likely that further cuts in the permissible volume of, or expenditure on, subsidised exports might be agreed in the Millennium Round - possibly of the same magnitude (in per cent terms) as in the Uruguay Round (Tangermann, 2001). This would put pressure on the EU to retain set-aside as a supply control instrument, at least as long as the EU is reliant on export subsidies. Should the EU be able to export cereals without subsidies, the WTO export constraints would no longer be binding and the supply control rationale of set-aside would be seriously weakened.

7.6 The prospects for exporting cereals without subsidies depend largely on the future development of world cereal prices in relation to EU support prices. Various commentators (Tangermann, 2001; Uhlmann, 2001) and organisations (USDA , 1999; OECD, 2001, FAPRI, 2001) project strengthening world cereal prices for the medium-term future, underpinned by strong and growing cereal demand world-wide, but particularly in developing countries and the Far East. The OECD in its 2001 Agricultural Outlook expects world consumption of wheat and coarse grains to grow by 1.5 percent annually up to 2006, compared to 1.1 per cent per annum over the last decade.

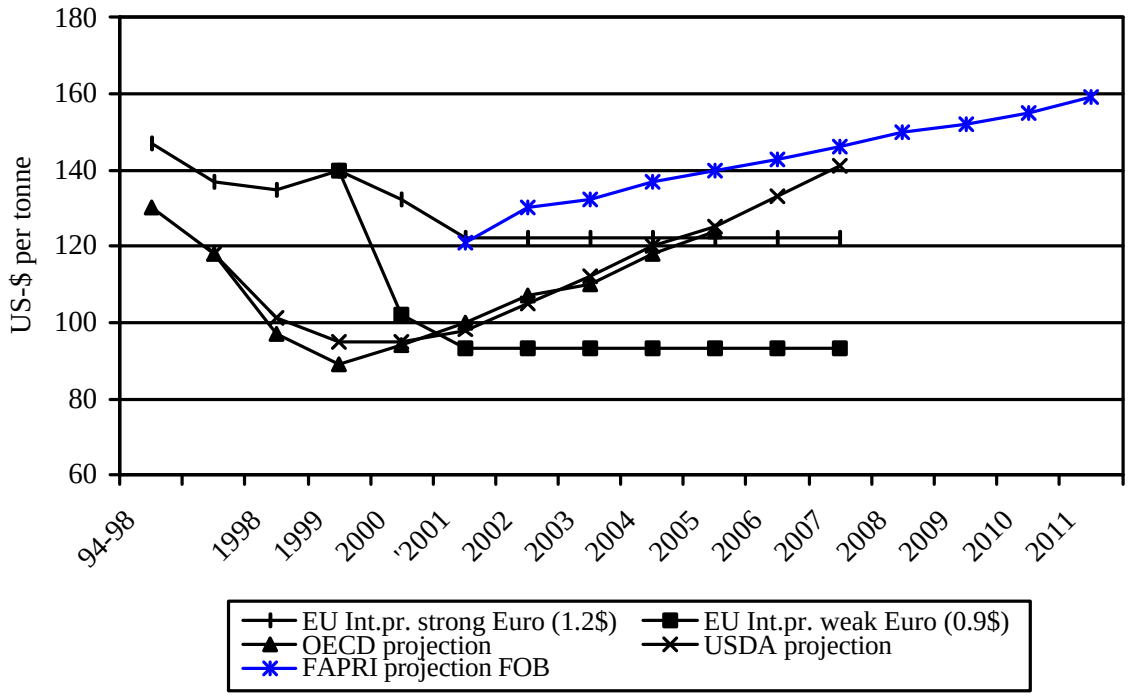
7.7 At the same time, EU internal prices are scheduled to come down further as the price cuts agreed under Agenda 2000 are being implemented in the current and the next cropping year. Tangermann (2001) predicts that, once Agenda 2000 has been fully implemented, there is a good chance that the internal price of wheat (expressed in US-$) may indeed fall below the world price, especially when the Euro continues to be weak against the US-$ at the current rate of Euro 0.9 per US-$. But even with a strengthening Euro (at 1.2 per US-$), it looks likely that world prices and EU internal prices converge within the next few years, allowing the EU to export wheat without the use of export subsidies. Indeed, the EU has already been able to export more than 8 million tonnes of wheat and barley without subsidies in the 2000/01 cropping year. This is more than a third of the total export volume of wheat and barley. The various price projections are shown in Figure 7.1. The world price projections are based on OECD, USDA and FAPRI forecasts, all of which point in the direction of a strong world market for wheat.

7.8 World price projections for feed grains are less optimistic. Tangermann (2001) does not expect the world price to rise above the internal price over the next five years. This view is supported by Bensted-Smith (2001). FAPRI, in contrast, predicts the world price of barley to rise above the EU intervention price as of the current cropping year. Tangermann (2001) thinks that the gap between internal and world prices will be sufficiently narrow to allow the EU to export *some* quantities of feed grains without subsidies. The OECD (2001) estimates the combination of rising world prices and falling internal prices will allow EU wheat exports to rise by over 5 million

tonnes (+37 per cent) to around 20 million tonnes and coarse grain exports by over half a million tonnes (+6 per cent) to over 13 million tonnes by 2006. These larger unsubsidised exports will enable the EU to increase its international market share, possibly at the expense of the US and other cereal exporters and will help to moderate world price increases (OECD, 2001).

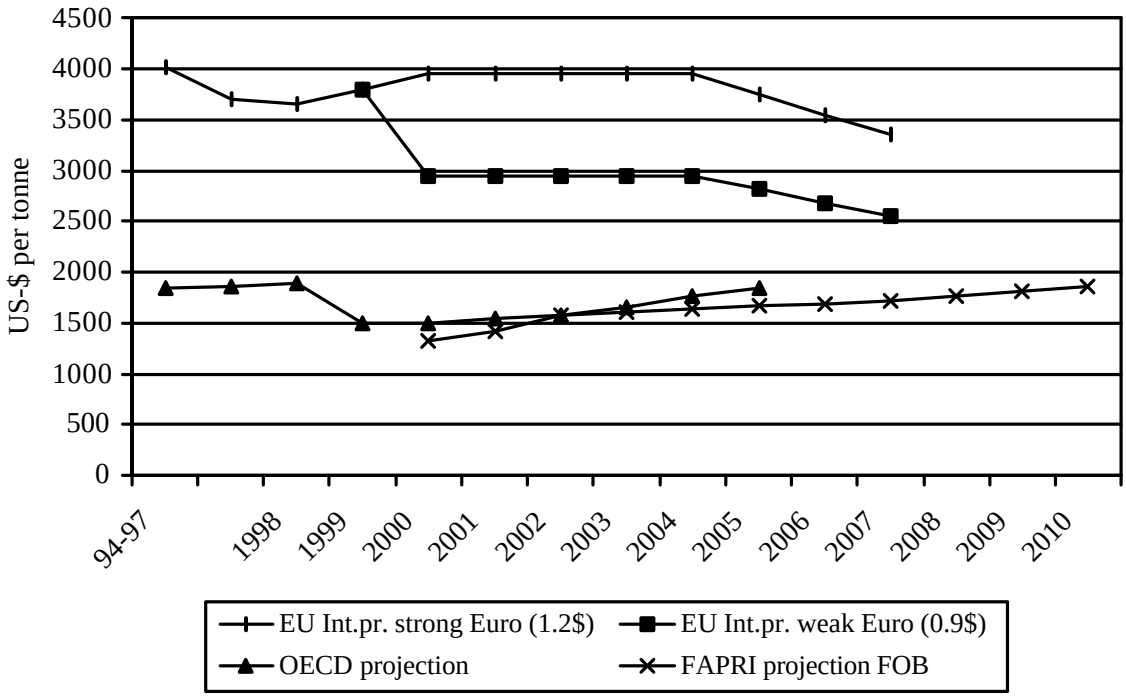
7.9 The situation looks entirely different for some other agricultural commodities. Figure 7.2 shows world price projections and EU internal prices for butter. It is clear from the figure that the price cuts of Agenda 2000 have not been sufficient to allow the EU to export butter without subsidies in the future. The same applies to the beef and the sugar sectors. Further price reductions (or tighter supply controls) are needed for these commodities, and it looks likely that trade negotiators in the current round will focus their attention on these sectors rather than cereals.

Figure 7.1: World price projections and EU intervention price: wheat



Sources: Adapted from Tangermann (2001) based on OECD (2000, 2001), USDA (1999), Agrarwirtschaft (2000), FAPRI (2001)

Figure 7.2: World price projections and EU intervention price: butter

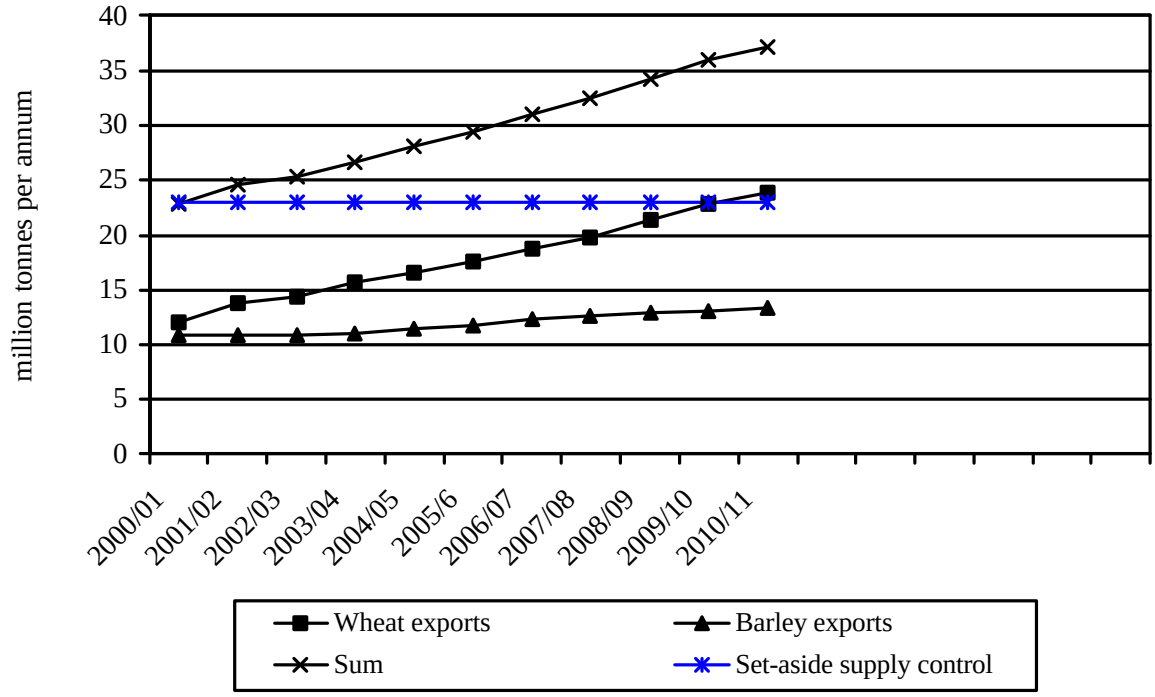


Source: OECD (2000), FAPRI (2001); courtesy of Stefan Tangermann

7.10 In sum, it appears likely that the EU will be able to export wheat without subsidies in the medium-term future. To a lesser extent, this may also be the case for other cereals, although this appears less certain. The chance of exporting rye without subsidies is virtually nil, unless the support price fell by approximately 30 per cent (Bensted-Smith, 2001). These projections make it look unlikely that, in the medium-term future, set-aside would be needed as a supply control mechanism for wheat - even if further cuts in the permissible volume of subsidised exports were agreed in the Millennium Round. However, set-aside may indeed be needed for controlling the supply of secondary grains, if not in an average year, at least in years of weak demand and low world prices. This assessment is shared by Bensted-Smith (2001). Thus, it might be prudent, as a measure of precaution, to keep the institutions of set-aside in case the market conditions for secondary cereals turn out to be weak so that the WTO export limitations remain binding.

7.11 One must bear in mind though that a significant increase in exportable surplus resulting from the abolition or scaling-down of set-aside, may put downward pressure on world prices. In Chapter 4, the supply control impact of set-aside was estimated at a total of 164 million tonnes of cereals for the whole of the EU during the period 1993 to 1999, or c. 23 million tonnes per annum. This is a large number when compared to the EU's projected exports of wheat and barley shown in Figure 7.3, suggesting that the abolition of set-aside may in deed have a marked impact on world prices. Clearly, if some form of set-aside is retained purely for environmental reasons, cereal production and exports would be lower than in a world without any form of set-aside.

Figure 7.3: FAPRI projections of EU wheat and barley exports vis-à-vis estimated supply control effect of set-aside



Source: FAPRI (2001); supply control data from Chapter 4.

7.2 Is there a continuing environmental rationale for set-aside?

7.12 A number of environmental benefits of set-aside are now widely recognised. These have been reviewed in Chapter 7. The stakeholder survey has shown that these benefits are widely cherished by environmental groups and that considerable vested interest has been building up behind set-aside.

7.13 From an economic point of view, the question arises whether set-aside is the most efficient mechanism for generating environmental benefits in the countryside. The following observations can be made:

1. Set-aside as an extensive-margin policy is effective in addressing extensive-margin problems, i.e. environmental problems related to the cultivation of unsuitable, environmentally fragile land. This is the case, for example, in the US where many environmental problems arise through the agricultural use of highly erodible land. Many of the environmental problems in the European countryside, in contrast, are caused by high land use intensities (rather than the use of the 'wrong' land). This suggests that, in principle, intensive-margin policies, i.e. policies that reduce intensities on existing agricultural land, might be more effective than set-aside.

2. There are, however, certain environmental benefits that are directly linked to set-aside and that are more difficult to generate by the use of intensive-margin

policies. These are, among other things, the provision of habitats and feeding grounds for birds in the arable landscape and the various buffer functions of set-aside adjoining environmentally sensitive areas such as water bodies or nature reserves.

