

Environmental Considerations for the Reform of the CAP Olive Oil Regime

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SUMMARY

Environmental pros and cons of olive production

Olive production is a major land use and farming sector in the Mediterranean regions of the European Union and has important environmental, social and economic influences. At the present time, olives are one of the few Mediterranean crops with significant possibilities for expansion due to increasing world demand for olive oil.

Certain types of more traditional olive plantations have important nature conservation and landscape functions. Traditionally managed olive plantations are of intrinsically high biodiversity and constitute an important element of the mixed farming landscape in Mediterranean regions. They also provide an essential source of winter food for very large numbers of migratory birds from northern Europe. When planted on steep slopes, traditional plantations use a system of terraces to prevent soil erosion. This constitutes a sustainable system for the cultivation of land in upland areas which otherwise present very limited possibilities for agriculture.

Activities such as pruning and harvesting provide a significant level of seasonal employment in marginal areas which often are economically dependent on a mixture of part-time farming and tourism. Olive production therefore contributes to the maintenance of rural communities in many marginal areas which have so far escaped wholesale abandonment. Due to the low productivity and small scale of holdings, production in such areas would not be viable without a considerable level of subsidy.

On the other hand, the more intensively managed olive monocultures which dominate the landscape of the major producing regions, such as in large parts of Andalucía, usually are of relatively low biodiversity and cause considerable degradation of natural resources through soil erosion on slopes. The creation of high levels of background pollution from pesticides is a concern in regions where intensively managed olive plantations cover large areas of land. The dominant producers in such regions tend to be far more competitive than the more traditional farmers in marginal areas, with larger holdings, higher productivity and well-developed marketing channels. Many probably would be able to compete on the world market without subsidy.

The key environmental challenges associated with olive production can be summarised as follows :

- To reduce currently high levels of soil erosion in the main producing regions by promoting a change in management practices. In more extreme cases, this would require the establishment of a permanent understorey which could be maintained by grazing livestock or allowed to revert to natural woodland.
- To maintain traditional olive groves where these make a positive contribution to natural and landscape values.
- To prevent the further expansion of olive plantations onto valuable habitats and soils that are vulnerable to erosion
- To promote more environmentally sensitive production systems, particularly through a reduction in the use of pesticides.

The need for reform of the CAP regime

At present, olive-oil production is heavily subsidised by the Common Agricultural Policy (CAP). The existing support system has led to intensification and increased output in the main producing regions

whilst failing to halt the abandonment of old groves in many marginal regions. Recent and current trends seem to show a regression of traditional production systems of high natural value and the expansion of intensive systems.

Under the "agri-environment programme" (Regulation 2078/92), some schemes have been set up in Mediterranean regions to provide additional aid for traditional olive groves (Portugal) and to promote soil conservation measures (Spain) and organic production methods (several member states). However, the impact of these measures is expected to be marginal as the financial resources available for Regulation 2078/92 are extremely limited. Unless a far greater budget is made available for Regulation 2078/92, only a very small percentage of EU olive producers will be affected by this measure.

Currently, the CAP support regime for olive oil is being reviewed, which raises important questions about the socio-economic and environmental effects and rationale of this policy. It is unfortunate that this sector generally receives little attention at the European level, particularly in the debate on the environmental role of agriculture. This is probably due to the fact that the debate is dominated by farming sectors characteristic of northern and central Europe. At present, the debate on the reform of the CAP olive regime is focused almost entirely on the questions of preventing fraud and, particularly in the case of the Spanish Government, on maintaining a system of subsidies which greatly benefits an important agricultural production sector.

The most realistic options for reform involve converting all or a part of the current production subsidy into a direct payment per tree or per hectare, thus partly decoupling the subsidy from production. Such a change would reduce the incentive for intensification and for extending plantations onto inappropriate land and could be considered broadly positive in environmental terms. It also would provide an important continuity of income for more marginal producers in remote areas, with older trees, etc., and thus may help to prevent abandonment.

However, there is a danger that a simplistic transfer of support from oil production to a tree payment might create as many problems as it solves, as it would tend to favour the most intensive plantation types, with a high density of trees. There would have to be some form of modulation and/or upper limits on the number of trees per hectare eligible for aid. A flat-rate payment per hectare might be a simpler way of avoiding the distorting effects of a tree payment and would ensure that traditional, extensive producers benefited from the same level of basic support as more intensive producers.

Furthermore, there are several important environmental problems (as well as certain social issues) which the change from price support to direct payments would not address, unless additional mechanisms are built into the support system. Although it is not realistic to expect to be able to design a European support regime which solves all of the environmental issues associated with the sector, it should be possible to establish a benign framework, within which Member States and regional authorities could then implement measures adapted to local conditions and needs. A possible framework is illustrated below.

Finally, given the lack of information currently available, a comprehensive study is recommended of the environmental issues relating to olive production and the effects of the CAP support regime. A new support system for a sector of such great environmental and social importance should be based on an objective assessment of conditions on the ground in different regions of the EU, including evaluations of how farmers might react to different support mechanisms.

Proposed framework for an environmentally sensitive support regime

1. A significant reduction in production support in order to reduce the incentive for intensive production and for expansion onto environmentally sensitive land.
2. The introduction of direct payments per hectare or per tree in order to provide a continuity of income for producers, thus helping to prevent abandonment, particularly in marginal areas. Direct payments should not be paid in direct proportion to historic yields or total number of trees. They should be designed to favour the maintenance of the types of olive plantation which contribute positively to nature conservation, landscape and sustainable resource management..
3. The requirement that Member States introduce a basic level of environmental cross-compliance to prevent direct payments being made to producers who use cultivation techniques which involve a high risk of erosion, make excessive use of pesticides of high toxicity or who expand production onto land which involves a high environmental cost, particularly land currently under natural vegetation.
4. The requirement that Member States should establish regional strategies under which specific agronomic and environmental problems would be tackled using targeted measures, including the conversion to permanent vegetation of plantations on highly vulnerable soils.
5. A major increase in financial resources for Regulation 2078/92 in order to establish significant regional programmes with specific objectives including: to promote low-intensity, environmentally positive production systems; to provide incentives for the widespread introduction of alternative management techniques to reduce soil erosion; to encourage the conservation of special features such as very old trees, stone walls and terraces.

