# Agri-environmental Relationships and the Choice of Policy Mechanism

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## 1. INTRODUCTION

THE main goal of international trade liberalisation is to establish a trading environment in which all firms compete on an equal footing. This includes a concern that all firms should pay the full costs of the inputs that are used in the production process. Where the production generates external costs, the Polluter Pays Principle has been widely accepted as indicating that the firm should bear the costs of environmental regulation (OECD, 1972). While for many years agriculture stood outside of most negotiations on international trade, it has taken a key role since the inception of the Uruguay Round of trade negotiations (Ingersent et al., 1995). In this context, agricultural policy has come under scrutiny to examine whether it is in conflict with trade liberalisation.

Following the conclusion of the Uruguay Round trade negotiations, policies are exempt from commitments to reduce aggregate measures of support (AMS) if they fall into the 'green box' by meeting a number of criteria specified in Annex 2 of the Agreement on Agriculture. Policies have both to meet policy-specific criteria and to meet more general criteria that 'they should have no, or at most minimal, trade distortion effect or effects on production', that they must be financed by government (rather than involving transfers from consumers), and that they shall not provide price support to producers. Tangermann (1996, pp. 332–3) comments that these general criteria may prove to be more binding than the policy-specific ones.

It is sometimes argued that agriculture in some places is different; that agriculture receives support in respect of the contribution that agricultural land management makes in protecting the quality of the rural environment and in supporting rural communities in other ways. While these policies, by their very nature, do affect the level of production, it is argued that they should not be regarded as trade-distorting subsidies and should be permitted within the rules

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established for international trade. But this type of claim is often regarded with suspicion that such payments represent disguised aid to the farm sector (Ervin, 1999). It is thus important to determine whether or not policies should fall into the green box and the criteria that should be applied in this decision.

These questions are of current significance in relation to further rounds of trade negotiations under the 1999 mini round and subsequent rounds of negotiations on international trade (Swinbank, 1999). A critical appraisal will be made as to which types of policy may be accepted as legitimately falling into the green box and which should properly be treated as production subsidies. This paper examines the basis for payments made to agriculture in support of the environment and their relationship to negotiations on agricultural trade. It is argued that different underlying assumptions about the relationship between agriculture and the environment can lead to different conclusions about the legitimacy of payments made to the agricultural sector.

## 2. THE VALUES OF THE RURAL ENVIRONMENT AND THE CULTURAL LANDSCAPE

Rural land resources have often been characterised in terms of their multifunctionality. The approach extends from simple 'scientific' descriptions of resource characteristics through to valuations of human land use systems. The term has for instance been used in relation to soils. For instance, soil is used for:

- Plant growth and crop production, for food, fibre, timber or energy.
- Protection of surface and ground waters by buffering, filtration and transformation of pollutants.
- Forming an important habitat for soil-dwelling micro- and macro-biota, thus safeguarding major biogeochemical cycles and an extremely diverse gene pool.
- A spatial base for physical structures.
- A source of raw materials, such as water, clay, gravel etc.
- Cultural heritage, holding paleontological and architectural items of value (Blum, 1993).

Similar discussion has been applied to wetlands. For example, Gren et al. (1994) comment:

> One important reason for serious concern about the loss of wetlands is that they are multifunctional and can be considered as very valuable capital assets. Under an appropriate (sustainable) management regime they can produce a flow of functions such as nutrient purification, ground water buffering and biodiversity. This flow is generated by species, populations and communities dynamically interacting with their physical and chemical environment in what is referred to as life-support systems. Life-support systems generate a range of ecosystem produced functions of value to society (Gren et al., 1994).

These discussions of multifunctionality of individual aspects of the countryside are clearly relevant to an analysis of the countryside as a whole. This is logically inevitable in the sense that the countryside represents the amalgam of the separate resources, land systems or habitats.