3. Another advantage of set-aside that is often emphasised by environmental groups in favour of retaining set-aside is its broad geographical coverage. As a quasi-compulsory policy, set-aside has the potential to deliver environmental benefits in all parts of the arable landscape. Experience shows that it is much more difficult to achieve the same geographical coverage with voluntary agri-environmental schemes. On the other hand, it may be argued that many agri-environmental problems are heterogeneous in space. It is recognised in the environmental economics literature that a one-size-fits-all policy is not the ideal arrangement under such circumstances. If the policy is to deliver environmental benefits in the most cost-effective way, the geographical delimitation of that policy programme should fit the spatial dimension of the problem in question.

4. Doubts may arise in the future as to the WTO compatibility of set-aside in a fully liberalised world. The impact on trade of any particular (agri-environmental) policy depends largely upon the extent to which agricultural output and environmental benefit are linked. Examples of policies where this link is relatively loose include the maintenance of hedgerows or the rebuilding of stonewalls as means of enhancing landscape value. In contrast, set-aside of productive farmland, even if environmentally motivated, may be seen as involving a more direct link between environmental objectives and agricultural output. This may give rise to calls for the use of more 'decoupled' measures (Latacz-Lohmann and Hodge, 2001).

7.14 On balance, it seems that there might be a continuing rationale for set-aside on environmental grounds. An environmental set-aside scheme, however, would be different from the current scheme. It would have clearly defined environmental objectives, it would be spatially targeted and tailored to local environmental conditions and demands and, assuming a fully liberalised world, it would try to minimise the impacts on production and trade. Such a scheme would be a stand-alone 'green box', 'second-pillar' agri-environmental programme, delinked from commodity programmes and stripped of any supply control objectives. It may be based on a whole-farm conservation approach, and farmers may be invited to bid for set-aside contracts with the government to ensure that the objectives are achieved in the most cost-effective way.

7.15 There are two ways in which such a scheme could be implemented. First, as a voluntary programme in line with the agri-environmental schemes under Regulation 2078/92. This may be seen to 'adversely' affect its geographical coverage compared to the current scheme. However, in a fully liberalised world, it may be the only realistic option. Second, and assuming that farmers continue to receive some direct support, environmental set-aside could be implemented as a cross-compliance type condition attached to that support.

7.3 Is there a continuing rationale for set-aside to advance industrial and energy crops?

7.16 The answer to this question is a clear 'no'. First, a set-aside rate that varies from year to year to reflect changing market conditions exposes the non-food industry to a great deal of uncertainty. This is particularly important in the processing industry where highly specific, long-term investments have to be made. Such investments are at risk of being devalued if the volume of set-aside is significantly reduced or if the policy is abolished. There is indeed the risk that the industry may use asset specificity and 'locked-in' investments as arguments in favour of retaining set-aside, if it is no longer needed for supply control. Second, the support provided through set-aside stands in no relation to the perceived benefits (such as the production of renewable energy sources or recyclable materials) of non-food production on arable land. If such benefits exist, they should be targeted by more specific policies, those that allow non-food crops to compete with food crops on an equal footing. The first important step would to further reduce support prices for food crops. In sum, set-aside can at best be a second-best policy to promote the planting of industrial and energy crops.

Chapter 8 Conclusions and Recommendations

8.1 Conclusions on set-aside

8.1 Set-aside was introduced as an expedient against a number of essentially incompatible policy pressures: to limit surplus production and the impacts of the CAP on world markets without being able to reduce domestic price levels sufficiently to achieve this. Whether or not it was seen as a temporary expedient is unclear, but its limitations were and still are quite widely recognised. In economic terms, it was always a second-best policy, or worse. However, it has clearly played a significant role as one part of the arable area payments regime.

8.2 The evaluation of set-aside is particularly complex for several reasons, essentially associated with providing a definition of the counterfactual, the conditions that would prevail in its absence. An evaluation involves a comparison of the world with the initiative being assessed with some alternative, counterfactual world. The particular problem arises from the simultaneous changes both in policy and in market conditions that occurred at the time of the introduction of obligatory set-aside and the varying rules that have applied to set-aside subsequently. We have taken a number of different views of this evaluation at different stages in our analysis. Thus we can assess set-aside from a number of different perspectives. While it has not always been possible to identify the separate influences of the individual elements of policy, we can make some general observations on the different aspects.

(a) The efficiency of set-aside as a means of supply control

8.3 As a general rule, a reduction in prices would always be more efficient than the introduction of an extra policy mechanism by which to restrain the levels of production. A supply control mechanism allows government to maintain a higher price level than would otherwise be the case. This price level sends false signals to decision makers in agriculture, and resources will be held in the industry that would otherwise shift to alternative uses. Adjustment between farms will be restricted and asset values too will be held at a higher level. Our analysis of a 'voluntary' set-aside policy suggests a potential gain of £80 per hectare and this illustrates the potential gains to be achieved from a reduction in price. The policy is likely to impose a cost on consumers that is regressive in nature and there is also a cost to taxpayers. It might be argued that there are social, environmental or distributional benefits from the policy, but in general these may be obtained more efficiently by means of more specific and targeted policy instruments.

8.4 However, if price reductions are deemed to be unacceptable (at least in the short term) then some form of supply regulation will be required in order to maintain them. The issue then becomes one of what form this should take.

8.5 If a policy of supply control is to be introduced, how does set-aside stand as a method of achieving it? We have not undertaken a review of alternative supply control mechanisms. A supply control measure has to operate by limiting inputs into the production process or the volume of outputs from it. Various suggestions have been made in the past as to how this might be achieved, such as for two-tier pricing or

quotas on production volumes or on fertiliser inputs. Other approaches are applied within other sectors in agriculture, particularly quotas whether on milk or on livestock. We have little information on which to judge whether such alternatives might be applied to the cereals sector, but generally there would seem to be few reasons for believing that these alternative would be preferred. We would need to consider both the implications for resource allocation in agriculture and the transactions costs of alternative mechanisms. Thus for instance it is difficult to imagine that a policy of quotas for cereals output could be effectively implemented and enforced.

8.6 We have undertaken a comparison of the costs of set-aside in comparison with the costs of dealing with surplus production via export subsidies. This suggests that in the year in which obligatory set-aside was introduced, set-aside was the cheaper option. However, over the next few years, the cost of set-aside was higher. The current position is unclear.

8.7 We have estimated the extent of slippage associated with set-aside for the UK and other European countries. The analysis suggests that this is not especially large. We have found little evidence that yields have increased as a result of set-aside. The areas of land set aside have often exceeded the official rate set for obligatory set-aside due to the other forms of set-aside in operation. This effect has been greater in other European countries than in the UK.

8.8 The responses in the survey suggested that set-aside has had a rather limited impact on farms. In the analysis of Farm Business Survey data we find, not surprisingly, that set-aside has had most impact on cereal and general cropping farms. Here too the evidence indicates that the reduction in output has been similar to the official set-aside rate. We also find evidence that set-aside is a source of inefficiency within individual farms, but the effect is very small. Generally, what impacts are evident seem to diminish over time as farmers are able to adjust their businesses to the altered policy regime.

8.9 Perhaps the strongest evidence of inefficiency arises from the way in which the set-aside has been implemented. Obligatory set-aside requires an equal minimum level of set-aside from all farmers too large to be eligible for the simplified scheme. Thus both high and low profit farmers are required to make the same minimum reduction. Our analysis suggests that in 1998, for example, a voluntary set-aside scheme could have achieved an equivalent area in set-aside at a payment of nearly £80 per ha below the rate currently paid. However, against this, our survey of farmers suggests that they may be reluctant to tender for set-aside and that there was surprisingly little relationship between willingness to participate in voluntary set-aside and the level of farm profitability. The implication is that there are potential savings to be made, but that some effort would need to be directed towards bringing a new policy approach into operation.

(b) The efficiency of set-aside as a means of environmental improvement

8.10 Despite the secondary and somewhat uncertain nature of the environmental objectives for set-aside, there appears to be quite a generally held view that set-aside is good for the environment because it is so widespread. Much depends on the details

of the type of set-aside, its location and the form of management. But the introduction of a 'break' into intensive arable rotations has been found to be beneficial, particularly for birds. Many of the stakeholders interviewed felt that this benefit is rather different from that offered by existing agri-environmental policy mechanisms and that it would be lost if set-aside were to be abolished. However, this is not to say that the current policy approach offers the best way of achieving environmental improvement given the level of resources that are directed towards it; this would be unlikely to be the case.

(c) The efficiency of set-aside as a means of supporting non-food and industrial crops

8.11 While we have not undertaken a specific analysis of the efficiency of using set-aside as a means of promoting the production of non-food and industrial crops, we believe that there are strong *a priori* grounds for doubting that set-aside offers the best option. A more targeted and consistent policy mechanism would be likely to achieve a given objective on a more secure basis and at a lower cost

8.2 A future for set-aside?

8.12 Current predictions for world price levels relative to EU price levels suggest that the requirement for set-aside may be lower in the short to medium term, perhaps the next decade or so. Environmental objectives for set-aside were added as something of an afterthought; perhaps to justify a politically unattractive policy of paying farmers not to grow crops. While some environmental benefits were expected, the overall view as to the environmental impact was mixed. However subsequent experience tends to confirm the delivery of certain benefits, particularly associated with an alleviation of some of the damaging consequences of intensive arable production for wildlife.

8.13 Our analysis leads us to a number of conclusions:

- That the regulation of supply by means of the level of output price will be more efficient than regulation by set-aside.

- That a competitive approach to set-aside will be more efficient than an obligatory scheme requiring equal participation by the majority of farmers.

- That projections of world prices suggest that set-aside may not be needed over the next few years, particularly for wheat, but that given the uncertainty in world prices, we cannot rule out the possibility that some requirement for set-aside may arise in the future.

- That while set-aside is not universally beneficial to the environment, it does generally offer benefits to wildlife, particularly in the most intensive arable areas; areas generally not targeted by regular agri-environmental schemes. But, that management is important.

- That set-aside has made a contribution to the development and production of industrial crops whose use has certain environmental advantages but that linking this to a set-aside programme distorts the incentives for efficiency.

8.14 While we have examined a number of aspects and implications of set-aside, we should recognise the limits of what has been undertaken. We have not considered the transactions costs associated with the implementation of set-aside. These must be substantial, both for government and for the individual farmer.

8.3 Potential policy package

8.15 We can identify three distinct roles for a 'set-aside' type policy mechanism: the capacity for the regulation of supply and environmental compensation in intensively farmed areas, a more detailed form of longer-term land diversion targeting environmental benefits at a more locationally specific level, and a scheme for the production of industrial crops. Given doubts about the requirement for a regular policy for supply control in the current context and the inefficiency of the set-aside mechanism as a means of supply control, the justifications for these policy mechanisms would depend on the presence of other types of missing markets. This is to say that the requirement to control the level of cereal production should not be seen as the primary motivation for the policies, but the potential to pursue this objective is retained. This raises questions about what source of CAP funding would be most appropriate for policies of this sort.

(a) A competitive scheme for land diversion

8.16 This element of the policy package would have two objectives: the maintenance of the capacity to implement set-aside for supply control whenever the need arises and the introduction of environmental compensation within intensively cropped areas.

8.17 While the immediate requirement for set-aside appears likely to be reduced, the possibility of its use in the future cannot be ruled out. However, if the policy mechanism were to be entirely dismantled, it would take time to reinstate it. There might be some element of option value associated with the maintenance of an institutional structure which can be quickly directed towards supply control, looking one season ahead, if this should prove necessary. At the same time, experience with the environmental impact of the existing set-aside scheme suggests that its major environmental contribution, beyond the types of environmental benefits provided by the existing package of agri-environmental policies, is to provide for wildlife within relatively intensively cropped areas. In this respect, it can be seen as a form of environmental compensation. It is widely held that intensive cereal production systems are unsustainable. From a 'constant natural assets' perspective, the objective of sustainability might then suggest that some measure of environmental compensation is called for to replace the natural capital degraded by intensive agricultural production. This could take the form of set-aside targeted on the more intensive areas of production. This might be implemented by maintaining a certain proportion of farmed areas with less intensive uses in order to provide space for habitat and wildlife. In intensively cropped areas the desired proportion could be achieved through the operation of an environmentally targeted set-aside scheme.

8.18 The scheme would operate along the lines of the two competitive set-aside scenarios that we have already described. However they would be integrated into a single policy mechanism. Tenders would be invited from farmers to set aside land. They would provide information against which their bids could be scored on an

environmental index. This approach is used in the selection of bids made for the Conservation Reserve Program in the United States. In this context, the environmental benefits would be weighted towards relieving the pressures of intensive cropping on the environment, taking account of the intensity of production within the local area, such as the percentage of the area under arable production, and the sensitivity of the environment, such as the presence of watercourses or nature reserves.

8.19 We believe that it would be possible to make an adequate assessment of the environmental benefits that could be expected to arise from a limited amount of information provided by farmers in their tenders, supplemented from available information about local characteristics. We would expect farmers to be required to indicate the area of set-aside offered, whether this is rotational or permanent, the length of interface with specific land uses (such as a watercourse, woodland or nature reserve), the proposed form of management (e.g. natural regeneration, game cover, wild bird cover) and whether or not public access will be provided. If supply control is an objective, farmers would also be asked to indicate their level of past cereal yields. This information would be straightforward for the applicant to supply and subject to relatively simple verification. Farmers would also indicate the total amount of payment that they would require.