I INTRODUCTION

Olive production is a major land use and farming sector in the Mediterranean regions of the European Union (EU) and has important environmental, social and economic influences. Furthermore, olives are one of the few Mediterranean crops with significant possibilities for expansion due to increasing world demand for olive oil.

At present, olive-oil production is heavily subsidised by the Common Agricultural Policy (CAP). This policy has led to intensification and increased output in the main producing regions, with generally negative consequences for the environment, but has failed to halt the abandonment of old groves in many marginal regions.

Currently, the CAP support regime for olive oil is being reviewed, which raises important questions about the rationale of this policy and its socio-economic and environmental effects. The European Commission has proposed the introduction of a production-neutral aid per tree to replace the current system of price support. However, the Spanish Government, supported by olive-oil producer interests, is negotiating hard to resist such a change.

The formulation of a support regime for a sector of such great environmental and social importance should be based on an objective and comprehensive assessment of conditions on the ground in different regions of the EU, including evaluations of the environmental issues relating to olive production and of how farmers might react to different support mechanisms.

In practice, the olive sector generally receives little attention at the European level, particularly in the debate on the environmental role of agriculture. In large part, this is probably due to the fact that the debate is dominated by farming sectors characteristic of northern and central Europe, such as sheep, beef, dairy and cereal farming. In the course of this brief study, only one publication was encountered which considers the environmental effects of CAP olive-oil regime (Pain, 1994).

This paper was produced by the European Forum for Nature Conservation and Pastoralism in partnership with the Asociacion para el Analisis y Reforma de la Politica Agro-Rural in Spain at the request of DGVI of the European Commission. It aims to address the key environmental issues concerning olive production and the CAP support regime, with a particular emphasis on nature conservation. Options for changes to the CAP olive oil regime are reviewed with a view to achieving a better integration of environmental concerns.

In order to feed into the current policy review, the paper had to be prepared in a short space of time; it is based on a review of available literature and consultation with a limited number of producers and other experts, principally in Spain and Portugal. The paper also draws on more detailed work previously undertaken in Italy for the EFNCP and the Institute for European Environmental Policy. In the time available, data could not be collected on production systems in Greece and France.

II PRODUCTION PATTERNS IN THE EUROPEAN UNION

Olive farming is a major land use in Mediterranean regions, covering 5.39 million ha in the EU Member States. The main areas of production are Spain, with approximately 2.2 million ha, and Italy, with 2 million ha. Both Greece and Portugal have over 0.5 million ha, whilst France is a very much smaller producer, with 40,000 ha. Whilst olive plantations are found over most of the Mediterranean region, the greatest concentrations are in the Spanish region of Andalucía, which has nearly a quarter of the total EU area. The EU countries currently produce almost 80 per cent of the world's olive oil.

The area of land under olives has fluctuated considerably over recent decades. In Spain, olive plantations reached their greatest extent in the mid-1960s, when they covered nearly 2.4 million hectares, which was about three times the area covered only a hundred years previously. This expansion took place largely at the expense of Mediterranean woodlands, as a result of land privatisation (Parra, 1990). This was followed by the abandonment and subsidised grubbing-out of many older plantations in the 1970s and early 1980s. Some 300,000 ha were cleared in Andalucía under a government restructuring scheme started in 1972, to be replaced mostly by arable crops (MAPA, 1988).

The decline in the area of old olive plantations due to a combination of abandonment and restructuring programmes seems to be common to other Mediterranean countries. In Italy, one estimate has put the decline in olive plantations due to abandonment at some 25-30,000 hectares per annum over the past ten years (Petretti, 1995). In Portugal, national production of olive oil has declined by about 20 per cent in the past 20 years (Fialho, 1996). Since 1986, 30,000 ha of old plantations have been removed under the PEDAP programme, which was funded by FEOGA with the aim of aiding the adaptation of Portuguese agriculture to EC market conditions. Only 7,000 ha were replanted with new trees (Fialho, 1996).

However, at the same time as older groves¹ are abandoned in some regions, new plantations are being created, particularly in regions with a high concentration of commercially orientated producers, such as Andalucía and Badajoz in Spain. For producers in such areas, the CAP regime has provided a strong incentive to increase production, and new plantations have increased steadily since Spain's accession to the European Community in 1986. In 1995 alone, 67,000 ha of olives were reportedly planted in Spain (López Sánchez-Cantalejo, 1996).

Overall, there appears to be a tendency towards the abandonment of traditional olive groves in certain more marginal regions and the expansion of new plantations and intensification of management systems in regions with a comparative advantage. This process of rationalisation and concentration of production, which has a number of negative environmental consequences, is encouraged by the current production-orientated support regime.

III PRODUCTION SYSTEMS

Olive production systems vary considerably. Tree density varies from as few as 40-50 stems per hectare in some of the older groves to as many as 300-400 stems per hectare in the more intensive plantations. Management systems range from the highly labour-intensive to the highly mechanised.

In general terms, we can divide production systems into three types: traditional groves, often with ancient trees and typically planted on terraces, which are managed with few or no chemical inputs; intermediate plantations which follow traditional patterns but are under semi-intensive management using large inputs of artificial fertilisers and pesticides; and modern plantations of smaller, "dwarf" tree varieties, planted at higher densities and managed under an intensive and highly mechanised system, usually with irrigation.