The value of these resource systems is commonly considered within a total economic value framework to include both use and non-use values (e.g. Krutilla, 1967; and Pearce, 1993). Some of the environmental functions are used directly, either contributing towards the production of marketed outputs or else contributing to consumption directly. This includes the use of the environment for recreation or as landscape value as well as ecological functions of the environment: flood control, waste assimilation or carbon storage. Total economic value is also often characterised to include option values, the value of maintaining the availability of potential uses, existence values, a value associated with the knowledge that certain things exist, and bequest values, that people are prepared to pay something now in order to be assured that certain environmental assets will be passed on to future generations. However, theoretical analysis has questioned whether these should be regarded as separate values and under what circumstances they can be assumed to be positive (Ready, 1995) and alternative perspectives are sometimes adopted. For instance, from a systems ecology perspective, Gren et al. (1994) classify wetland values into two categories:

(i) a 'primary' value, the value of the ecosystem's self-organising capacity, and
(ii) a 'secondary' value, the value of the life-support functions and ecological services that this capacity generates.

*a. The Cultural Landscape*

The concept of value supported by land resources may be broadened to include the human societies and cultures that depend upon those resources. Societies based upon particular resources may have certain characteristics and values that are unique to the particular natural and historical context within which they are set. These may be represented in the physical attributes of rural settlements, such as traditional buildings and structures, or through social or cultural activities. The latter may require regular maintenance in a way similar to the former through the maintenance of information and the protection of social institutions and activities. In specific contexts these characteristics may be unique and their loss may be irreversible. They may thus represent a source of option values in the same way that is more generally recognised with respect to natural resources.

This view has been particularly developed in discussion of the cultural landscape. A definition as applied in Austrian research is quoted by Hovorka:

> The cultural landscape is a perceived unity of the spatially effective fabric of natural conditions and human influences. Cultural landscapes develop and change over time as a result of the interplay of socio-economic, cultural and natural factors (Hovorka, 1997).

Hovorka continues:

> The cultural landscape can thus in no way be conceived as a static entity but rather as an expression of ecological, cultural and socio-economic development and change in living and working space … [It] can only be understood as a process (Hovorka, 1997).

The cultural landscape is often especially associated with mountain areas where it is thus seen as being concerned with more than just the physical appearance of the areas, encompassing the economic activities and social structures that are associated culturally and historically with the use of and life within the mountain areas. A recent study of Alpine areas (Dax and Wiesinger, 1998) has included protection against erosion, service to the community, protection against avalanches and the provision of infrastructure and jobs among the tasks of mountain farming.

How is the cultural landscape produced and conserved? The landscape values are produced by a mixture of man-made, natural and human capital that has achieved its present form through a gradual process of co-evolution. Mountain landscapes involve certain characteristic patterns of pasture management intermixed within an afforested landscape. But it is not just the physical appearance, or even the complex of appearance, recreational opportunities and biodiversity that is to be maintained. The idea that the conservation of environmental values depended on the conservation of plant and animal species would be unexceptional. But the application to the cultural landscape takes the argument further, suggesting that conservation principles should be extended to encompass the forms of human culture and organisation that are *necessarily* bound up in the production of that landscape, where these could not readily be re-created if lost.

This is not to say that the goal becomes one of preserving all forms of human activity and culture in their present form. The point has already been made that the cultural landscape is dynamic and changing. This is reflected in the history of mountain areas in Europe, for instance that have typically seen a shift from subsistence to market-based agriculture, with arable production of grains giving way to increased dairy production, and the growth of non-agricultural enterprises, especially those associated with tourism. Rather there is a more general need to maintain an institutional structure that can support certain valued forms of land use. The key concern is to guarantee the capacity to maintain the system in the face of changing social and economic circumstances. Thus, in an analogy with the critical natural capital approach to sustainability (e.g. Turner, 1993), this might be termed the ‘critical institutional capital’ where a pattern of institutions that effectively co-ordinates individual responses to external forces for change is non-substitutable and the loss of which would be irreversible. This links to the

wider current debate about the importance of social capital (e.g. Putnam, 1995; and Szreter, 1999).