8.20 This could be supplemented with information on the local density of arable cropping, so that relief can be targeted at the most intensively farmed areas. Information on cropping at a local level is available from the June Census. Environmental priorities could be defined against local species composition and densities (such as from British Trust for Ornithology data for birds or the Biological Records Centre data). This could possibly be matched against priorities identified within Biodiversity Action Plans. This is an aspect for which more detailed priorities could be developed from existing datasets. Finally, human population density could be used as a proxy for the potential values from recreation and landscape benefits. Local population information would be available from the Population Census. We would anticipate that all of this supplementary information could be provided at the parish or ward level.

8.21 A score would be computed to represent the benefits offered from each bid. It would thus be necessary to determine the weights to be attached to the alternative environmental benefits offered and whether or not supply control is to be a factor. These weights might be set at the same level across the whole country, or they could be determined regionally. While farmers would be supplied with information as to the way in which the benefits index is constructed, they would not know the weights. This would reduce the scope for strategic bidding.

8.22 The weights applied would be selected each year taking account of the market prospects for the forthcoming market year. Where there is expected not to be a requirement for set-aside for the forthcoming year, the supply control benefits offered in tenders would be given a zero or low weight. Where a requirement for some level of set-aside is expected, a greater weight would be attached to supply control. In this way, the same policy mechanism can be targeted either for supply control or for environmental compensation as conditions determine.

8.23 Bids would be ranked by the ratio of the benefits index to the amount of money required and the highest bids selected until the available funds are used. This would mean that the maximum level of benefits would be obtained for the given level of funding. It is likely that the scheme would be operated in regional pools so as to avoid an imbalance in areas set aside across the country. Similarly, a more even distribution might be achieved by adjusting the way in which scores are computed for individual bids as the selection of bids progresses. Thus for instance, the indicator relating to the local intensity of cropping could be adjusted as land in that local area is entered into the set-aside scheme.

8.24 Enforcement would be similar in most respects to enforcement under the current set-aside scheme. While the area to be set aside would vary to a greater extent between holdings, in practice enforcement would still require a comparison of actual land use against maps submitted by farmers. Information on the location of set-aside land with public access could be publicised within local areas as is the case under current schemes.

8.25 We would envisage that government would maintain a portfolio of contracts with different end dates, so that there is a steady stream of contracts coming up for renewal each year. This need not significantly reduce the scope for environmental benefits in that environmental assessment demonstrates the potential for benefits from rotational set-aside under current arrangements. The numbers of contracts offered in any one year could be adjusted to match the volatility of the market and the likelihood of the need for supply control. The potential for providing longer-term, better targeted environmental gains in arable areas would be secured through the whole farm set-aside scheme, as discussed below.

(b) A whole farm set-aside

8.26 A second element of the policy package would operate a whole farm approach to set-aside as described earlier in the whole farm set-aside plan scenario. This would operate as a longer-term land bank targeted at providing environmental benefits. Environmental benefits would arise from providing buffer zones around watercourses and sensitive habitats, developing lattices for wildlife and improving the landscape and recreational value of access routes in the countryside.

8.27 The policy mechanism would follow that outlined above. Individual farm plans would be developed in consultation and negotiation with environmental advisors. Indeed, the option should also be looked at against the business options available on the holding. Thus farmers might choose to enter land into set-aside in the context of developing a diversification enterprise, such as stabling for horses or the development of a fishery. The longer-term nature of this mechanism would provide for the creation of more valuable habitats. While in some contexts a long-term commitment might deter potential applicants, farmers using set-aside in the context of diversification might well want the security that a long-term contract could provide for their other business investments. The funds provided through the set-aside contract could offer some security to farmers diversifying from a more familiar agricultural production system. Thus, set-aside could become a more flexible support for diversification than that offered through existing agri-environmental schemes.

8.28 It is accepted that it might be harder to attract farmers into a scheme with this degree of complexity and that the administrative costs could be quite substantial. However they need not be significantly greater than those currently accepted under the Countryside Stewardship Scheme or with the provision of advice from the Farm Business Advisory Service. At the same time, the aim would be to attract a relatively small proportion of farmers. Nevertheless, quite a significant proportion of farmers in the survey did appear to be willing to consider this type of scheme. It would also have the significant advantage that access to the scheme would not be limited in the same way as access to participation in Environmentally Sensitive Areas and, to a lesser extent, participation in the Countryside Stewardship Scheme.

(c) Set-aside for industrial crops

8.29 Set-aside has provided opportunities for the development of industrial crops that would not be grown in a purely commercial market. However, under present arrangements, the area of land put into industrial set-aside is essentially determined by conditions in the world cereals market and international exchange rates. A more decoupled policy mechanism would give the opportunity to attain more precise policy objectives in a more targeted way. The arguments for an industrial set-aside do not depend on the requirement to take land out of cereal production, although the low or even negative opportunity cost is a relevant factor. Other arguments arise from the public good characteristics of the products produced; the fact that there are no markets and hence no incentives for the provision of some sorts of benefits. Thus the production of fuels from biomass reduces requirements for the use of fossil fuels and the external costs, especially on the climate, associated with them. At the same time there may be 'infant industry' arguments for public support for new forms of production that might in time develop into fully competitive commercial activities. Again, the supply of a new type of renewable energy may only be feasible once there is an established demand, but an established demand will only develop once there is a reliable supply. This 'chicken and egg' problem might only be resolved by means of public investment in production activities and facilities to get things going.

8.30 Such a scheme would be similar to, and potentially merged with, the Energy Crops Scheme operated under the England Rural Development Programme. However, again, we would envisage that this type of policy could be operated on a competitive basis, with farmers tendering to provide target levels of specified industrial crops and tenders being accepted against the priorities for the alternative outputs offered and the payment required. In assessing the justification for this type of mechanism, consideration needs to be given as to whether other types of market intervention, such as through prices offered for electricity delivered through different generation methods, might offer a more cost-effective means of achieving the policy objective.

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Appendix 1

Survey Data used in the Evaluation

FBS

Both the Farm Business Survey (FBS) for England and Wales and the Farm Accounts Survey (FAS) for Scotland are annual surveys of farm businesses that give detailed information on farm accounts. In the former case, the annual survey is of about 2,700 farm businesses, whereas in the latter, about 500 farm businesses are surveyed annually. In both cases, the survey has a panel format – that is, the same farm business may remain in the survey for a number of years. For the years available to us, in both surveys, 50 per cent of farms stay in the survey for at least 4 years. For the FBS, we have data between 1988 (i.e. cropping year 1988/89) to 1997 (i.e. cropping year 1997/98). For the FAS, our data spans between 1989 and 1998.

The fact that the sample size for the FBS is so much larger than for the FAS (i.e. about 29,000 observations compared to about 5,000 observations) will often mean that statistical estimates will be more reliable from the former survey. Also, the quality of information available to us about how variables have been derived is much more detailed in the case of the FBS.

A very important point to note is that a size threshold applies for both the FBS and the FAS. Both are surveys of farms above eight Economic Size Units. Over forty per cent of farm holdings in the UK are too small to be included in the survey. Hence the results reported in this chapter cannot be extrapolated to the entire population of farms – only that proportion which these surveys are taken to represent.

The 1993 to 1998 Studies of Cereals and Set-Aside

Methodology

The studies were designed to collect returns and variable and fixed costs (only in 1993 and 1998) from winter and spring varieties of wheat and barley in England and Wales and for set-aside (only in 1998) where no industrial crops were grown. Returns and variable cost data only were collected for the minority crops, oats, rye and triticale. Replacements for those who did not want to continue participating were selected from randomly drawn lists. Care was taken to ensure that the final sample was representative of the national situation. From the original 1993 sample, 42 per cent of the co-operators in England and Wales provided data for all of the six years. The information was collected and recorded on a standard questionnaire by personal interview with each co-operating farmer. One visit was normally made after harvest when details of variable inputs and grain sales completed to date for each wheat and barley crop were collected. Details of later sales of grain were obtained during a further visit or by telephone. As noted in previous reports a major benefit of annual recording with a majority of continuing co-operators is that in many cases information is to hand when visiting, and in a readily accessible form.

In the 1993 and 1998 study fixed costs were also collected. Some of these are readily allocated to a particular enterprise but where a resource, such as tractors, is shared between several enterprises it has been necessary to use a standard cost to charge to the cereal enterprise. In addition there are other costs (overheads) incurred in the general operation of the farm business, for example building and farm maintenance,

which cannot be easily allocated to any particular enterprise. The general overhead cost, which includes provision of services, insurance and office expenses, was estimated from data from the Farm Business Survey in England and Wales, and calculations made for a range of farm types and size. The machinery overhead was derived from a coefficient calculated by farm type, applied to the total direct machinery costs (tractor and implement) for the farm. It covered the operating cost of machinery used for general farm work, such as hedging and ditching, and a proportion of the annual cost of farm transport. The labour overhead was also derived from a coefficient calculated by farm type, applied to the total direct labour costs (including casual). The labour overhead covered the cost of labour used for general farm maintenance and repairs.

Special Study of Cereal Production follow up study

Farmers in England and Wales who had participated in the Special Study on the economics of cereals and set-aside for harvest year 1998, were re-contacted to see if they were willing to provide some additional information on set-aside and industrial crops. A questionnaire was devised and posted to these farmers with a letter of explanation. This was followed by a telephone call from an experienced fieldworker, in many cases the same person who had visited them in 1998. The fieldworker went through the questionnaire and dealt with any queries or misunderstandings. The farmers returned the completed questionnaires to their local centres and they were forwarded to Cambridge for analysis. Overall a response rate of 62 per cent was achieved (204 useable records). Inevitably some farmers from 1998 were no longer in a position to take part and others were too busy. Many Welsh farms do not have set-aside because they are either too small or opt for other livestock-related schemes. It was not possible, therefore, to carry out a separate analysis for Wales.

Scotland had not participated in the 1998 survey and so an attempt was made to recruit a random sample of 60. The same methodology was used as in England and Wales but because of Scotland's non-participation in 1998, the questionnaire had some additional questions relating to farm cropping and farm level responses to set-aside. A sample of 44 was obtained. This sample was robust enough to provide information on main issues but it was not always possible to disaggregate the data into valid groups for more detailed analysis.

The stakeholders survey

A wide range of organisations have an interest in the ways in which set-aside has been operated and in the potential developments in policy in the future. A further major element of the evaluation involved a survey of stakeholders with an interest in set-aside.

The stakeholder survey involved three stages:

1. Letters to the whole spectrum of organisations and government departments with an interest in set-aside and the arable regime more generally, explaining the study and allowing respondents time to familiarise themselves with the types of questions to be asked. This was followed by telephone calls to arrange a time for a telephone interview if they were willing.

2. Telephone interviews as arranged; one organisation requested a face-face interview which was agreed.
3. Analysis of responses.

It was felt that semi-structured interviews were the most appropriate interview technique because the respondents come from a variety of professional backgrounds and contexts and do not have a common ground as regards their expertise and specialisation. The semi-structured interview technique provides qualitative depth by allowing respondents to talk about the subject in terms of their own frame of reference. Prompts were given where necessary to guide the interview to ensure that all areas of interest were adequately covered.

The interviews addressed three main areas: experiences with the present set-aside system; respondents' vision for the future of set-aside and the arable regime more generally; and their opinions on each of the set-aside scenarios proposed in this study, with a view of establishing their administrative feasibility and potential impacts.

A high success rate was achieved with most organisations very keen to contribute. Eighteen organisations were contacted initially with the following participating:

Alternative Crop Technology Interactive Network (representing the industry view for non-food crops)
Council for the Protection of Rural England
Country Landowner Association
The Countryside Agency
DG AGRI European Commission (two contacts supplied by MAFF)
English Nature
Farming and Wildlife Advisory Group
Fertiliser Manufacturers Association
Game Conservancy Trust
Game Conservancy Trust - Scotland
HM Treasury
National Farmers' Union
National Farmers' Union - Scotland
Royal Society for the Protection of Birds
Scottish Natural Heritage
UAP (United Agricultural Products – a private company that has undertaken research about targeting set-aside etc)

Appendix 2

Literature review

1. Introduction

A central change brought about in the 1992 reforms of the CAP was the introduction of a supply control policy in the form of 'set-aside' of agricultural land. Farmers above a threshold of production became obliged to set aside a proportion of their eligible cropping area in order to receive per hectare arable area payments on their area of eligible land. At the same time, there was a phased reduction in support prices for cereals by 29 per cent. Initially, the set-aside rate was set at 15 per cent of eligible area and this area had to be rotated around the farm (i.e. rotational set-aside). However, the rate of set-aside has changed through time and there is now no distinction between rotational and non-rotational set-aside.[20] Although the main objective of the policy is to control production, there has also been interest in using the scheme to enhance the environment, although this is a subsidiary goal.

Although the 1992 reform introduced large-scale set-aside of agricultural land in the UK, the principle is certainly not new. Prior to 1992, there was a five-year voluntary scheme for set-aside in the UK and in many respects this resembled the Conservation Reserve Programme in the US (Ervin 1987).[21] Indeed, the US has a long history in the use of 'set-aside' of agricultural land as a policy measure. As in other European countries, the uptake of the five-year voluntary scheme was low in the UK (Ansell and Tranter, 1992) but following the 1992 CAP reforms, 94.8 per cent of the estimated base area eligible for set-aside was entered into the new set-aside scheme in 1993/94 (Roberts *et al.* 1996).

Drawing on research based on the experience of 'set-aside' in different countries and in the context of different schemes, this review will bring together the main findings to cover the following issues: the effectiveness of set-aside both as a supply control policy and as a policy to achieve environmental objectives; the efficiency of 'set-aside' as a policy instrument as means to achieve these objectives; the impact of the policy on farmers and on structural change within the agricultural sector and the impact of 'set-aside' on taxpayers and consumers. Finally, some conclusions will be presented.

2. Effectiveness of 'set-aside' in achieving supply control objective

2.1 Reasons for slippage

The effectiveness of 'set-aside' as an instrument of 'supply control' policy is most often discussed with reference to the extent of 'slippage'. Slippage refers to the situation whereby the proportionate reduction in output is less than the proportionate reduction in land under crops (Rygnestad and Fraser, 1996a).[22]

There are at least three main causes of slippage usually identified in the literature.