The nature conservation value and wider environmental issues associated with olive production are reflected by these three types of system. The traditional groves have the highest natural value (biodiversity and landscape value) and represent a sustainable approach to exploiting marginal

¹ The term "grove" is used in this report to refer to smaller, traditional plantations of olives; "plantation" is used generically, to refer to both traditional groves and more modern plantations.

agricultural land. The intermediate and intensive systems are of least natural value and have potentially the greatest negative environmental impacts, particularly in the form of soil erosion and pesticide pollution.

1. Traditional plantations

The trees in traditional plantations are mostly old and in some cases have been maintained in production for several hundred years by means of pruning and grafting of new stock. Old trees are of intrinsically high natural and landscape value (see below).

There is a great variety of traditional planting patterns, depending on local traditions, soil conditions, rainfall, etc. In Spain, trees were traditionally planted between 9 and 14 metres apart, which equates to between 50 and 140 stems per hectare. The most extensive plantations may have as few as 40 trees per hectare, particularly in areas of low rainfall. In Grosseto province in Italy, the most extensively managed groves have approximately 50 trees per hectare (Petretti, 1995).

On the other hand, in certain areas, traditional plantations may have over 200 trees per hectare (for example, Sierra de Gata and Hurdes in Extremadura, Spain). The trees in traditional plantations sometimes are planted randomly, rather than in lines, and in some cases may even have been formed by grafting cultivars onto wild olive trees.

On steep slopes, the land is almost invariably terraced, which prevents soil erosion. Terraces are a characteristic landscape feature in many Mediterranean uplands, although some areas have already been lost to abandonment.

In the past, the soil often was cultivated for the production of crops for on-farm use, such as barley, oats, chick-peas or vetch. Nowadays, the normal practice is simply to control spontaneous grasses and other vegetation by seasonal ploughing or harrowing, sometimes preceded by grazing or cutting. The frequency of tillage depends on the region: the conventional pattern in most of Spain is to plough once in the winter, following the olive harvest, once in the spring, to control weeds, and again in the summer, to create a fine tilth, which is thought to reduce moisture loss through evaporation. However, this also depends on the individual farmer. In a given area, some olive groves may only be cultivated once or twice a year, whilst more enthusiastic farmers may subject their plantations to repeated ploughing. The control of vegetation in traditional olive groves by sheep grazing seems to be quite common in Italy but is rarely seen in Spain.

The spontaneous vegetation which develops between tillage can be of a high floral diversity, if sufficient time is allowed for it to develop. In a selection of plantations in western Andalucía, 75 plant species were recorded prior to the spring cultivation (Rodenas *et al*, 1977).

The structural diversity of traditionally managed olive plantations (tree canopy, trunk, understorey and cultivated land) provides a variety of woodland and open habitats. The older trees support a high diversity and density of insects which, together with the tree's fruit, provide an abundant supply of food (Parra, 1990). Artificial pesticides are not normally used, other than to deal with occasional outbreaks of pests. The low level of pesticide use allows a rich flora and insect fauna to flourish, which in turn provides a valuable food source for a variety of avifauna.

Consequently, traditional olive groves generally support a high diversity of wildlife, including reptiles, butterflies and other invertebrates, birds and small mammals. As well as many passerine species, typical nesting birds include Hoopoe (*Upupa epops*), Roller (*Coracias garrulus*) and Scops owl (*Otus scops*) (Petretti, 1995). The Little Owl (*Athene noctua*) traditionally is associated with old olive groves where it nests in the hollows of older trees and hunts insects, lizards and small mammals. The trunks of older trees are also used by mammals, such as the genet (*Genetta genetta*), and by reptiles.

The main problems faced by traditional olive groves are abandonment and clearance for new, more

intensive plantations. The abandonment of olive groves goes hand in hand with the general social decline and depopulation of upland areas which has taken place in recent decades in Mediterranean regions. A particular problem associated with traditional olive production is that harvesting has to be carried out by hand (the most modern types of plantation are harvested mechanically). The significant seasonal labour force which is needed is no longer available in some areas.

Olive grove abandonment has taken place on a large scale in certain upland areas, for example in Grosseto Province in Italy, and is associated with a loss of habitat and landscape diversity and an increase in the risk and destructiveness of forest fires (Petretti, 1995). Abandoned terraces in very dry areas are vulnerable to collapse which in some cases leads to serious erosion and landslips. During the 1970s and 1980s, various programmes were implemented in Spain and Portugal with the aim of grubbing out old olive plantations (see Section II, above).

Nevertheless, large areas of traditional olive plantations survive throughout the Mediterranean member states particularly, but not exclusively, in more remote and upland areas. This type of production is low yielding and probably contributes a very small proportion of total EU output. However, activities such as pruning and, especially, harvesting, provide a significant level of seasonal employment in areas which often depend on a mixture of part-time farming and tourism. Olive production therefore makes a significant contribution to the maintenance of rural communities in many areas which have so far escaped wholesale abandonment.

2. Intermediate plantations

Although relatively large areas of traditional plantations survive in most Mediterranean regions, the larger part of EU production comes from plantations which are managed under a semi-intensive system. This system dominates the landscape in provinces such as Jaén and Córdoba in Spain, which between them account for about 15 per cent of the total EU olive area.

The trees are generally younger and planted closer together (80-220 per hectare). Drip irrigation allows for higher densities in some cases. Artificial fertilisers and pesticides are used systematically and the land is cultivated repeatedly during the year to keep the soil free of competing weeds.

These plantations are of some value as a winter food source for migratory birds but otherwise they are not of great interest for wildlife. Management systems are more intensive than in traditional plantations: the grass understorey is rarely allowed to become established whilst pesticide use reduces the diversity and richness of insect fauna. As far as the visual landscape is concerned, these plantations often form monotonous monocultures.