Thus the protection of certain land uses and a wider conception of landscape becomes interrelated with the protection of rural culture and societies more generally. We might suggest that the aim should be to preserve a particular mix of critical natural, man-made and institutional capital that can support a range of economic activities that is in turn needed to conserve the physical landscape in a desired form. But the identification of the relevant 'critical institutional capital' is not simple. The first stage is to define carefully the precise components of capital that deserve to be protected on the grounds that they are not readily substitutable and could not easily be reproduced once lost. This may be difficult given our present limited understanding of the processes of economic development. This matches the uncertainty associated with our understanding of the processes in the physical environment and is a topic deserving greater attention. The next stage is to identify the essential institutional and policy arrangements that are required in order to achieve this goal in a cost-effective way. Many of these elements are not amenable to quantitative measurement and this presents difficulties for assessment and evaluation.

## 3. RURAL VALUES AS JOINT PRODUCTS OF AGRICULTURE

The values arising from the rural environment are often directly linked with particular forms of agricultural production. That is to say that agricultural and environmental are often jointly supplied. Marshall (1920) discusses the case of joint products:

> i.e. things that cannot be easily produced separately; but are joined in common origin, and may therefore be said to have a joint supply, such as beef and hides, or wheat and straw (Marshall, 1920).

In principle the proportions in which the products are produced might be fixed, but in practice some degree of flexibility is generally possible. Thus for example, variety of wheat can be altered to produce different proportions of grain and straw or the breed of sheep can be altered to produce different proportions of meat or wool.

Where the proportions are fixed, there is in effect only one product and so costs may not be separately estimated (Stigler, 1966). Where the joint products may be produced in variable proportions, it is generally possible to assign a marginal cost to the production of each of the products. However, this is not possible where there are several products and, although this is attempted in various ways in practical contexts, such an allocation must be arbitrary (Stigler, 1966, p. 165). The optimality conditions associated with joint products are considered by Winch (1971, pp. 118–20).

The existence of joint products does not of itself offer a case for public intervention. Marshall (1920) comments:

> So long as any product of a business has a market value, it is almost sure to have devoted to it some special care and expense, which would be diminished or dispensed with if the demand for that product were to fall very much. Thus for instance, if straw were valueless, farmers would exert themselves more than they do to make the ear bear as large a proportion as possible to the stalk … It is only when one of the two things produced in the process is valueless, unsaleable, and yet does not involve any expense for its removal, that there is no inducement to alter its amount; … (Marshall, 1920).

Joint product relationships lead to interrelationships between markets. Again, Marshall (p. 322) comments on the low price of mutton in Australia when the wool was exported, leaving the meat to be consumed at home. However, the development of methods of preserving meat for transportation led to a higher domestic price for meat. This in turn would be expected to influence the production decisions taken by Australian sheep producers.

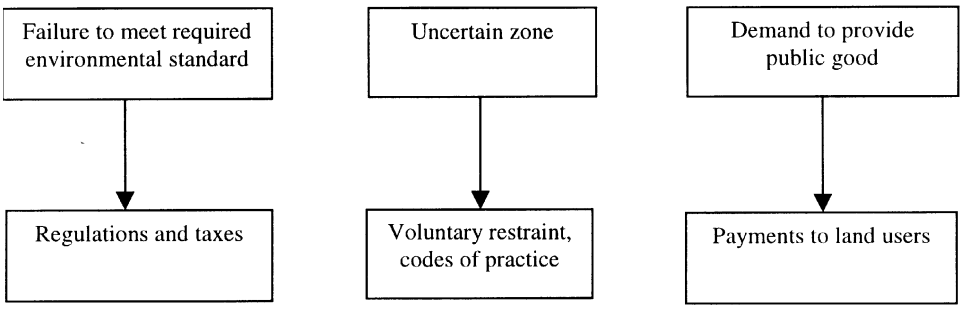
## 4. PROPERTY RIGHTS AND THE DEFINITION OF COSTS AND BENEFITS

The impacts of agriculture on the environment and rural community may either be regarded as costs or benefits. Typically, environmental impacts tend to be portrayed as costs, with the implication that payments in respect of these impacts thus represent a departure from the Polluter Pays Principle or else the application of a ‘weak PPP’. But this represents an assumption with respect to the allocation of property rights. It has direct implications for the way in which any public policy might be implemented so as to internalise the externalities and, vice versa, the way in which public policy is implemented indicates an often implicit judgement as to the allocation of property rights.