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[20] The non-rotational option was introduced in 1994 – 3% higher than the rotational rate. The distinction between rotational and non-rotational set-aside was effectively abolished in 1996 (and formally abolished in 1997).

[21] The set-aside scheme introduced as a result of the MacSharry 1992 reforms resembles the Acreage Reduction Programme in the US.

[22] It is computed by Gardner (1987) as [1 - (% change in output / % acreage reduction)].

Farmers entering their lowest net return or lowest yielding hectares into the scheme. In the extreme case, farmers may be entering land to the scheme that they intended to withdraw from production completely. This problem is thought to be more severe for non-rotational than rotational set-aside since in the former case, farmers may withdraw certain parts of their land from production on a permanent basis.

(i) Intensification of production on cultivated land due to greater use of variable inputs. This will happen if the set-aside restriction causes the marginal value product of variable inputs such as fertiliser to increase. It is suggested that withdrawal of land from production could increase the world market price of cereals (Ervin, 1987) and this would be the mechanism through which the demand for variable inputs would increase, thus causing an intensification of production. This effect could also induce more land into crop production (even if it would not be eligible for arable area payments). Another possibility is that if farmers are restricted in the use of one factor input, they will substitute towards other, non-restricted inputs. Although the elasticity of substitution between land and labour and machinery respectively is very low, the estimated elasticity between land and fertiliser is quite high and had been estimated at 1.29 and 2.98 in different studies (Gisser, 1993).

(ii) Productivity gains on non-diverted and diverted land. The former gain may arise because management time is allocated across fewer hectares giving rise to improved timeliness in operations. The latter effect may arise in the case of rotational set-aside when land is cultivated after a period of fallow (after a build-up of soil fertility).

2.2 Evidence for slippage

Slippage is widely thought to have reduced the effectiveness of 'supply control' policy in the US to a very significant extent. For example, it has been estimated that total slippage for major field crops ranges from 25% to 58% (Hoag *et al*. 1993)[23]. However these estimates have been based on aggregate data and could have more than one interpretation. On the one hand, individual farmers might have selected out lower yielding fields for the 'set-aside' scheme. On the other hand, individual farmers might have limited scope to select out low yielding fields yet a high slippage rate may be observed because the scheme is more popular in regions with relatively low yielding land. Averaging over all regions with diverse land quality and participation rates might show that average production did not fall proportionately with land area. In fact, Ervin (1988) notes a very strong regional pattern in the US. The heaviest enrolment is in the regions with relatively low productivity. In a study based on micro-data, Hoag *et al.* (1993) claim that their findings (along with work by Weisberber, 1969) suggest that regional differences in the productivity of diverted land and other factors are more important in determining aggregate national slippage than land productivity differences at the farm level.

The study by Hoag *et al.* (1993) is based on field-level data on soil productivity in North Carolina. They derive a formula for measuring 'land quality slippage', which is based on yield indexes for soil types in diverted and non-diverted land. They estimate very low rates of land quality slippage - in the region of 5-10% - depending on their assumptions about how farmers behave. Also, farmers do not seem to be maximising the extent to which they divert the 'worst' land - at least if this is measured purely in terms of soil quality. They suggest that the effect of other factors such as size, shape, accessibility and rotation considerations are more important than soil productivity in determining what fields will be diverted. Their conclusion raises a question about how

[23] The sources cited in Hoag *et al*. (1993) are as follows: Gardner (1987, p.60); Tweeten ((1970, p.315); Love and Foster (1990).

slippage ought to be measured. It isn't clear whether estimated yield based on soil quality alone is necessarily an accurate measure of expected yield. If farmers react to difficult field characteristics by farming such land with lower intensity (if at all), then the expected yield might be lower than estimates based on soil quality. In this case, estimates of slippage could be biased downwards, even if based on detailed farm data. However, this issue is not addressed in the study.

There do not appear to be such detailed studies of slippage in European contexts that have been published in the academic literature. The issue of slippage is addressed by Barnes (1997) in the context of the Arable Area Payments Scheme in the UK. Changes in cropped area are compared to changes in production over the 1990-96 period using aggregate data. They find little evidence for slippage in 1993. They show that the 1993 harvest of cereals fell by 9.5% compared with the previous year, while the cereal area fell by 13.6%. If yields had remained constant at the 1992 level, then wheat production would have fallen by 15.2%. However, in later years, the supply control effect of set-aside is far from clear. The study shows a percentage increase in land area, production and yield every year between 1994 and 1996. By 1996, the area of cereals was 3.8% below its 1992 level, yet the production of cereals was 13.5% higher than in 1992. Asby and Renwick (1999) also report on the continued increase in production and make the point that while production would have grown even further had set-aside not been reduced, the policy had a limited effect in cutting the surpluses that already existed. In a review of the developments leading to a continual decline in the set-aside rate, Barnes (1997) states that set-aside has been used by the EU as the mechanism to maintain subsidised exports at their maximium permitted level, rather than to achieve any long term reduction in production.

Wilstacke and Plandkl (1989) and Appleton and Crabtree (1992) report limited slippage in the case of voluntary set-aside schemes in Lower Saxony and Scotland respectively. However, Wilstacke and Plandkl (1989) emphasise the potential yield of 'set-aside' land compared to the average yield – and this method could be criticised for the reasons mentioned above. Appleton and Crabtree (1992) obtain data on yields of land set-aside from a farm survey (though they do not report how this question was asked). They find that average yields for various crops are not significantly different from the Scottish average. However, they also report that the desire to remove difficult land from production was one of the most important reasons given by farmers for entry into the scheme. This was also found for the five-year voluntary scheme in England and Wales (Ansell and Tranter 1992).

Ansell and Tranter (1992) report a high degree of 'deadweight' in the five year voluntary scheme since in their survey of farmers in England and Wales, 15% of that land receiving set-aside payments would have gone out of production anyway. Farmers had decided that such land was not capable of profitable cropping. However, farmers attributed only a small impact to other sources of slippage, such as better timeliness of various operations and/or a build of fertility on land set-aside.

There is not as much evidence on slippage caused by intensification of operations on cultivated land. Appleton and Crabtree (1992) do not find evidence of this effect in their survey of Scottish farms and Hodge (1992) suggests that generally there is little empirical evidence with regard to this effect. Barnes (1997) find that only 12 per cent and 1 per cent of farmers in England and Wales respectively thought that yields had increased as a result of the Arable Area Payments scheme – and this was attributable to changes in rotations and more timely operations. Farmers' responses to questions

on input use suggest that few perceived any change in inputs to be as a result of the scheme. However, even from a farm-based survey, this source of slippage is hard to identify since 'set-aside' may have indirectly brought about a change in input use. For example, 'set-aside' may have brought about a change in prices that would then influence input use.

There is research suggesting a positive elasticity of substitution between fertiliser and land. Although there do not appear to be many studies where this elasticity is estimated, available studies suggest that it is fairly high.[24] Boyle (1995), in particular, stresses this source of slippage, stating that the effectiveness of an exclusive 'set-aside' policy depends on the magnitude of the land/materials elasticity of substitution. However, available studies on the 1992 MacSharry reforms do not find very much change in the rates of fertiliser application to tilled land (Asby and Renwick, 1999; Barnes, 1997).

There have been studies that have modelled the effect of the 1992 CAP reforms to the arable sector. Guyomard *et al*. (1996) and Lansink and Peerlings (1996) develop models of crop response and apply them to farms in France and The Netherlands respectively using data from 1970 to 1992. They then simulate the effects of the CAP reform. Both papers suggest that the output effect attributable uniquely to 'set-aside' is likely to be very modest. For example, although Guyomard *et al.* (1996) estimate that 'soft wheat' reduces by 23% relative to the base period level, most of this reduction is generated by the price decrease (18%). The compensatory payments package induces a small decrease in supply of about 1%. This only leaves a reduction of 4% that can be attributed to 'set-aside'. The analysis by Lansink and Peerlings (1996) imply that 'set-aside' only contributes 5.9% to the output reduction achieved by the 1992 CAP reforms to cereals and oilseeds. Neither of these papers appears to take account of the potential effects of slippage. Hence it is noteworthy that even in this case, the set-aside regulation introduced in 1993 only has a small estimated effect on output.

3. Effectiveness of 'set-aside' in achieving environmental objectives

There have been many studies about the environmental impact of set-aside (see in particular Firbank (1998) and Clarke (1992)). Only a brief review of findings in this extensive literature is provided here. A widely expressed view is that set-aside has enormous potential to benefit the environment but whether this potential is realised or not depends on how it is managed. In fact, Tattersall *et al.* (1999) state that although set-aside has potentially great consequences for biodiversity and wildlife, inappropriate management could lead to environmentally damaging consequences. Although the rules governing the management of set-aside land have changed over time to reflect the expected effect of management practices on wildlife, there appears to be low interest among farmers in active conservation management under current scheme conditions (Neve *et al*. 1998).

Despite limited pro-active conservation management, studies on the impact of set-aside on birds have been extremely positive. In a study of the use of set-aside in winter by declining farmland birds, Buckingham *et al.* (1999) found the five out of six declining species were found in significantly greater numbers on this habitat than would be expected if birds were randomly distributed over the farmland landscape. The results confirm the importance of winter food sources to declining farmland seed-eaters. In a study on the relative abundance of birds on set-aside and neighbouring

[24] See discussion in Boyle (1995) and Gisser (1993).

fields in the summer, Henderson *et al*. (2000) find strong preferences for set-aside land over cultivated crops or grassland by a broad range of bird species found on English arable farmland. While they draw attention to several other detailed autecological studies which show the benefits of set-aside to birds such as skylarks and gamebirds, this study demonstrates a broad generality of preference for set-aside in summer by non-passerines, passerines, insectivores and seed-eating birds across a wide geographical area in the UK. It is also found that bird densities are much higher on rotational than non-rotational set-aside for most functional groups. It is suggested that this may be related to differences in sward structure and composition of the two types of set-aside, with conditions in rotational set-aside being more favourable for ground-feeding birds. The general findings of this study are also supported by research findings in Sweden and Denmark.

An interesting question raised by the study by Henderson *et al*. (2000) is whether the increase in birds observed on 'set-aside' reflects increases in breeding productivity that will effect populations or whether it simply reflects a change in the distribution of birds within the arable landscape. Using the BTO's Common Birds Census, they do not find evidence of a clear 'population' effect for skylarks. They suggest that the most likely explanation is that there has not been a sufficient area of set-aside in place for long enough to result in a large enough population increase to be detected by the Census. However, they emphasise the likely contribution of the 'set-aside' policy in curtailing the decline in bird populations.

There is some evidence that set-aside land supports more plant and invertebrate species than cropped land (e.g. Kennedy, 1992; Moreby and Aebischer, 1992; Poulsen *et al*. 1998). However, Firbank (1998) reports that it is unusual for set-aside to contain scarce plant species or communities, though the conservation value of such situations can be high. While there have been attempts to model the vegetation of set-aside, it is very difficult to produce precise forecasts for individual sites or to identify which sites may become of high botanical conservation value without more information about the vegetation in the surrounding landscape. Andrews (1992) states that much wildlife does not readily colonise new sites and this is particularly true of invertebrates, many of which have limited powers of dispersal. He gives the example of some butterflies, which may be apparently strong fliers but are really quite sedentary. In this context, he suggests that the most valuable and successful restorations are likely to be those which extend an existing habitat. He sees greatest value coming from restoration that provides a substantial link between two existing isolated areas of a scarce habitat.

If the siting of land within a farm is important in linking isolated areas of habitat, then it would appear that targeting such land on a long-term basis (i.e. non-rotational set-aside) would be more effective than changing the area of land to be set-aside on an annual basis. However, in general, the relative merits of rotational versus non-rotational set-aside depend on the particular environmental objectives (Baldock and Beaufoy, 1992). While the relative benefits of rotational set-aside have been demonstrated for birds, some studies have found that the rotational option has negative consequences for nitrate leaching. For example, Meissner *et al.* (1999) found that rotational fallow led to intensified leaching of nitrates in their study areas in Germany. However, as with other types of environmental impact, the effect of 'set-aside' depends critically on how it is managed. For example, although Froment *et al.* (1999) also found that there is increased leaching risk from bare fallow and natural regeneration set-aside on English sites, the results suggest that a ryegrass cover minimises the amount of readily leachable nitrate during and immediately after the

set-aside period. Clotuche *et al*. (1998) also show that leaching risks can be minimised if appropriate set-aside covers are sown at the right time of year. However, in a large postal survey of farmers reported by Firbank (1998), it was found that 70 per cent of farmers setting-aside land availed of the rotational option and over 70 per cent of these farmers put their rotational set-aside down to natural regeneration. Thus, it would appear that if control of nitrate leaching were the main environmental objective of the 'set-aside' scheme in the UK, this goal would not have been achieved very effectively by how the policy has been implemented on a farm level.[25]

Although it would appear that sowing a cover on non-rotational set-aside would be the most effective way to reduce nitrate leaching, there is in fact a further complication highlighted if we consider the study by Rygnestad and Fraser (1996b). They emphasise that farmers' total nitrogen use will be higher if they set aside the least productive fields on a permanent basis than if they are forced to take out the relatively more productive land at some stage (i.e. as in rotational set-aside). Thus, if non-rotational set-aside is more effective in preventing leaching (for a given quantity of nitrogen use) whereas rotational set-aside is likely to result in higher nitrogen use, then it is not clear *a priori* whether rotational or non-rotational set-aside will be more effective in reducing nitrate leaching.

Given different environmental conditions and priorities across Europe, it is not surprising that rules for managing set-aside differ across European countries. Hansson and Fogelfors (1998) say that an example of these different rules is that in the UK, herbicides are allowed for weed control, whereas in Denmark and Sweden, legislation requires that pesticide use should be reduced by a defined percentage and herbicide use is prohibited on land that has been set-aside.