Soil erosion probably is the most significant environmental problem associated with this type of olive production. A large proportion of the plantations are found on slopes, which are often steep and generally have thin soils which are highly vulnerable to erosion. Flatter land with deeper soils traditionally has been reserved for annual crops. In Andalucía, many new plantations have been established in recent decades by clearing natural woodland on slopes. Terraces are no longer constructed as they are very labour intensive and restrict the access of machinery.

3. Intensive plantations

The most modern plantations use smaller tree varieties planted at high densities. In the 1970s and 1980s, systems using very high densities were developed (up to 400 trees per ha), although the current tendency is to use a density of 200-225 trees per ha (Guerrero, 1994). These plantations are intensive and highly mechanised, often using seasonal irrigation and mechanical harvesting. Production is

considerably higher than in the "intermediate" plantations described above. Experimental plantations in Córdoba have produced yields of 4,276 kg/ha in dryland conditions and 9,689 kg/ha with irrigation; these figures compare with an average yield for the province of 1,700 kg/ha (Guerrero, 1994).

Intensive plantations are inherently low in biodiversity due to the use of high levels of insecticides and herbicides, the absence of a grass understorey and the young age and small size of trees. Soil erosion generally is not so serious as in Intermediate plantations, as modern production techniques usually involve reduced tillage and a greater use of herbicides to control competing vegetation. On the other hand, there is some concern that accumulation of herbicides and other types of pesticide may result in high levels of background pollution over time (Civantos, 1995).

There is some concern amongst conservationists in Spain at the potential for these highly productive plantations to encroach on arable land in areas of importance for the conservation of steppeland bird communities. This has happened to a limited extent in Andalucía, but may now have been slowed by the introduction of arable area payments which tend to keep land under arable cultivation.

IV ENVIRONMENTAL ISSUES ASSOCIATED WITH OLIVE PRODUCTION

This paper limits itself to the principal environmental questions associated with the management of olive plantations: nature conservation and landscape, soil erosion and pesticide use. The question of water pollution resulting from the olive oil production process, which is a serious environmental problem in many olive producing regions, is not covered here.

1. Nature conservation and landscape

The value of olive plantations for nature conservation ("natural value") varies according to factors such as the level of pesticide use, whether a seasonal ground storey is allowed to become established beneath the trees, the age of the trees, etc. The intensive application of techniques intended to increase production (frequent tillage, heavy herbicide and insecticide use, etc.) has a detrimental effect on ground flora and insect populations and generally results in a reduction of natural value.

Consequently, given the same edafo-climatic conditions, low-yielding plantations tend to be of higher natural value than those from which high-yields are achieved through intensive management. Young plantations usually are the most economically productive but the poorest in nature conservation terms; conversely, the oldest groves are of the highest natural value but tend to produce a much smaller crop of olives.

In addition to the particular natural values of traditionally managed groves (described in Section II, above) the use of Mediterranean olive plantations as a food source by very large numbers of migrant passerine birds, both from northern and central Europe and from Africa, is well documented. Migrants which are common in olive plantations include Chiffchaff (*Phylloscopus collybita*), Song Thrush (*Turdus philomelus*), Blackcap (*Sylvia atricapilla*) and Rufous Bush Chat (*Cercotrichas galactotes*) amongst many others. In more open olive plantations with a higher proportion of cultivated land, typical bird species include Black-eared Wheatear (*Oenanthe hispanica*) Thekla Lark (*Galerida theklae*) and Corn Bunting (*Miliaria calandra*) (Soler, *et al*, 1988). Where pesticides are used intensively to control specific parasites, the overall insect population inevitably suffers and the trees' overall value as a food source for birds is reduced, although the olive fruit is still available to them.

Where olives form a part of a diverse land use system, for example in combination with arable cultivation and vineyards or where vines are grown between rows of olive trees, they are an important

landscape feature and may add considerably to habitat diversity, particularly in countryside with few other trees. However, in major oil-producing regions such as Andalucía, olive plantations tend to dominate the landscape, forming vast monocultures in which the trees themselves are the only form of vegetation for the greater part of the year. In this situation, landscape and habitat diversity are very limited.

The intermittent harvesting of olives which often precedes abandonment in marginal plantations should not be detrimental to their natural value; on the contrary, it seems that in drought years when many groves are not harvested, birds take particular advantage of the availability of olives, given the scarcity of wild fruits (Rodríguez *et al*, 1986). One option for the management of non-viable plantations may be to abandon cultivation and introduce livestock to graze the spontaneous vegetation. This is reported to have happened in some less-productive plantations west of Sevilla in Spain (Rodenas *et al*, 1977). The result may be to create a more natural, *dehesa* type of landscape.

On the other hand, the total abandonment of olive groves leads to scrub invasion through natural succession, and consequently to a more fundamental ecological change. Forest fires permitting, some form of woodland or Mediterranean *maquis* will result. Research undertaken in Grosseto province in Italy has shown that approximately 50 per cent of olive plantations in the area are either marginal and threatened with abandonment or are already abandoned (Petretti, 1995). Abandoned olive groves in this area develop into dense woodland within a period of 9-15 years. As a result, many species associated with the extensively managed olive plantations of the area decline or disappear, particularly reptiles, butterflies and birds. On the other hand, woodland species tend to benefit, for example mammals such as the Porcupine (*Hystrix cristata*), Pine Marten (*Martes martes*) and Wolf (*Canis canis*) (Petretti, 1995).

The natural woodland which results from abandonment may develop into a habitat of high natural value. However, it is important to consider the wider context of the landscape within which abandonment takes place. In upland regions which have suffered agricultural abandonment in recent decades, and in which landscapes are in danger of becoming dominated by forest and scrub, remaining olive groves provide an important element of more open habitat which should benefit overall biodiversity (Petretti, 1995). They also provide effective firebreaks, a very important consideration in Mediterranean areas suffering from widespread abandonment and forest fires.