The application of public policy towards rural land owners tends to accord to them considerable rights over the way in which the land may be used. Policies to influence the quality of the rural environment in developed countries have generally been in the form of subsidies offered to encourage owners to manage the land in certain ways with compensation paid where restrictions have been placed over land owners so as to promote environmental values. Thus the Polluter Pays Principle has not always been followed (Baldock, 1992).

The distinction between public goods and bads and between external benefits and costs does not depend upon the technical characteristics of the effects being considered. Rather it depends upon a political judgement as to what are the responsibilities or duties associated with land ownership. This can be portrayed in terms of a reference point with respect to environmental quality (Hodge, 1989; Bromley and Hodge, 1990; and Hodge, 1994). This point defines the particular allocation of individual property rights and hence the level of responsibility

FIGURE 1
Objectives and Approaches to Environmental Management




which landowners are required to adopt with regard to the wider implications of their choice of land use. Where land owners fail to achieve the reference point environmental quality, this will be regarded as an external cost. Where landowners achieve an environmental quality in excess of this standard, they will be regarded as generating an external benefit. This point is not immutable. It is subject to movement in response to changes in the political attitudes towards the rights and duties associated with land use and these are in turn influenced by a wide range of economic and social forces.

This suggests a relationship between the objectives of policy and the approaches to environmental management adopted, illustrated in Figure 1. The left-hand category represents the control of pollution and indicates a standard of land management which all land users are expected to maintain. The 'Polluter Pays Principle' would indicate that they should therefore not be paid for taking the actions necessary for reducing environmental damage.

The right-hand category represents the provision of a public good. State intervention would take the form of a payment for the contribution which land owners make to environmental quality in excess of the reference level, reflecting a 'Provider Gets Principle' (OECD, 1994; OECD, 1996; and Hanley et al., 1998). In practice, the payments are often made by the government rather than by the specific individuals who gain the benefit so that a Beneficiary Pays Principle has less relevance.

The middle category is less clear-cut. It represents an intermediate position between the two extremes which arises because either rights have not formally been defined or else where the historical allocation is subject to a significant challenge. Barzel (1989) argues that the ownership of property rights is never complete due to a lack of knowledge and the diminishing returns associated with the costs of establishing and enforcing rights. This zone often appears to represent a temporary state where rising expectations for the environment translate into a higher environmental reference level.

## 5. ALTERNATIVE MODELS OF AGRICULTURE AND THE ENVIRONMENT

It is possible to suggest two rather different perspectives in the way in which the issue of rural environmental values is assumed to enter into agricultural policy analysis. The first of these, termed an 'input model' tends to be associated more particularly with a New World context and the second, an 'output model' with an Old World context.

### *a. The 'Input Model' of Environmental Impact*

The approach often favoured by North American and Australian commentators tends to model the impact of agriculture on the environment as an external cost associated with input use (e.g. Anderson, 1992; Just and Antle, 1990; and Zilberman et al., 1997). The paradigmatic example is of water pollution: fertiliser and chemicals applied by farmers run off or are leached from farm land into aquifers and watercourses imposing external costs on water users and damaging ecosystems. Reductions in output prices lower the value of the marginal products of the inputs, lowering optimal use levels and hence lessening environmental damage. The story with respect to soil erosion is similar to the extent that less erosion is associated with less intensive land use which would arise from lower output prices although it is more complex in that lower output prices will also reduce the return to investments in soil conservation investments.

A key implication of this approach is an inevitable and clear relationship between output prices and environmental quality. Provided that we accept certain basic premises from economics about the supply response in agriculture, a reduction in the level of price support inevitably leads to a reduced intensity of production and thus to an improvement in environmental quality. Reductions in other forms of support, such as area or headage payments, would also tend to reduce the incentives to keep land in potentially environmentally damaging production. In practice, these assumptions may be questioned, for instance as to whether price changes may lead to shifts to more erodible crops or more environmentally damaging pesticides, or to structural changes (e.g. Potter et al., 1999) with less straightforward implications. But the general expectation in this context is that lower levels of agricultural support will result in environmental improvement.