4. Efficiency of 'set-aside' as a policy instrument

In comparison with a perfectly competitive market, the regulation to 'set aside' land causes a distortion for at least three reasons. Firstly, producers can no longer combine inputs in the most efficient way, given a restriction on one factor of production. Secondly, a welfare loss arises if all producers are obliged to set-aside the same proportion of land. Bourgeon *et al.* (1995) explain that this is caused by the fallowing of efficient plots. They suggest that a way of mitigating this effect would be to allow the more efficient producers to opt out of the programme.[26] Thirdly, any expenditure needed to finance the 'set-aside' scheme is likely to impose further welfare costs due to the effect of raising distortionary taxes.[27] The welfare costs of raising taxation are estimated to be very high. They are likely to be between $0.20 and $0.50 per dollar of government spending in the US and hence there are strong implications for the social costs and efficiency ranking of farm programmes (Alston and Hurd, 1990).

However, a number of papers addressing efficiency issues in the context of 'set-aside' do not use the free market as a baseline scenario. For example, Gisser (1993) shows that in comparison with a programme using a 'target price' as the sole instrument of policy, combining a 'target price' policy with an acreage control programme dramatically lowers the associated deadweight loss. In a paper by Bourgeon *et al*.

[25] It should be noted that control of nitrate leaching is not the main environmental objective of set-aside in the UK. However, set-aside management rules are designed to prevent any increase in nitrate leaching as a result of set-aside.

[26] They suggest that a way to achieve this would be to levy a lump-sum tax on producers who do not participate in the set-aside programme.

[27] For example, income tax is distortionary because it affects the individual's labour/leisure decision.

(1995), set aside of agricultural land increases efficiency whenever the optimal guaranteed price is greater than the shadow price of output (i.e. the world price under certain assumptions). Chambers (1995) shows that there are circumstances in which supply control may even be more efficient than lump-sum transfers to producers and also pass the 'Kaldor test' (i.e. in which a policy is socially efficient if the gainers can compensate the losers). However, this would only be true if initial price support was very high and the tax system was very inefficient. Alston and Hurd (1990) make the more general point that when the welfare costs associated with raising taxation are considered, it is no longer clear that 'decoupled payments' are more efficient than other policy instruments.

With regard to the achievement of environmental goals, the EU set-aside policy seems likely to be much less efficient than other potential policies. Part of the problem is the potential for goal conflict that arises if the same policy instrument is used to address both supply control and conservation objectives (Ervin, 1988). Depending on the precise environmental goals, efficient achievement of environmental objectives may involve diverting land with below average productivity, thus jeopardising achievement of the supply control objective. Furthermore, the lack of spatial targeting in the EU set-aside policy makes it something of a blunt instrument in achieving well-defined objectives. In the context of the five-year voluntary scheme, Potter *et al.* (1991) comment that there is no way to steer set-aside into areas or on to farms where it can be most cost effective or environmentally beneficial. There is also very little incentive for farmers to pursue positive environmental practices (Hodge 1992, Neve *et al*. 1998). Such reasoning leads Hodge (1992) to argue that environmental benefits achieved through reducing output by supply control are bound to be less than if obtained from a policy targeted directly on environmental improvement.

The Conservation Reserve Programme in the US is an example of a 'set-aside' policy aimed directly at environmental improvement (with supply control as a secondary objective). After a signup period, each parcel of land offered under the programme is scored based on an Environmental Benefits Index and an offered rental rate[28] (Heimlich, 2000). The Environmental Benefits Index is designed to proxy a range of environmental benefits and takes account of physical characteristics of the land (erodibility, soil leachability, proximity to waterbodies etc.) and measures of locally affected populations (numbers of well-water users). Those land parcels with the highest score are given priority for acceptance into the programme (Feather *et al*. 1999). Although evaluating the efficiency of the programme through Cost-Benefit Analysis is difficult (but advocated by economists such as Feather *et al*, 1999), it would seem that in principle, it should attain environmental objectives more efficiently than current 'set-aside' schemes in the EU.

5. Impact of 'set-aside' on farmers and structural change in the farm sector

5.1 Farm-level economic impact of 'set-aside'

It is acknowledged by the EU (European Commission, 1997a) that arable farmers were over-compensated for reductions in price support that were agreed in the 1993 CAP reforms. This is on account of high world market prices throughout the period and in the UK, currency devaluations that were very favourable to producers in the early 1990s. Barnes (1997) reports that green rate changes have more or less cancelled

[28] The 'offered' rental rate must be less than or equal to computed soil-specific rental rates that adjust the observed county average cash rent up or down based on an index of relative soil productivity. This has replaced the 'maximum acceptable rental rates' that were based on agricultural rents.

out the reduction in intervention prices, so that in sterling terms farmers' prices hardly fell over the transitional years. Furthermore, market prices have risen relative to intervention prices in much of the period since 1992 (to the time of the study). Even in a relatively early evaluation of the CAP reform by Froud and Roberts (1993), compensation payments were expected to outweigh the influence of a fall in producer prices and the set-aside restriction, resulting in a gain in Producer Surplus. Furthermore, Roberts *et al*. (1996) show that there is clear potential for reducing support prices and set-aside compensation payments and increasing the set-aside requirement without any loss of take up.

Relative to a more dramatic fall in support prices, the introduction of supply control through 'set-aside' benefits higher cost or more inefficient producers (Chambers, 1992) since it prevents prices from falling to a level at which they could no longer compete. The CAP reform of 1992 has been shown to disproportionately benefit farmers with low and unreliably yielding land relative to those with high and reliably yielding land (Fraser, 1997). This effect must be reinforced by the abolition of any distinction between rotational and non-rotational set-aside. Farmers with more heterogeneous land quality have an opportunity to permanently withdraw less profitable areas from production.

Considering the impact of 'set-aside' without regard to other policy measures or heterogeneous land quality, the restriction may more severely impact on small producers since there is less scope for reducing fixed assets such as land and machinery. In the 1992 scheme, farmers have the option to enter a simplified scheme, where there is no set-aside requirement. However, they would only be able to claim arable area payments on about 15.5 ha of their land at the cereal rate. According to Nix (1994), the cost of entering the simplified scheme in terms of area payments forgone would be prohibitive over about 20 ha of eligible land, except perhaps on high yielding land. Given entry to the main scheme for most farms above this threshold, it might be expected that large farms would disproportionately benefit. In absolute terms, large farms also have obtained much higher compensation. Barnes (1997) suggests that the scheme has contributed to the wider income differential between small and large farms.

Ansell and Tranter (1992) report a failure to attract small farmers in the five-year voluntary set-aside scheme in England and Wales. However, for those farms that did participate in the scheme, significant savings were possible in both machinery and labour. Over half of respondents to the survey reported a change in labour requirements as a result of the scheme. Savings arising from shedding farm labour, reducing the length of the working week for those that remained and cutting down on the use of contract labour were estimated at over £1 million for the survey of 259 farms. Appleton and Crabtree (1992) also estimate a net loss of employment directly attributable to set-aside entry and they report that farmers saw reducing labour requirements as important as a reason for entry to the scheme.

However, studies about the MacSharry reforms in the UK do not report large changes in labour and machinery. In a survey of 575 holdings in England and Wales, Barnes (1997) finds that 75% of respondents had not changed the size of their labour force since the introduction of the Arable Area Payments Scheme and of those making such adjustments, 84% did not attribute these changes to the scheme. It is also suggested that there has been small net increase in investment in machinery as a result of the scheme due to improved profitability. Asby and Renwick (1999) report that most

farmers in their survey did not adjust their investment and employment in line with the reduction in productive area. Indeed, the majority of farmers stated that set-aside had little or no financial impact. Neve *et al*. (1998) report a similar finding - few respondents agreed that the introduction of set-aside land had reduced labour requirements on their holding. It should be noted that all three of these studies are based on quite a small sample of farms and do not condition farmer response on any farm characteristics such as farm size. Also, it is possible that the effects of 'set-aside' were offset by favourable market conditions and while the scheme may not have caused much reduction in fixed assets, it may have curtailed any increase in investment. However, these studies suggest that aggregate trends in labour and machinery are unlikely to show much change that are readily attributable to the 'set-aside' policy.

Ansell and Tranter (1992) estimate that the biggest single benefit to survey farmers in the five-year set-aside scheme was the variable costs avoided. These amounted to the same sum as the set-aside payments. However, farmers thought that any gains resulting from increased soil fertility on land set-aside were likely to be small. Garstang *et al.* (1994) also reports that yield benefits associated with rotational set-aside are likely to be small. However, in a mail survey of 1800 farms in 1995 (response rate of 36%), Firbank (1998) found that 40 per cent of farmers expected yields to be higher following rotational set-aside, though 80 per cent of farmers expected to use the same amount of fertiliser following set-aside as on any other crop. They report that in general farmers considered that few agronomic problems were found to adjacent or following crops, except for increased rabbit damage. Asby and Renwick (1999) also report a perception of improved yields as a result of the scheme, and improved timeliness of fieldwork on productive land. On the other hand, Neve *et al*. (1998) report that there was no consensus with respect to the potential of set-aside to enable more precise timing of operations on areas remaining within the crop cycle. Firbank (1998) reports that of the farmers using rotational set-aside, only 16 per cent put land down to an industrial crop.[29] The main reason for relatively low uptake of this option is reported to be insufficient profit.

5.2 Farmer attitudes to 'set-aside'

Although producer groups have an incentive to support 'set-aside' since it is a less transparent form of support than direct income transfers and is expected to increase the price of land (Hodge and Sturgess, 1992), surveys of individual producers often suggest a more negative attitude towards this policy. Neve *et al*. (1998) report that only 34% of their survey of farmers thought set-aside had been beneficial to the sector. 87% of farmers thought that set-aside was viewed by the public as 'paying farmers to do nothing' and 71% thought that set-aside gave the impression of untidy and unkempt farmland. Carr and Tait (1991) also report that farmers discounted the conservation value of 'wilderness' areas and described these in terms of 'neglect' and 'untidiness'. Neve *et al*. (1998) report that the constraints to conservation based management on set-aside land were lack of financial incentives (cited as most important by 46% of farmers), the unpopularity of the set-aside policy (35%) and the lack of awareness of available options (14%).

However, other studies report more positive attitudes to the scheme. In the survey by Asby and Renwick (1999), only 21 per cent of producers wanted to see it abolished

[29] Joaris (2000) reports that in recent years 10-15 % of set-aside land in the EU has been devoted to non-food crops and that set-aside area has become a major contributor to non-food area in the Community.

owing to its perceived lack of financial impact and several advantages[30] – improved yields; timeliness of operations; opportunity to grow industrial crops; a good break in the rotation. Firbank (1998) reports that most farmers were happy with the use of set-aside as a supply control measure and that they found the scheme documentation comprehensible. The most common criticism of the scheme was frequent changes in the rules. Most farmers were of the opinion that the scheme has benefits for the environment though 90% considered that it does not improve the look of the countryside. Farmers were asked about whether any changes in wildlife had been observed on areas that had been set-aside. Over half the farmers thought that birds and hares had increased though fewer reported increases in butterflies and wildflowers. It is interesting that different observations between farmers could not be explained very well by differences in their management of set-aside, nor did they match the results expected on the basis of the field surveys. Farmers with the greatest interest in environmental issues tended to observe more wildlife, especially on non-rotational set-aside.

5.3 Influence of 'set-aside' on structural change in agriculture

Voluntary schemes have sometimes been used by farmers as a form of semi-retirement or partial adjustment out of agricultural employment. The attraction of voluntary set-aside schemes for older farmers is noted in several papers (Ansell and Tranter 1992; Appleton and Crabtree, 1992 and Jones *et al.* 1993). In fact, during the mid 1980s, a proposal to introduce set-aside on European farms was being considered as a pre-pension scheme for farmers (Potter, 1987; Dessylas, 1987). Potter *et al.* (1991) report that in the US scheme, elderly farmers, farmers with off-farm jobs and those who for various reasons wanted to work less on the farm were the most enthusiastic supporters. In Ansell and Tranter's (1992) study of the voluntary set-aside scheme in England and Wales, 21% of respondents reported that non-farm incomes had increased as a result of participating in the scheme.

Whether 'set-aside' has accelerated or slowed down the pace of structural change depends partly on whether it has facilitated adjustment on farms or whether it has prevented change that might otherwise have occurred. It also depends on the choice of baseline scenario. Jones *et al.* (1993) see the policy as enabling farm adjustment – allowing gradual lay-off of workers, the seeking of alternative income sources, enabling farm succession etc. However, the policy may also have discouraged farmers from leaving the sector completely - through retirement or seeking a non-farm job. In fact, Jones *et al.* (1993) report that for a certain group of farmers, participation in the only alternative to being forced out of the industry. They suggest that it is a survival policy for certain sections of the farm community. Whether this is judged desirable depends on the goals of policy makers. Whereas set-aside tends to disproportionately benefit inefficient producers (Chambers, 1992), the policy may also help to retain farms in marginal areas.

In the context of the Arable Area Payments Scheme, Barnes (1997) reports that there is no clear evidence of any marked structural change as a result of the scheme. Although there is certainly a link between the scheme and the increase in land rents, farmers in the survey did not think the scheme had affected their decision to increase or decrease land area. If anything, it is suggested that the scheme slowed down structural change because increased profitability reduced the incentive to amalgamate holdings.

[30] The study is based on a survey of 168 cereal farmers.