The converse of the abandonment phenomenon can be seen in certain other regions. Since the CAP regime began to be applied in Spain from 1986, there has been an expansion in olive plantations in the main producing areas. In parts of Andalucía this expansion has taken place at the expense of natural woodland which is of high conservation value, because it contributes an element of diversity in landscapes already dominated by intensively managed olive plantations. The environmental damage is compounded by the fact that the land cleared for new plantations is often on steep slopes. The removal of natural vegetation and the repeated cultivation of plantations which is practised by olive producers in this region leads to severe soil erosion (see point 2 below).

Several recent publications have emphasised the importance for nature conservation in Europe of traditional, low-intensity farming systems (Beaufoy *et al*, 1994). These agro-ecosystems and the wildlife species associated with them are threatened by a combination of abandonment and intensification in many parts of the EU member states. The same tendencies appear to apply to olive plantations: traditional systems of high natural value are being lost to abandonment in certain marginal areas, whilst new plantations expand and management systems are intensified in regions with a clear olive producing vocation and with high concentrations of competitive producers.

2. Soil erosion

Soil erosion is a major problem associated with olive plantations. In Spain, dryland tree crops on slopes (principally olives and almonds) have been identified as the agricultural land use with the highest rates of soil erosion (Díaz Alvarez and Almorox Alonso, 1994). Aggregate losses of topsoil from olive plantations in Andalucía have been calculated to reach as high as 80 t/ha per annum in some cases (Pastor and Castro, 1995), indicating a totally unsustainable farming system which is resulting in the widespread degradation of natural resources.

The problem of erosion has been greatly exacerbated in recent decades by changes in practices associated with mechanisation. The introduction of tractors has made it possible to cultivate up and down steep slopes and to plough dry soils, practices which were not possible with animal traction (Díaz Alvarez and Almorox Alonso, 1994). It is now widespread practice for farmers to keep the soil of olive plantations bare of vegetation all the year round, by regular cultivation. Normally, this tillage is carried out up and down the slope, rather than following the contours. The most severe erosion takes place with the arrival of the autumn rains on bare soils which have been cultivated to a fine tilth by summer harrowing.

Cultivation is practised as a means of removing ground vegetation which is thought to compete with the olive trees for moisture and nutrients. Many farmers also believe that the creation of a fine tilth through summer cultivation reduces moisture loss, although this is questioned by some agronomic research (Aguilar Ruiz *et al*, 1995). There are various systems for reducing erosion, including contour tillage and minimum tillage (shallower and less frequent). According to experts, the frequent tillage which is widely practised is of dubious agronomic value. Shallower and less frequent cultivation would be equally effective as a means of controlling ground vegetation and would reduce the soil's vulnerability to erosion.

New minimum tillage and non-tillage systems have been developed which produce higher yields than conventional systems. These systems include techniques which greatly reduce erosion, particularly the maintenance of plant cover (crops such as barley or vetch, or spontaneous vegetation) on the strips of land between the lines of olive trees. Under such systems, the plant cover is normally eliminated with herbicides, rather than by mechanical cultivation.

Unfortunately, from an environmental point of view, the herbicides which are used are mostly residual products of relatively high toxicity (principally simazine and diuron). More environmentally friendly options are available, such as glyphosate, but require far more frequent application as they are not residual. Mechanical mowing or grazing by livestock involves more complex management and generally results in lower yields.

Various factors are cited in Spain which account for the fact that very few olive producers have adopted minimum or non-tillage cultivation systems:

- an ingrained mentality that land must be kept entirely free of weeds; also, most farmers have a tractor and harrow or plough and want to use them, and take pride in having a "clean" olive plantation completely free of weeds;
- changing to a non-tillage system would require the purchase of new machinery in many cases, for applying herbicides or for mowing spontaneous vegetation;
- farm extension services in most regions are highly inadequate; consequently, alternative systems are not promoted to the great majority of farmers.

3. Pesticide use

Excessive use of pesticides creates other environmental problems, apart from greatly reducing the

natural value of olive plantations. For example, problems of pesticide residues can arise in olive oil and in table olives. Indiscriminate use of wide spectrum products has led in some cases to explosions in coccid populations and other pests due to the removal of their natural enemies. Excessive herbicide treatment has caused die-back in the olive trees of some plantations. The creation of high levels of background pollution is a concern in regions where olive plantations cover extensive areas of land (Civantos, 1995).

V OPTIONS FOR A REVISED SUPPORT REGIME

In order to integrate environmental concerns into support policies for the olive sector, the following issues need to be addressed:

- To reduce currently high levels of soil erosion by promoting a change in management practices. In more extreme cases, this would require the establishment of a permanent understorey which could be maintained by grazing livestock or allowed to revert to natural woodland.
- To maintain traditional olive groves where these make a positive contribution to natural and landscape values.
- To prevent the further expansion of olive plantations onto valuable habitats and soils that are vulnerable to erosion.
- To promote more environmentally sensitive production systems, particularly through a reduction in the use of pesticides.

While it is not realistic to expect to be able to design a European support regime which solves all of the environmental issues associated with the sector, it should be possible to establish a benign framework, within which Member States and regional authorities could then implement measures adapted to local conditions and needs.

Such a benign framework plainly does not exist at present. While it is not possible, without more comprehensive research, to ascertain the exact role of the CAP olive-oil regime in defining production patterns and tendencies, it is clear that the current system of support, under which aid is paid in the form of a production subsidy, provides a strong incentive to olive farmers to maximise output by intensifying their production systems. In certain areas, this incentive also appears to be encouraging farmers to expand their plantations onto new land, sometimes at the expense of valuable natural habitats and onto steep slopes which are highly vulnerable to soil erosion. In 1995 alone, 67,000 ha of olives were reportedly planted in Spain (López Sánchez-Cantalejo, 1996).

Nevertheless, in spite of the high level of price support currently provided, the abandonment of olive groves in remote and marginal areas continues. There appears to be a process of concentration and intensification of production in certain areas with a comparative advantage and continued decline and abandonment in others; this process results in the loss of traditional olive plantations of high natural value.