### *b. The 'Output Model' of Environmental Impact*

A somewhat different model is more often stressed by European commentators. This emphasises marketed food and environmental quality as separate *products* of the land (e.g. Buckwell, 1989; Russell, 1993; and Traill, 1988). These are often seen as joint products that can be produced in varying combinations. In

this case, the environmental focus concentrates more on landscape and wildlife considerations.

This model can have similar implications to the 'input model' where environment and agricultural production are competitive. A reduction in agricultural production would still be associated with an increase in environmental quality. However, the 'output model' more often assumes that, over certain levels and styles of production, particularly in respect of relatively extensive grazing systems, agricultural outputs and environment are complementary. This means that a reduction in agricultural prices and hence of production may lead to a *reduction* of environmental quality. For example, as the price paid for livestock products falls, livestock grazing may become sufficiently extensive for undesirable scrub species to invade pastures that would otherwise maintain valued heather moorland or wildflower meadows.

If this model has validity, it suggests that price reductions will alter the mix of environmental attributes associated with agricultural production and not be unambiguously beneficial. There is likely to be less chemical pollution, but also potentially fewer countryside services.

The two models are not incompatible. It is possible that agricultural production at a particular location can reflect both tendencies. Particularly, a change in the type of technology may represent a change from an output model to an input model. However, the models would seem to have most direct relevance in different circumstances. The 'input' model posits an agriculture operated in opposition to the 'natural' environment. In fact, the environment existing prior to the introduction of modern farming methods may usually already have been substantially modified by human activity and thus not appropriately be termed 'natural' (see e.g. Budiansky, 1995), but the point is that what is regarded as the 'natural' environment is *not a product* of this type of agricultural activity. In contrast, the 'output' model is premised on agricultural systems that have often co-evolved with the environment over substantial periods of time to the extent that there is a close interrelationship between the valued characteristics of the environment and certain attributes of the agricultural systems that are associated with them.

These assumed relationships between production and environmental variables may have parallels in the relationships between production and social variables. Traditional agricultural systems have also co-evolved with particular societies and cultures with similar implications. The protection of these cultures may then depend upon the protection of the co-evolutionary agricultural activities.

The 'output model' may be seen as a generalisation of the 'European model' which has been promoted by the European Commission. Fischler defines this as meaning that agriculture:

must be able to perform all functions on a sustainable basis across the whole Community.

- European farming must perform its market function, providing consumers and the processing industry with healthy, high quality food and renewable raw materials.
- At the same time it must also carry out its environmental functions, ensuring the sustainable use of natural resources, safeguarding the wide variety of ecosystems and protecting the diversity of Europe's farmlands.
- European agriculture must also provide a wide range of services, performing new functions that are in increasing public demand such as tourism or in the social sector.
- Finally, it has a major role to play in providing employment in rural areas (Fischler, 1998).

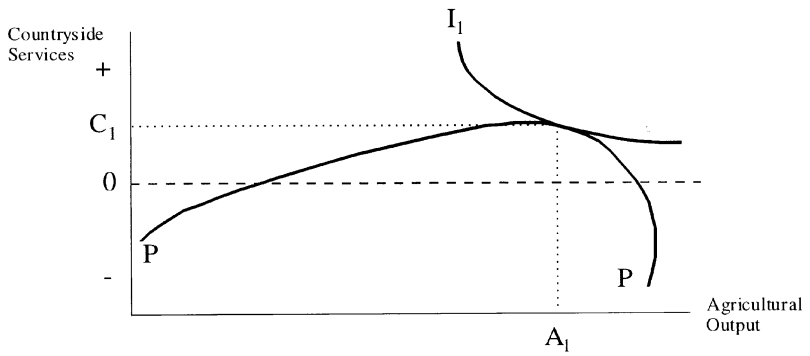
This is seen in contrast to the 'one-dimensional models practised overseas'. However, a model defined in terms of technical relationships between agriculture and the environment, as is the aim with the characterisation adopted here, would seem to represent a more robust approach, in preference to a perception of the general role of agriculture within a diverse geographical region. Even so, it is accepted that the distinction between the two models is not always straightforward. The input model represents an agricultural system imposed over a pre-existing local ecosystem and thus will still be required to safeguard ecosystem functions, while the output model arises from the co-evolution between agricultural systems and environmental characteristics. It may then be asked how a 'local ecosystem' is to be defined and to what extent changes in a 'co-evolved' agricultural system mean that it should be regarded as becoming a different system.