6. Impact of 'set-aside' on taxpayers and consumers

Attempts to analyse the impacts of agricultural policy in a partial equilibrium framework on producers, consumers and taxpayers respectively show that there is a gain (loss) in consumer surplus to the extent that prices fall (rise). This is shown analytically in papers such as Froud and Roberts (1993) and Ervin (1988). The size of the change in Consumer Surplus will depend on the magnitude of the change in price, the elasticity of demand for cereal products and the extent to which prices changes are transmitted to the retail level (Froud and Roberts, 1993). However, the elasticity of demand for agricultural produce generally is known to be quite low. Although if introduced on its own, set-aside might be expected to increase the world price for cereals and thus reduce Consumer Surplus, if introduced in the context of declining support prices (as in the 1993 CAP reforms), the net effect may be a reduction in prices. In their analysis of the effect of the 1992 reforms, Froud and Roberts (1993) suggest the latter impact and hence a gain in Consumer Surplus.

There is generally more discussion on the potential impact of 'set-aside' on the budget or taxpayers. Generally, papers do not refer to the reduced need to raise distortionary taxation (as outlined above), though this saving may be significant. Ervin (1988) points out that any reduction in (non-distortionary) taxation does not represent an efficiency gain, but rather a transfer from producers to the taxpayer. In the case of the 'set-aside' reform of 1993, the overall impact on the budget depends on whether the saving in intervention costs and export subsidies outweighed the expenditure on compensation payments and the administrative cost of the scheme. The reforms to the arable sector generally are known to have resulted in a dramatic reduction in intervention stocks, although they have contributed to an increase in total EU budget expenditure due to the increase in direct compensation payments. EU budget expenditures on agriculture increased from 35 billion ECU in 1992 to 45 billion ECU in 1996 (European Commission, 1997b). According to Barnes (1997), in the UK, the cost of the Arable Area Payments Scheme in 1996/97 was more than twice the total cost of support the year before the scheme was introduced (£546 million).

Ansell and Tranter (1992) attempted to estimate Exchequer savings from the five-year voluntary set-aside scheme in England and Wales. They used MAFF estimates of the marginal disposal costs of extra production to calculate the Exchequer savings on crops that may have been harvested but for the Scheme. They found that projected Exchequer savings were extremely variable due to substantial variation in public support costs over years. So while in 1988/89 the marginal disposal costs for wheat was estimated at £20/t (compared to a set-aside cost of £37/t), this figure was £60/t in 1989/90.

Hodge and Sturgess (1992) distinguish the effect of set-aside on the budgetary position from the viewpoint of national governments and the viewpoint of the EU. Key variables are the per hectare payment; the reduction in cereal production per hectare set-aside and the disposal cost per tonne of surplus cereals to the Community. The second variable is measured by the Community average yield times a slippage factor (which is stated as at least 0.5). They find that while at a European level, the five-year set-aside scheme was unambiguously beneficial from the EU viewpoint, the position from a national viewpoint depends on the net budgetary flows between the EU and the Member States. In the UK, analysis is complicated by the Fontainbleau agreement whereby Britain receives a rebate of two-thirds of its net exchequer contribution. They argue that this rebate makes it more probable that 'set-aside' will

be financially advantageous to the UK than to other countries. However, Ervin (1988) argues that 'set-aside' could well yield a net cost to the UK Exchequer. This occurs if the fall in total EU expenditure outweighs the net effect of changes in VAT contributions and changes in the UK share of VAT. Appleton and Crabtree (1992) and Russell and Power (1989) explain a method of calculation for public expenditure effects in detail. Appleton and Crabtree (1992) estimate a net cost of the five-year voluntary set-aside scheme in Scotland of £31.70 per hectare.

Chambers (1995) provides a general equilibrium analysis of different policies in the presence of distortionary taxes. Unlike the usual partial equilibrium approach, it considers the true beneficiaries (victims) of farm programs as owners of the fixed factors of production and not the stylised 'producers', 'consumers' and 'taxpayers'. The effects of farm programs are ultimately capitalised in returns to the fixed factors. The benefit of this approach is that it takes account of potential indirect effects of policy instruments - such as the potential impact of 'set-aside' on the non-farm wage. On the other hand, this approach imposes the strong assumption of a competitive economy in which changes in agricultural policy lead directly to changes in factor prices in both the agricultural and non-agricultural sector. For example, retiring land acreage shifts the agricultural labour demand curve inwards and this puts downward pressure on the wage. Landowners save on their current wage bill. Owners of the fixed factor in the non-farm economy gain to the extent that wages are depressed by acreage retirement. The overall gain or loss depends on whether acreage retirement leads to budgetary savings and hence to a reduction in taxation. Although partial equilibrium analysis is criticised for only considering direct impacts, it is difficult to believe that some of the secondary effects considered by Chambers (1995) are of any great magnitude. For example, since agriculture is such a small sector of the economy, a reduction in agricultural labour demand seems unlikely to have an impact on non-farm wages.

However, if 'set-aside' is considered as part of a package of measures and these measures are predicted to bring down consumer prices, this could have positive macro-economic effects. For example, in an impact analysis of Agenda 2000 reforms (as agreed in Berlin in March 1999), the European Commission (2000) report that the Consumer Price Index could fall by 0.25 per cent by 2005 and that this would generate significant and permanent positive macro-economic effects that would come from both an increase in real private consumption and the positive supply response resulting from the reduction in wage costs faced by firms. They suggest that adjustments in the wage could generate a virtuous cycle that could lead to an expansion in investment, output and employment. However, their analysis depends crucially on the competitiveness of European labour markets - wages must adjust flexibly to changing market conditions.

7. Summary and conclusions

Although a major criticism of the 'set-aside' policy has been the problem of 'slippage' and undoubtedly this problem has been significant in the US, it is less clear what is the main driving force behind slippage. For example, in the US, high slippage may be more due to high participation rates in regions where average yield is relatively low or due to individual farmers selecting out their lowest yielding land for entry to the scheme. There are also some difficulties in measuring slippage. Simply comparing potential yields on land set-aside to average yields in a region may be a poor estimate of actual slippage if the intensity of production is lower on fields where the marginal costs of production are higher (e.g. due to problems such as field shape or

accessibility). Also, it is possible that the 'set-aside' policy could lead to higher yields on other land if it leads to higher cereal prices or if farmers substitute fertiliser for land. However, comparing actual yields to potential yields provides a lower-bound estimate of the extent of slippage.

With regard to the environmental effectiveness of 'set-aside', this largely depends on how set-aside land is managed. However, despite the fact that most set-aside land has not been managed specifically for bird conservation (Henderson *et al.,* 2000), rotational set-aside in Europe seems to have had very positive consequences from this point of view. Positive effects of 'set-aside' have been reported for a range of plant and invertebrate species, although rotational set-aside can have negative consequences for water quality unless it is managed very carefully.

The efficiency of 'set-aside' as a supply control policy depends on whether it is considered in the context of a range of other support policies or whether it is introduced on its own in an otherwise perfectly competitive market. In the latter case, restricting a factor of production and compensating farmers introduces a number of distortions. However, in a highly distorted market with a range of support mechanisms, the introduction of 'set-aside' has been shown to enhance the efficiency of agricultural policy. From an environmental perspective, it is generally agreed that 'set-aside' is an inefficient way to achieve environmental objectives if it is introduced primarily as a supply control policy.

The effects of 'set-aside' on farmers, consumers and taxpayers similarly depends on whether or not it is considered in the context of a range of other support policies. A general finding is that large farmers have more scope than small farmers to reduce fixed assets such as labour and machinery. A set-aside policy has also been shown to disproportionately benefit inefficient producers. Evaluation of the effects of 'set-aside' on taxpayers is complicated by whether this is considered from a national or a European perspective and whether the welfare costs of raising tax are considered.

Whether the introduction of 'set-aside' is judged to speed up or slow down the pace of structural change in agriculture depends on the choice of baseline scenario and the way in which farmers change their behaviour as a result of the policy. Relative to situation pre-1992, the introduction of 'set-aside' may be judged to have accelerated the pace of structural change to the extent that it forced resources such as labour out of agriculture. On the other hand, it may also have slowed the pace of structural change, if it has influenced farmers to remain in agriculture who may otherwise have retired or left the sector.

Relative to the situation where cuts in price support would have been more severe, the introduction of the 1992 set-aside policy will have retained relatively inefficient producers in the industry. On the other hand, the policy may also have helped to retain farms in marginal areas of the European Union.

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Appendix 3

A3.1 Analysis of FBS Data

Definition of variables for FBS production functions

Value of crop production: In the Farm Business Survey, this is obtained from section C2: current crops (except fodder). We exclude set-aside. The value of main products is defined as the sum of revenue obtained from sales, the value of crops in store or in the ground at the end of the year, the value of crops used as farmhouse consumption, benefits-in-kind and feed. Thus the value of Arable Area Payments and set-aside payments are excluded. Unfortunately there is no information provided for fodder crops that are produced for use on the farm. This makes is difficult to interpret the output value recorded under 'by-products, forage and cultivation' (section C3). In particular, there is no measure of the amount of fodder crops that has been produced and consumed during the year. However, any fodder crops that have not been consumed will be included in the closing valuation and valued at current market prices (regardless of intended use). In a reasonable proportion of cases, the opening valuation is greater than the sum of closing valuation, revenue etc. because the livestock have consumed the fodder crops during the year, generating a negative value for the recorded total output. Hence we exclude this section.

Land: area of land under main products. This excludes the area under set-aside.

Hours: total hours of labour on the farm from all sources.

Machinery: This includes contract work and machinery rental and valuation of the machinery and equipment on the farm. The amount of machinery used during the year is calculated as the sum of opening valuation, gross expenditure (less sales), revaluation increment less subsidies and grants, private share and drawings and closing valuation.

Crop expenditure: This includes expenditure on seeds and young plants, fertiliser, crop protection and other crop costs. It is calculated in a similar way as for machinery.

Set-Aside and Output Supply

To examine the impact of set-aside on output supply, an output supply equation is specified as follows:

$$Y_{it}=f(SA_{iqt}, P_t, A_{it})$$

where Y_{it} is the value of crop output of farm i in period t; SA_{iqt} represents whether the farm i had any set-aside of type q in each period t. In the regressions, a distinction is made between entry into rotational set-aside (in each year 1993-96); entry into non-rotational/flexible set-aside (in each year 1994-96), entry into all types of set-aside in 1997 and entry into the voluntary 5-year scheme (at any time between 1988 and 1996). P_t is prices of variable inputs and outputs (not observed here but captured through time dummies) and A_{it} is fixed and quasi-fixed assets of the farm (total area of land; value of operator owned machinery).

If entry into set-aside has any influence on supply control, it is expected that the set-aside dummy variables will be negatively related to the value of output. Furthermore, if there were no slippage, additional voluntary set-aside, or measurement error in the variables, the percentage reduction in output should be close to the official set-aside rate in each year.

The most important methodological issue is that unobserved characteristics of farms may influence both the value of crop output and the probability of entering land into set-aside. For example, more efficient farmers or those on farms with higher land quality may be less likely to enter land into set-aside but more likely to obtain a high value of crop output. If this problem is ignored, it may be difficult to tell whether the coefficients on the set-aside dummies reflect the true effect of the scheme or whether the coefficients really reflect the influence of an omitted variable. The availability of panel data allows us to overcome this problem. For example, since there are multiple observations on the same farm businesses over time, a separate dummy variable could be included for each farm business. This would capture the influence of all time-constant factors that vary between businesses and cannot be controlled for explicitly in the regressions (e.g. management ability; soil quality). An equivalent approach is to perform a 'within group' transformation of the data. This means that for every farm business, each variable is subtracted from its average value over the time that the farm is observed in the survey, i.e. $Y_{it}^*=Y_{it}-\text{mean}(Y_i)$; $A_{it}^*=A_{it}-\text{mean}(A_i)$ etc. The effect of this procedure is to remove the influence of all time-constant variables from the regression. Therefore we can be confident that the coefficients on the set-aside dummies reflect the true impact of the scheme.

Table A3.1: Output Supply regressions for Cereal and Cropping farms; Mixed farms

Year dummies included. Within group regressions; Dependent variable: log value of crop output; Coefficients reported; t-statistics in parenthesis.

	Set-aside official rate	Cereal & General Cropping FBS	Cereal and General Cropping FAS	Mixed farms FBS
Rotational set-aside: 1993	**15%**	-0.119	-0.092	-0.050
		(4.06)*	(1.01)	(1.55)
Rotational set-aside: 1994	**15%**	-0.161	-0.136	-0.053
		(4.92)*	(1.37)	(1.27)
Rotational set-aside: 1995	**12%**	-0.114	0.078	-0.117
		(3.41)*	(0.81)	(2.64)*
Rotational set-aside: 1996	**10%**	-0.035	0.152	0.019
		(0.91)	(1.58)	(0.43)
Non-rotational set-aside: 1994	**17.5%**	-0.197	--	0.021
		(5.21)*		(0.27)
'Flexible' set-aside: 1995	**15%**	-0.132	--	-0.049
		(3.52)*		(0.68)
'Flexible' set-aside: 1996	**10%**	-0.082	--	0.092
		(1.73)		(1.23)
All set-aside: 1997	**5%**	-0.068	0.205	0.055
		(1.67)	(1.97)*	(1.07)
All set-aside: 1998	**5%**	--	-0.066	--
			(0.61)	
Any land in voluntary set-aside ('88-'96)		-0.245	--	-0.258
		(8.62)*		(5.83)*
log of total land area		0.855	0.750	0.681
		(37.81)*	(3.51)*	(11.3)*
Log operator owned machinery		0.070	0.042	0.024
		(8.19)*	(0.95)	(1.39)
Observations		6998	849	3147
Number of farm ref (inc. accountancy offi		1582	290	848
R-squared		0.47	0.45	0.29
* significant at 5% level;				

Note: Rotational and non-rotational/flexible set-aside not distinguished here for FAS data given very few observations in latter option.