The most realistic options for reform involve converting all or a part of the current production subsidy into a direct payment per tree or per hectare, thus partly decoupling the subsidy from production. Such a change would reduce the incentive for intensification and could be considered broadly positive in environmental terms. It also would provide an important continuity of income for more marginal producers in remote areas, with older trees, etc., and thus may help to prevent abandonment. Particularly when they are not irrigated, olive trees tend to produce a very variable crop, with high yields occurring every other year at most.

While the change to a production-neutral support system would be a broadly positive development, it would need to be complemented by additional mechanisms in order to address the specific environmental concerns set out above. Such mechanisms may include :

- Tree or area-payment quotas to prevent uncontrolled expansion.
- The modulation of support payments to favour less intensive production systems.
- “Agri-environment” incentive payments to promote particular practices.
- “Cross-compliance” to prevent the payment of support to producers whose practices damage the environment.
- Regional strategies to address particular problems, such as the withdrawal from production of olives

on land highly vulnerable to erosion.

These options, and some of the issues relating to tree and area payments, are discussed below.

1. Tree payments

From an environmental perspective, a support payment per tree potentially would be an improvement over the current production subsidy. Assuming that appropriate controls on new planting were implemented, it would remove the current incentive for intensifying and expanding production and would provide a basis on which to build additional environmental measures and "cross-compliance" mechanisms.

However, the conversion of a part of the production subsidy into an aid per tree could have some significant side-effects, given the fact that tree densities vary enormously. For example, national statistics show a range of average tree densities between a low of 54 trees per hectare in Portugal up to 190 per hectare in Greece (Guerrero, 1994). The density of trees per hectare is dictated by many factors, including soil and climatic conditions, local tradition, harvesting techniques, availability of irrigation (permitting higher densities), etc.

Generally speaking, traditional plantations have a low density of large, old trees, whereas modern, more intensive plantations have a high density of small trees. A simple tree payment therefore would tend to provide a much higher level of aid to the most productive and intensive systems; these are the systems of least value for nature and landscape and which in many cases cause high levels of soil erosion. (The picture is further complicated by the fact that some traditional production systems also have a relatively high density of trees, for example in Sierra de Gata in Extremadura, Spain (Guerrero, 1994)).

There are other local peculiarities: for example, the trees of most plantations in Córdoba province in Spain actually consist of three stems planted together. Although judging from the number of tree canopies, such a plantation may appear to have 80 trees, in reality it typically has 240, planted in bunches of three. This planting system is quite different from that practised in the neighbouring province of Jaén and elsewhere, where each tree has only one stem. In practice, production relates much more closely to the volume of the tree canopy than to the number of stems. Tree payments therefore should be calculated per canopy and not per stem; this should not be difficult as, in Spain at least, the forms which farmers use to register for the CAP production subsidy already require a declaration of how many stems make up each tree.

From an environmental perspective, there is a risk that the introduction a tree payment might provide an incentive to a producer with an old, widely spaced plantation of 100 trees per hectare to clear the existing trees and to replant with a more intensive system at, say, 250 trees per hectare. On the other hand, some *additional* planting in very old and highly extensive groves would be desirable in order to introduce a new generation of trees.

To avoid this incentive and to avoid favouring modern, intensive plantations at the expense of traditional, more extensive plantations, a tree-density upper limit should be set above which the aid would not be paid (for example, 150 trees per hectare). Alternatively, payments could be modulated by "banding" into various levels, and paid in inverse proportion to the density of the plantation, in order that all types of plantation should receive approximately the same payment per hectare, regardless of the density of trees. Tree payments should not be paid simply in proportion to the number of trees per hectare as this would produce serious distortions which would be potentially detrimental to the environment.

2. Area payments

An area-payment system would avoid the distortions inherent in a tree payment and would achieve more clearly the objective of reducing the incentive for maximising production. All producers, regardless of local planting traditions and plantation type, would receive a basic payment per hectare of land classified as olive plantation. There would be no incentive for clearing older trees to create new intensive plantations. To avoid claims from the owners of fields with only one or two trees, a minimum number per hectare would be required; this should be low enough to allow very extensive, traditional groves to benefit (e.g. 40-50 trees per hectare).

Overall, an area payment system should be simpler to administer, would introduce fewer distortions and would ensure that traditional, extensive plantations received the same basic support payment as the most intensive, highly productive plantations.

3. Management commitments

The possible change to a system of direct payments raises the question of whether recipients of the aid would be required to maintain their plantations in production, or to undertake particular management tasks in order to maintain the plantation. With the removal of price support, it is quite possible that marginal producers would find it no longer economical to harvest their olives - the price may not cover the high labour costs. In purely environmental terms, this should not be a problem in itself; studies have shown the fruit of unharvested to be valuable for wildlife (especially overwintering birds) and the reduced level of disturbance might also be beneficial. However, without a minimum level of management, an olive grove will convert itself quite rapidly into scrub and ultimately woodland. To prevent this process, probably the minimum management would be :

- to maintain an open understorey, either through grazing, mowing or cultivation and
- to remove the new shoots which grow from the base of the olive tree each year.

There is also a social issue, in that the olive harvest (and other management, such as pruning) provides a very significant level of seasonal employment in some rural areas. It may be that the removal of price support would lead to a collapse of this economy. On social grounds, therefore, there may be a case for requiring olive farmers to produce olives in order to receive the new direct payment.

For a combination of social and environmental reasons, therefore, some mechanism probably is needed in order to keep traditional groves in production, even though on *purely environmental grounds* a very basic level of management would be sufficient. Without further research into how farmers would respond to different policy options, it is difficult to come up with the right formula, although some combination of market intervention and direct payments may be the most effective mechanism. A total removal of price support and reliance entirely on direct payments may produce as many problems as it solves.