A3.2 Input Demand

The input demand function is specified as follows: $X_{it}=g(SA_{it}, P_t, L_{it})$, where X_{it} is the input level of labour, machinery or fertiliser of farm i; SA_{it} is whether the farmer puts land into set-aside in period t (1993-1997); P_t is prices of variable inputs and outputs (not observed here but captured through time dummies) and L_{it} is the total land area of the farm. It is assumed that total land area of the farm is not simultaneously determined with the level of other inputs.

The dependent variable in columns 1-5 of Table A4.2 is defined (in logs) as fertiliser expenditure, total hours of on-farm work; hours of regular hired labour (i.e. regular full-time or part-time non-family); total value of machinery; total value of operator owned machinery. Again the regressions are estimated within groups since entry into set-aside is likely to be correlated with non-time-varying unobserved variables that are also related to input demand (e.g. soil quality; management ability).

Table A3.2: Demand for farm resources on Cereal and General Cropping Farms, FBS
Within group regressions; coefficients reported, t-statistics in parenthesis. Year dummies included.

	Log fertiliser	**Log total hours**	**Log hired hours**	**Log total machinery**	**Log owned machinery**
Set-aside: '93	-0.16	-0.065	-0.072	-0.086	-0.090
	(3.95)*	(2.00)*	(0.82)	(1.97)*	(1.84)
Set-aside: '94	-0.18	-0.063	-0.331	-0.085	-0.144
	(3.58)*	(1.54)	(2.77)*	(1.57)	(2.34)*
Set-aside: '95	-0.18	-0.061	-0.120	-0.007	-0.016
	(3.36)*	(1.41)	(1.00)	(0.13)	(0.25)
Set-aside: '96	-0.13	-0.077	0.006	0.004	0.045
	(2.33)*	(1.73)	(0.05)	(0.06)	(0.68)
Set-aside: '97	0.06	-0.061	0.103	0.029	0.077
	(1.24)	(1.38)	(0.88)	(0.48)	(1.17)
log total land area	0.96	0.439	0.444	0.526	0.568
	(34.15)*	(19.57)*	(8.55)*	(17.53)*	(16.40)*
Observations	7050	7034	4546	7054	6999
Number of farm ref (inc. accountancy offi	1591	1591	1139	1593	1582
R-squared	0.26	0.14	0.09	0.11	0.13
* significant at 5% level;					

Table A3.3: Demand for farm resources on Cereal and General Cropping Farms, FAS

Within group regressions; coefficients reported, t-statistics in parenthesis
Year dummies included

	Log Fertiliser	Log owned Machinery	Log on-farm annual labour units
Set-aside: '93	-0.087	-0.001	-0.002
	(0.78)	(0.01)	(0.04)
Set-aside: '94	-0.052	-0.033	-0.088
	(0.43)	(0.34)	(1.41)
Set-aside: '95	0.200	-0.228	-0.067
	(1.71)	(2.46)*	(1.12)
Set-aside: '96	0.017	-0.033	0.009
	(0.15)	(0.35)	(0.15)
Set-aside: '97	-0.070	-0.065	0.037
	(0.56)	(0.65)	(0.57)
Set-aside: '98	0.038	-0.026	-0.122
	(0.29)	(0.24)	(1.80)
Log of total land area	0.400	0.106	-0.017
	(1.54)	(0.51)	(0.13)
Observations	848	850	850
Number of fa_id	290	290	290
R-squared	0.27	0.08	0.06
* significant at 5% level			

A3.3 Examining Technical Efficiency

Econometric studies have derived a measure of technical efficiency from the production function. The frontier production function shows the maximum amount of output obtainable from given quantities of inputs. Deviations from the frontier have been interpreted as indicating technical inefficiency. However, if factors influencing technical inefficiency were observed (e.g. management ability), an equivalent approach would be to include such variables as inputs directly in the production function. However, since technical inefficiency (or factors influencing it) is not fully observed, one cannot estimate the full extent of technical inefficiency in this way. However, this procedure is appropriate for examining the influence of set-aside on technical inefficiency. Given that we control for all inputs used in production, set-aside only influences production through its impact on technical inefficiency. It could also be thought of as lowering the effectiveness with which inputs are used in production. Similarly to other studies we assume that the frontier is stochastic and that the production function is Cobb-Douglas. We write our model as follows.

$$Y_{it}=E_{it}X_{it}^{\beta} \quad u_{it} \qquad (1)$$

Where Y_{it} is the output of the i^{th} farm in time t; X_{it} is a vector of inputs; β is a vector of parameters and E_{it} is a shift parameter that is affected by the state of technology and farm-level efficiency.

This can be re-written as follows:

$$\ln Y_{it}=\ln E_{it}+\beta \ln X_{it}+u_{it} \qquad (2)$$

$$\text{where } \ln E_{it}=\alpha_o+\alpha_1 SA_{it}+\alpha_2 D_t+v_i \qquad (3)$$

The variable SA_{it} represents set-aside and may have a time-varying impact on E_{it} as farms adapt to the policy and as regulations change over time. D_t represents changes in technology over time. v_i represents other factors influencing farm-level efficiency such as management ability, which are assumed to stay constant over time.

Substituting (3) in (1), we obtain the following equation:

$$\ln Y_{it}=\alpha_o+\alpha_1 SA_{it}+\alpha_2 D_t+\beta \ln X_{it}+u_{it}+v_i \qquad (4)$$

We do not observe v_i, but its omission may bias the estimated coefficients on the other variables. For example, farmers with greater management ability may use inputs (X_{it}) more effectively. Also, factors such as management ability may influence whether farmers set-aside land or (more likely) how much land they will enter the scheme. Within group estimation of (4) will remove the impact of v_i. Thus we estimate the following:

$$\ln Y_{it}^{*}=\alpha_1 SA_{it}^{*}+\alpha_2 D_t^{*}+\beta \ln X_{it}^{*}+u_{it}^{*} \qquad (5)$$

where $Y_{it}^{*}=Y_{it}-\text{mean}(Y_i)$; $X_{it}^{*}=X_{it}-\text{mean}(X_i)$ etc. u_{it}^{*} is assumed iid and uncorrelated with the explanatory variables.

We estimate the production function defined by (5) where the value of crop output (main products excluding subsidies) is a function of four essential inputs: land (under cultivation of main products), labour, crop expenditure (e.g. fertiliser) and machinery.

Further explanation of variables is provided in the Appendix 4.5. We include a dummy variable for whether any land was set aside during the survey period. In table A4.5, we interact the 'set-aside' dummy with year effects to examine whether 'set-aside' may have had a time-varying impact on output (through it's influence on technical inefficiency). We have also examined the robustness of our results to including different measures of set-aside such as the number of hectares entered to the scheme in each year. Results are qualitatively similar.

Table A3.4: Production function for FBS farms

Within group estimation. Coefficients reported, t-statistics in parenthesis
Dependent variable: value of crop production. All variables in logs. Year dummies included

	Cereal and General Cropping	**Mixed**
Whether farmer has any land in set-aside	-0.026	-0.015
	(1.77)	(0.79)
Land used for main crops	0.524	0.62
	(27.20)*	(23.48)*
Total hours of on-farm labour	0.095	0.036
	(8.65)*	(1.29)
Machinery	0.066	0.04
	(8.10)*	(2.52)*
Crop expenditure	0.358	0.325
	(25.83)*	(14.85)*
Observations	7029	3145
Number of farm ref (inc. accountancy offi	1591	847
R-squared	0.62	0.51
* significant at 5% level;		

Table A3.5: Production function for FBS farms

Within group estimation. Coefficients reported, t-statistics in parenthesis.
Dependent variable: value of crop production. All variables in logs. Year dummies included

	Cereal and General Cropping	Mixed
Rotational set-aside: 1993	-0.030	-0.002
	(1.19)	(0.08)
Rotational set-aside: 1994	-0.068	-0.038
	(2.49)*	(1.10)
Rotational set-aside: 1995	-0.032	-0.053
	(1.11)	(1.43)
Rotational set-aside: 1996	0.081	0.018
	(2.51)*	(0.49)
Non-rotational set-aside: 1994	-0.110	-0.037
	(3.43)*	(0.58)
'Flexible' set-aside: 1995	-0.056	-0.006
	(1.76)	(0.10)
'Flexible' set-aside: 1996	0.052	0.105
	(1.29)	(1.69)
All set-aside: 1997	-0.042	0.038
	(1.21)	(0.88)
Any land in voluntary set-aside ('88-'96)	-0.031	-0.082
	(1.26)	(2.19)*
Land used for main crops	0.525	0.612
	(27.33)*	(22.92)*
Total hours of on-farm labour	0.096	0.037
	(8.66)*	(1.31)
Machinery	0.065	0.043
	(8.02)*	(2.50)*
Crop expenditure	0.359	0.326
	(25.91)*	(14.86)*
Observations	7029	3145
Number of farm ref (inc. accountancy offi	1591	847
R-squared	0.62	0.51

* significant at 5% level;

A3.4 Results from Structural Change and Off-farm Labour Analysis

Table A3.6: Probability of exit from survey
Probit model. Marginal effects reported; t-statistics in parenthesis

	Cereal and Crop farms FBS	Cereal and Crop farms FAS	All farms FAS
Set-aside: 1993	-0.08 (2.63)*	-0.036 (0.99)	0.001 (0.03)
Set-aside: 1994	-0.05 (1.15)	--	0.521 (4.04)*
Set-aside: 1995	-0.07 (1.74)	-0.053 (1.15)	0.022 (0.56)
Set-aside: 1996	-0.05 (1.22)	0.003 (0.05)	0.157 (4.00)*
Set-aside: 1997	--	-0.089 (1.8)	0.044 (1.13)
Log Utilised Agricultural Area	-0.01 (1.81)	0.032 (1.65)	0.006 (1.03)
Whether farm operator works off-farm	0.02 (1.75)	0.001 (0.03)	0.030 (0.94)
Whether spouse works off-farm	-0.01 (1.10)	0.045 (1.23)	0.017 (0.86)
Year trend	Year dummies	0.014 (1.68)	-0.005 (1.73)
Year=1994	--	--	0.756 (27.17)*
Years since entered survey	0.013 (19.68)		
Age of farm operator	0.013 (3.67)		
Observations	5409	670	4479

Off-farm Labour Supply in Scotland

For Scotland, the whole sample is used to estimate a simple Probit model for whether the farm operator works off-farm and an OLS regression for hours of off-farm work. The level of Arable Area Payments is included to reflect the combined impact of set-aside and AAP subsidies. The relationship between off-farm labour decisions and this variable will depend on whether the (positive) impact of set-aside or the (negative) impact of receiving AAP subsidies dominates. Attention is restricted to the off-farm labour decisions of farm operators since as with the FBS, there is incomplete information on whether a spouse is present on the farm. [31]

Results from the Probit model (shown in Appendix 3.4) indicate a small negative relationship between Arable Area Payments and whether the farmer works off-farm. If subsidies increase by £10,000, the probability of off-farm participation reduces by only one per cent. This is without accounting for the possibility that subsidies may be correlated with an unobserved variable (which is difficult to do here, given the small number of farmers working off-farm). If the farmer is observed working off-farm, again there is a negative relationship between the level of Arable Area Payments and his/her hours of off-farm work. However, if we estimate the regression within groups (i.e. attempting to remove the influence of unobserved variables), the coefficient becomes completely insignificant and changes sign. This may indicate that AAP subsidies are reflecting the influence of some unobserved variable. On the other hand, there are too few farmers working off-farm to be confident about the interpretation of 'within group' estimates. A tentative conclusion is that the overall influence of set-aside and AAP payments on off-farm labour decisions is likely to be negative.

[31] We only observe a spouse if she/he is working on or off the farm. We cannot distinguish between farms where there is no spouse and farms where the spouse does not work outside the home.

Table A3.7: Off-farm labour for all farms in Scottish FAS

(1) Probit model: whether farm operator works off-farm; Marginal effects reported. t-statistics in parenthesis
(2) OLS model: log hours of off-farm work for the farm operator

Farm operators work off-farm in four per cent of the survey (213/4978 observations)

	(1) Probit	**(2) OLS**
area and set-aside payments/10000	-0.009	-0.277
	(2.06)*	(2.02)*
livestock subsidies/10000	-0.023	-0.118
	(5.75)*	(1.03)
Log total land area	-0.003	-0.073
	(0.84)	(0.85)
Location in LFA	0.016	-0.132
	(2.64)	(0.64)
Year trend	0.004	0.089
	(5.06)*	(3.01)*
Dairy farm	-0.036	0.018
	(5.87)	(0.05)
Age of farm operator/10	-0.009	0.026
	(4.52)*	(0.35)
Observations	4943	290
R-squared		0.06
* significant at 5% level		

Appendix 4

Estimation of Supply Control in Europe

A first estimation of the supply control impact of set-aside for the EU was conducted using the following method. The first stage is to assess how much of the land set-aside would have been down to cereals. As with the UK analysis it is assumed that the land set aside would be cropped in the same general rotation of COP crops as the land not set aside. The next stage is to estimate the yield potential of the land. The analysis at the aggregate level shows no clear evidence of yield slippage as a result of set-aide. However, it would seem unreasonable to make no allowance for the fact that some land set-aside may generally be lower yielding. For voluntary forms of set-aside such as 5-year it is assumed that land of lower quality is generally offered. In addition when there was a distinction between rotational and non-rotational it is assumed again that lower quality land would be placed in non-rotational set-aside. When the distinction between rotational and non-rotational set-aside was removed it was assumed that countries maintained the same relative proportions in each type.[32] For rotational set-aside it is assumed that the quality of land tends to the average. An estimate of the likely difference between lower yielding and average yielding land is taken from the 1998 UK cereal survey. Here it was found that cereal yields on the lowest yielding fields were 80 per cent of the average yield. This relationship was assumed to hold for other European Countries.

For a country in a year the estimated supply control effect for each type of set-aside is calculated by multiplying the area set aside by the average yield by a weighting factor for the relative quality of land by the share of cereals in the rotation. The sum of these is the estimated total supply control for each country.

The results of this aggregate approach can be compared to the estimates made for the UK using the micro level cereal data (Table A4.1). There do appear to be some differences in results between using the two types of data. The aggregate approach generally produces higher estimates of the reduction in supply caused by set-aside

Table A4.1: A Comparison of Supply Estimates between methods

	Percentage Supply Control		
Year	Aggregate	Micro	Difference
1993	14.8	13.6	1.2
1994	15.9	16.0	-0.1
1995	13.8	13.4	0.4
1996	10.6	9.1	1.5
1997	7.2	6.3	0.9
1998	7.4	6.2	1.2

As noted in the text there are a number of reasons why the estimates based on this method might be viewed as high for a number of European countries. A second approach to estimating the impact of set-aside is described below.

[32] This was the case in the UK

Estimation of Supply Control Impact of Set-aside

A second estimate is made of the supply control impact of set-aside. Using aggregate data from each member of the EU for the period 1973 to 1992, a panel data model was constructed. This model was then used to assess the impact of set-aside in 1993.

Following economic theory, the area sown to cereals is expected to be a function of the expected profitability of cereals and the expected profitability of alternative crops and the quantity of arable land available.

The model estimated took the following form:

$$C_{it} = a_0 + a_1 PW_{it-1} + a_2 PO_{it-1} + a_3 A_{it} + a_4 C_{it-1}$$

C_{it} = Cereal Area in the *ith* Country in Year *t*
PW_{it} = Price of Cereals in the *ith* Country in Year *t-1*
PO_{it} = Price of Oilseeds in the *ith* Country in Year *t-1*
A_{it} = Arable Area in the *ith* Country in Year *t*

The model was estimated for total cereals area rather than the area of individual cereal crops as it is the impact of set-aside on total cereals that is of major interest. Given the strong correlation between cereal prices, the price of wheat was chosen to represent cereal prices. The price of oilseed rape was taken to represent oilseed crops. It can be reasoned that it is expected prices that effect the decision on the area to plant. In this model following Lee and Helmberger (1985) lagged producer prices were used as a proxy for producer price expectations. These prices were deflated by an agricultural price index. The model was estimated in log form. A 'fixed' effects model, where the intercept was allowed to vary between countries was found to be superior.

The results are shown in Table A5.2. The estimated parameters are of the correct sign and generally statistically significant. The results show that production reacts positively to changes in real cereal price and negatively to changes in oilseeds. Although significant the low value of the coefficient on oilseeds suggests that changes in price do not have a large impact on the level of cereal production. The results of this analysis show that changes in the overall area of cereals planted are fairly unresponsive to the price of cereals. That is, in the short run, a 10 per cent change in expected price is assumed to change the total area planted to cereals by 1.6 per cent. This estimate can be compared with the findings of Guyomard *et al* (1996) from their analysis of supply response in France. They analysed wheat and barley separately and estimated the elasticities of area response to be 0.31 and 0.11 respectively.

The model was initially estimated up to the period of 1992 and then the results were used to forecast the expected level of plantings in 1993 in the absence of set-aside.

Table A4.2: Area Response to Price Changes: Dependent Variable: Cereal Area

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Price Oilseeds	-0.0247	0.0144	-1.7148	0.09
Price Wheat	0.1617	0.0540	2.9918	0.00
Arable Area	0.7835	0.0671	11.6800	0.00
Lagged Cereal Area	0.8130	0.0608	13.3695	0.00
Fixed Effects				
_BL--C	0.0415			
_DK--C	0.5589			
_ES--C	0.8075			
_FR--C	0.8272			
_IT--C	0.5831			
_NL--C	-0.7473			
_UK--C	0.6763			
_DE--C	0.8237	Number observations		96
R-squared	0.9996	Mean dependent var		7.47
Adjusted R-squared	0.9995	S.D. dependent var		1.41
S.E. of regression	0.0317	Sum squared resid		0.08
Log likelihood	364.6189	F-statistic		61869.67
Durbin-Watson stat	1.7654	Prob(F-statistic)		0.00

The difference between this estimate and actual areas was then multiplied by the expected yield on this land to attain an estimate in terms of production. This figure was then added to the estimate of the level of supply control from the land in the 5-year set-aside programme to attain a total supply control figure.

The model was also used to predict beyond 1993. However, given the changes in policy that occurred and also the quite dramatic changes in the world markets the results need to be treated with caution (Table A5.3). They seem to indicate that given the declining profitability of cereals in the late 1990s it is not clear that a high proportion of the land in set-aside would return into cereals and therefore the actual degree of supply control is actually quite low. The figures for Germany and Italy highlight the difficulties with this form of prediction. By 1997, on the basis of the earlier price responsiveness of cereals, the predicted area in the absence of set-aside is lower than the actual area with set-aside. The results for these countries are in part caused by the large changes in arable area that occurred from 1993 onwards discussed in the text.

However, the findings from the 2000 survey of UK farmers conducted as part of this study contradict these findings. From this study respondents indicated that 72 per cent of the land set-aside would return to cereals if set-aside were abolished. This figure is much closer to the estimates achieved based on rotations.

Table A4.3: Difference between Predicted and Actual Cereal Areas 1993 to 1998

Year	Germany	Italy	France	UK	Spain
1993	9.1	16.2	11.2	16.9	14.6
1994	7.7	9.7	16.0	17.8	5.2
1995	4.7	5.4	13.9	13.4	7.2
1996	1.9	0.1	7.6	8.7	10.5
1997	-1.2	-2.5	3.0	3.2	3.9
1998	-2.5	-1.1	3.4	4.8	9.9

Supply Response to a Price Cut

As discussed in the text, an alternative method to attain the given level of supply control achieved through set-aside would have been a price cut. This section describes the methodology for obtaining the estimate of the level of price cut required. The above model looked at the plantings of cereals. However, it is clear that supply can be adjusted at the intensive margin as well as the extensive margin. Therefore to evaluate the impact of a price cut on production, a model is built with total production as the dependent variable. The model has the same basic form as that described above namely:

$$C_{it} = a_0 + a_1 PW_{it-1} + a_2 PO_{it-1} + a_3 A_{it} + a_4 C_{it-1} + a_5 t$$

C_{it} = Cereal production (tonnes) in the *ith* Country in Year *t*
PW_{it} = Price of Cereals in the *ith* Country in Year *t*
PO_{it} = Price of Oilseeds in the *ith* Country in Year *t*
dA_{it} = Arable Area in the *ith* Country in Year *t*
t = time Trend

In this model a time trend is added to capture the general increase in yields brought about by technological process. Again a fixed effects model was found to be superior.

Table A4.4 Supply Response of Cereals Dependent variable Cereal Production

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Arable Area	0.717	0.169	4.235	0.000
Price Oilseeds	-0.102	0.048	-2.133	0.036
Wheat Price	0.616	0.259	2.382	0.020
Trend	0.040	0.014	2.945	0.004
Lagged Cereal Production	0.282	0.110	2.560	0.012
Fixed Effects				
_BL--C	1.97			
_DK--C	2.36			
_ES--C	1.69			
_FR--C	2.67			
_IT--C	1.25			
_NL--C	1.36			
_UK--C	2.73			
_DE--C	2.62			
R-squared	0.99	Mean dependent var		11.187
Adjusted R-squared	0.99	S.D. dependent var		1.247
S.E. of regression	0.10	Sum squared resid		0.784
Log likelihood	210.04	F-statistic		3799.565
Durbin-Watson stat	1.97	Prob(F-statistic)		0

The results appear to suggest that the short-run response to a 10 per cent increase in the price of cereals will lead to a rise of 6.2 per cent increase in cereal production. That suggests that for the EU as a whole supply of cereals is relatively inelastic to price. The validity of assuming a similar response across countries was tested and the restriction was found to be valid. The degree of elasticity is similar to that found for France by Guyomard *et al* (1996). They found elasticities of supply of 0.7 for wheat and 0.4 for barley. Separate functions were estimated for wheat and barley and wheat was found to be more elastic in supply than barley. The results suggest that to obtain the estimated 14 per cent fall in production that occurred as a result of set-aside, an uncompensated price cut of over 22 per cent would have been necessary

Yields Pre and Post Set-aside

Analysis of aggregate EU data enables us to look at some of the other issues involved with set-aside, in particular the existence of yield slippage. A preliminary analysis was undertaken using a production function approach. It aimed to capture whether the inputs to output relationship changed after set-aside was introduced by using intercept and slope dummies.

$$Y_{it} = a_0 + a_1 F_{it} + a_2 CP_{it}, + a_3 S_{it} + a_3 A_{it} + a_4 DS_{it} + a_5 DS * F_{it} + a_6 DS * CP_{it}, + a_7 DS * S_{it} + a_8 T + a_9 D$$

Where
Y_{it} = Yield per hectare in country i in year t
F_{it} = Nitrogen Fertiliser application (kg/ha) in country i in year t
CP_{it} = Expenditure on Crop Protection per hectare at 1990 prices in country i in year t
S_{it} = Expenditure on Seed per hectare at 1990 prices in country i in year t

A_{it}= Proportion of Arable Area down to the wheat in country *i* in year *t*
DS = Set-aside Dummy (1 after 1993)
T = Time Trend
D = Dummy to Capture impact of German Unification

Table A4.5 Dependent Variable Yield Wheat

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Intercept	-0.21	0.04	-5.40	0.00
Nitrogen Fertiliser	0.15	0.06	2.53	0.01
Dummy Germany	0.03	0.04	0.66	0.51
Set-Aside Dummy	-0.01	0.04	-0.19	0.85
Seed	0.09	0.05	1.84	0.07
Trend	0.01	0.00	5.80	0.00
Crop Protection	0.05	0.04	1.05	0.29
Proportion of Area Down to Wheat	0.03	0.02	1.29	0.20
Nitrogen Fertiliser * Set-Aside Dummy	-0.24	0.14	-1.70	0.09
Crop Protection * Set-Aside Dummy	0.05	0.10	0.51	0.61
Seed * Set-Aside Dummy	-0.03	0.11	-0.25	0.81
R-squared	0.68	Mean dependent var		0.01
Adjusted R-squared	0.67	S.D. dependent var		0.20
S.E. of regression	0.11	Sum squared resid		3.59
Log likelihood	382.21	F-statistic		60.43
Durbin-Watson stat	1.86	Prob(F-statistic)		0.00

The insignificance of the dummy variable for intercept appears to suggest that there has been no significant change in yields pre and post set-aside. All the slope dummies are insignificant at the five per cent level though the dummy for nitrogen is significant at the 10 per cent level. Further analysis of variable input use appears to indicate a fall in average use per hectare after the MacSharry reforms. The initial results indicate that the input output relationship was no different before and after set-aside suggesting that intensification has not occurred.

Reference

Guyomard, H., Baudry, M and Carpenter, A. (1996) Estimating crop supply response in the presence of farm programmes: application to the CAP *European Review of Agricultural Economics* **23** 401 – 420

Appendix 5

An Efficient Set-aside: Methodology

In the analysis reported in the text it is assumed that a producer would be willing to set-aside a hectare of land if the expected return from doing so was at least as great as the expected return from producing a crop on that land. The return from an extra hectare of crop production is assumed to be the crop revenue plus any compensatory payments minus the marginal costs of production. The return from set-aside is the set-aside payment less any costs associated with set-aside.

The assumption that a grower would set-aside land in the above situation is clearly based on the assumption that the producer is motivated by profit maximisation rather than other factors. In addition it assumes that a producer shows no preference for the certain set-aside return as opposed to an equal uncertain return from cereals.[33]

To assess the impact of set-aside it is first necessary to estimate a cost function from which the marginal cost of production can be derived. The data used were obtained from the 1998 cereal survey. Following Guyomard *et al* the estimated cost function adopted was quadratic. The cereal data set contains price and quantity information therefore it does not have to be assumed that all producers face the same prices for inputs. The estimated function took the following form:

$$CY_i = a_0 + b_1 Y_i + 0.5 b_{11} Y_i Y_i + \sum_{k=1}^{7} c_k P_{ki} + 0.5 \sum_{k=1}^{7} \sum_{j=1}^{7} c_{kj} P_{ki} P_{ji} + \sum_{k=1}^{7} d_k P_{ki} Y_i + \sum_{m=1}^{8} e_m D_{mi}$$

Where

CY_i is Total Cost of production of producer i
Y_i is area of crop down to crop
P_{ki} is Price of input k for producer i
D_m is a regional dummy variable

Differentiating the above equation by output produces the marginal cost of an extra hectare of land. It is assumed that yield and price do not vary as a result of increasing output. The difference between the return from the crop and the marginal cost can therefore be seen to be the minimum payment that a producer would need to set-aside the land. The process of allocating set-aside efficiently is undertaken by raising the payment for set-aside until the required quantity of land is taken out of production. This payment is therefore seen as the minimum necessary to achieve the required level of set-aside for that year.

[33] For a discussion on the impact of uncertainty on the decision to set-aside land see Roberts *et al* (1996)

Clearly, the use of a costs and returns obtained from a one off survey raises some issues. As mentioned above it is the expected returns that will effect the decision making not the actual returns. In any one year the actual return will vary from the expected return for a number of reasons (crop failure etc.). For example a number of farms show a loss from wheat production in 1998. If this actual return is used it would indicate that a negative payment for set-aside could be made. However, it is reasonable to argue that this loss was not expected (otherwise the farms would probably not have produced wheat), therefore the returns to these producers are adjusted to the level where they 'break even'.

Another issue is that ideally the costs and returns from cropping used should be some form of weighted average of the crops grown on the COP area. However, for ease of estimating the cost function just the costs and returns from wheat production are taken. As wheat is one of the more profitable COP crops this decision may overstate the profitability of cropping the land. Although analysis shows that a weighted return from a hectare of COP land is not that different than from that obtained from wheat alone.