4. Direct payment "quotas"

As with the direct payments in the arable and livestock sectors, a system of "rights" or "quotas" would need to be established in order to prevent fraud or an unlimited expansion of payments. A quota system could also help to prevent further clearances of valuable natural or semi-natural habitats to make way for new olive plantations, or the clearance of extensive olive groves for the plantation of new, intensive plantations.

It should be stressed that there appears to be considerable scope for expanding the area of olive production in the southern member states of the EU; from a socio-economic point of view it would be wrong to fossilise existing land use patterns and prevent any further expansion. Olives represent one of the few Mediterranean crops with definite potential for expansion thanks to increasing world demand.

From an environmental point of view, the main concern is to steer any future expansion of olive plantations onto the most appropriate land. This means principally avoiding steep slopes and land with particular conservation values, such as woodland, steppelands and wetlands. Following such an approach there would still be large areas of land currently under low-yielding arable cultivation, and with edafo-climatic conditions highly suitable for olive production, which could be planted with olives without environmental damage, and with potential environmental benefits, depending on the types of plantation and the management practices. Ideally, a system should be set up which would allow regional or national authorities to achieve a redistribution of existing land-use patterns in the longer term.

5. Modulation of direct payments

The existing olive support regime includes a mechanism for providing a higher level of support to producers whose output is less than 500 kg of oil per year. The threshold of 500 kg is largely arbitrary and bears no relation to any specific social or environmental criteria. Many traditional groves produce more than 500 kg of oil per year, and some very small plantations producing over 500 kg of oil may be managed intensively, causing soil erosion, for example.

The rather blunt instrument of aid for small producers should be replaced either by a more sophisticated form of modulation based on objective environmental and/or social criteria or by a basic, flat-rate payment per hectare for all producers, supplemented by additional payments under a greatly enhanced agri-environment programme (Regulation 2078/92 - see point 4, below).

Any new form of modulation should be designed to provide a higher level of aid for olive plantations of the type which are environmentally valuable, thus providing a basic integration of environmental concerns into the support regime. The difficulty is in defining precise criteria as indicators of these types of plantation. Low tree density, for example, cannot be taken *always* to be an indicator of traditional groves, since both very intensive and certain types of traditional plantation have high tree densities. The presence of old trees might be a better indicator, but one which would be very hard to measure.

A more practical approach might be to allocate a higher payment for olives on terraces. This would help to correct the current situation under which a producer who is causing serious soil erosion by ploughing plantations on steep slopes receives the same support as a producer who is conserving the soil and landscape through the maintenance of traditional terraces. At the same time, such a bonus would aid producers in upland, marginal areas who have very limited production options and many of whom have plantations on terraces.

It is important that any additional aid for terraces should only apply to those which are constructed and maintained with supporting walls in the traditional manner and not to new terraces created with bulldozers, which may cause more erosion than they prevent.

A higher payment could also be offered for organic production. Many traditional olive groves are managed without the use of chemical inputs and therefore could benefit from such an aid. At the same time, the commercial production of olives under an organic system presents fewer technical problems than in many other sectors (livestock, arable, etc.), although average yields are estimated to fall by some

20-25 per cent. A higher payment for organic production could encourage many producers to convert to organic methods and to register their production with organic associations. Organically managed plantations are of considerably higher biodiversity than those which use pesticides systematically.

Organic production systems often depend on mechanical methods of weed control, with consequently higher risks of soil erosion. If organic producers were to be eligible for a higher level of direct payment, the introduction of techniques to reduce soil erosion should also be required.

Another useful environmental criterion for a higher level of support payment could be the maintenance of a permanent or semi-permanent grass understorey, cultivated no more than twice per year.

6. “Agri-environment” incentives under Regulation 2078/92

Under the "agri-environment programme" (Regulation 2078/92), some schemes have been set up in Mediterranean regions to provide additional aid for traditional olive groves (Portugal) and to promote soil conservation measures (Spain) and organic production methods (several member states). However, the impact of these measures is expected to be marginal as the financial resources available for Regulation 2078/92 are extremely limited. Unless a far greater budget is made available for Regulation 2078/92, only a very small percentage of EU olive producers will be affected by this measure. A very much greater impact could be achieved by the inclusion of some basic environmental modulation and cross-compliance in the support regime, since this affects nearly all producers.

Nevertheless, a greatly expanded agri-environment programme could provide an effective means of promoting olive production systems of high environmental value. This would allow the development of regionally appropriate schemes and avoid the need for a complex, modulated system of direct payments under the support regime; a basic, flat-rate support payment with cross-compliance would be sufficient.

7. Cross-compliance

For the purposes of this paper, "cross-compliance" is used to refer to the laying down of environmental criteria with which farmers would have to comply in order to receive payments under CAP support measures. Whichever support system is adopted for the olive sector, provision should be made for some basic form of environmental cross-compliance which would be applied to all producers benefiting from CAP support payments. In particular, a mechanism should be introduced to prevent aid from being paid to producers whose management practices lead to serious soil erosion, either by extending their plantations onto steep slopes or by using management practices, such as repeated tillage, which result in high erosion rates.

Payments also should not be paid for new plantations which are created on land which is currently of high natural value, such as natural woodland, steppelands and wetlands.

Probably the best arrangement would be for the CAP regime to require member states to implement some form of basic cross-compliance. The particular criteria and conditions could then be established at the national or regional level. Land-use plans should be required, indicating areas of land which are unsuitable for new plantations on environmental grounds.

CONDITIONS FOR ENVIRONMENTAL PAYMENTS UNDER 2078/92 ZONAL PROGRAMME FOR OLIVES IN ANDALUCIA

Replacement of systems involving repeated cultivation or the use of high-toxicity herbicides with systems of reduced tillage or non-tillage, using the following options:

- on slopes of 10-15%, contour tillage with a maximum of two passes in spring and the creation of ditches to reduce the erosive effects of torrents;
- on slopes of >15%, no tillage; herbicides may be used as an alternative.

Source: MAPA, 1994

As an example of conditions which might be set, under the application of Regulation 2078/92 in Andalucía, environmental area payments are proposed for olive producers undertaking the practices shown in the box above. Such criteria could be introduced by national or regional authorities as conditions which have to be met in order to be eligible for tree or area support payments. Other possible options would be to set maximum limits for pesticide usage, although this would be hard to control.

8. Regional strategies

Given the widely differing conditions between countries and regions, it is not realistic to expect to design a European support regime which solves all of the environmental issues associated with the olive sector. Once a reformed and environmentally benign support regime is established, Member States and regional authorities should then develop strategies which are adapted to local conditions and needs. Such strategies should be based on a comprehensive study of olive production in the region, with the aim of identifying specific agronomic and environmental needs which could then be tackled with appropriate measures under a long-term programme.

As an example of this approach, a study in the province of Jaén (Andalucía) in 1975 identified 74,699 ha of olive plantations (17.2% of the provincial total) on land which should not be ploughed due to the high risk of erosion. It was recommended that 49,309 ha could be maintained in production under a non-tillage system whilst the remainder should be converted to a mixed management system, using the understorey of the plantations for extensive grazing and forage crops (Aguilar Ruiz *et al*, 1995). These proposals have not been implemented.

VI CONCLUSIONS AND RECOMMENDATIONS

Certain types of more traditional olive plantation have important nature conservation and landscape functions. Traditionally managed olive plantations are of intrinsically high biodiversity and constitute an important element in the diversity of the mixed farming landscape in Mediterranean regions. They also provide an essential source of winter food for very large numbers of migratory birds from northern Europe. When planted on steep slopes, traditional plantations use a system of terraces to prevent soil erosion. This constitutes a sustainable system for the cultivation of land in upland areas which otherwise present very limited possibilities for agriculture. Terraces are also an interesting landscape feature characteristic of many upland areas in the Mediterranean regions.

On the other hand, the more intensively managed olive monocultures which dominate the landscape of key production regions usually are of relatively low biodiversity and cause considerable degradation of natural resources through soil erosion on slopes. Recent and current trends seem to show a regression of traditional production systems of high natural value and the expansion of intensive systems.

In order to integrate environmental concerns into this sector of the CAP, the support regime for olives and olive oil should take account of the widely differing types of olive production existing within the EU, and of their very different environmental values. Although it is not realistic to expect to be able to design a European support regime which solves all of the environmental issues associated with the sector, it should be possible to establish a benign framework, within which Member States and regional authorities could then implement measures adapted to local conditions and needs.

The most realistic options for reform involve converting all or a part of the current production subsidy into a direct payment per tree or per hectare, thus partly decoupling the subsidy from production. Such a change would reduce the incentive for intensification and for extending plantations onto inappropriate land and could be considered broadly positive in environmental terms. It also would provide an important continuity of income for more marginal producers in remote areas, with older trees, etc., and thus may help to prevent abandonment (the main olive harvest occurs every other year).

However, there is a danger that a simplistic transfer of support from oil production to a tree payment might create as many problems as it solves, as it would tend to favour the most intensive plantation types, with a high density of trees. There would have to be some form of modulation and/or upper limits on the number of trees per hectare eligible for aid. A flat-rate payment per hectare might be a simpler way of avoiding the distorting effects of a tree payment and would ensure that traditional, extensive producers benefitted from the same level of basic support as more intensive producers.

Furthermore, there are several important environmental problems (as well as certain social issues) which the change from price support to direct payments would not address, unless additional mechanisms are built into the support system. Although this brief study cannot produce a blueprint for reform of this policy sector, a proposed framework is illustrated below.

Finally, given the lack of information currently available, a comprehensive study is recommended of the environmental issues relating to olive production and the effects of the CAP support regime. This should cover environmental needs and opportunities and examine in greater depth the options for improved policy measures and how farmers might respond to them in practice. An effective reform of the sector, consistent with the EU's commitment to incorporate environmental protection into all policy areas, can only be achieved on the basis of objective research.

Main environmental issues to be addressed

- To reduce currently high levels of soil erosion in the main producing regions by promoting a change in management practices. In more extreme cases, this would require the establishment of a permanent understorey which could be maintained by grazing livestock or allowed to revert to natural woodland.
- To maintain traditional olive groves where these make a positive contribution to natural and landscape values.
- To prevent the further expansion of olive plantations onto valuable habitats and soils that are vulnerable to erosion
- To promote more environmentally sensitive production systems, particularly through a reduction in the use of pesticides.

Proposed framework for an environmentally sensitive support regime

1. A significant reduction in production support in order to reduce the incentive for intensive production and for expansion onto environmentally sensitive land.
2. The introduction of direct payments per hectare or per tree in order to provide a continuity of income for producers, thus helping to prevent abandonment, particularly in marginal areas. Direct payments should not be paid in direct proportion to historic yields or total number of trees. They should be designed to favour the maintenance of the types of olive plantation which contribute positively to nature conservation, landscape and sustainable resource management..
3. The requirement that Member States introduce a basic level of environmental cross-compliance to prevent direct payments being made to producers who use cultivation techniques which involve a high risk of erosion, make excessive use of pesticides of high toxicity or who expand production onto land which involves a high environmental cost, particularly land currently under natural vegetation.
4. The requirement that Member States should establish regional strategies under which specific agronomic and environmental problems would be tackled using targeted measures, including the conversion to permanent vegetation of plantations on highly vulnerable soils.
5. A major increase in financial resources for Regulation 2078/92 in order to establish significant regional programmes with specific objectives including: to promote low-intensity, environmentally positive production systems; to provide incentives for the widespread introduction of alternative management techniques to reduce soil erosion; to encourage the conservation of special features such as very old trees, stone walls and terraces.

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