Clearly there is a wide range of different relationships within Europe and in many contexts there can be elements of both models. In the most intensive arable areas, pollution from the use of inputs is likely to be of more significance. In areas where production options are more restricted by physical environmental factors, the output model may be of more salience. However, this is not a clear distinction in that many of the physical constraints may be associated with environmental fragility, such that even low levels of input use may cause environmental harm.

## 6. AN ILLUSTRATIVE MODEL

The key determinant between the models relates to the assumed relationships between agricultural and environmental outputs. Figure 2 suggests a possible relationship between agricultural outputs and a collection of countryside services. This contrasts with Runge (1999) who looks at a relationship between landscape conservation and farm income support. Clearly in practice there will be different relationships between agricultural production and individual countryside services (e.g. Traill, 1988) but countryside services are assumed here to be produced as a single bundle, as indeed are the agricultural outputs. It is assumed that the outputs may be achieved from a given resource base and that there are choices as to what combination to produce. The production relationship

FIGURE 2
Production Opportunities for Countryside Services and Agricultural Products




between the two different output bundles is illustrated by the production possibility curve PP.

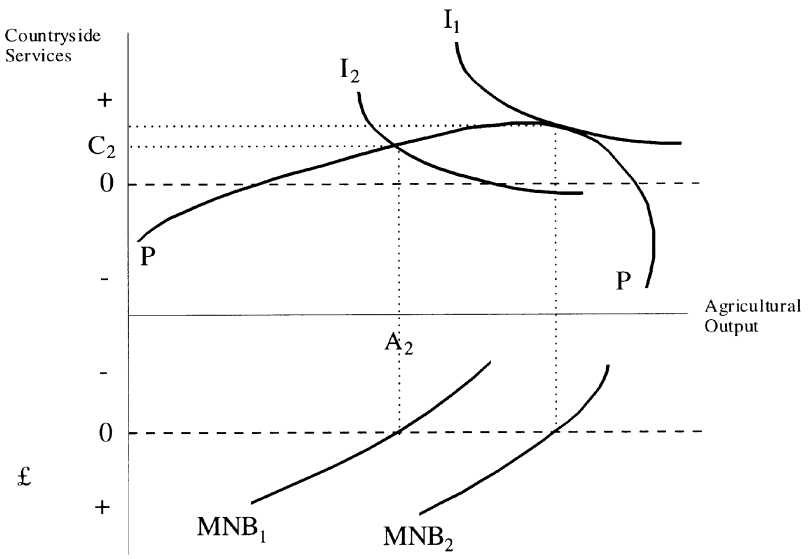
The point '0' on the Countryside Services axis indicates a reference level of environmental quality. Landowners are deemed to have a duty to reach this standard and below this point represents 'pollution'. The production of services above this level is thus regarded as the provision of a public good.

The relationship indicates that at lower agricultural intensities the two types of output are complementary, but that at higher levels they become competitive. This may be regarded as representing the 'output model'. With an 'input model', the two bundles would be expected to be competitive across all agricultural production levels. We can then define an optimal combination of outputs against a community indifference curve ($I_1$) which is tangential to PP at $C_1A_1$.

A relationship between the production possibilities and the return from agricultural production is illustrated in Figure 3. Farmers' decisions are assumed to be determined by maximising the return to agricultural production. The bottom part of the figure shows a Marginal Net Benefit curve ($MNB_1$) illustrating the private net return to agriculture at different levels of production. This is determined by economic and policy variables that arise independently of the values attributed to countryside services. The private return will be maximised by producing up to the point where $MNB_1$ equals zero. At this level of agricultural costs and prices, the combination of countryside services and agricultural output ($C_2A_2$) reaches $I_2$, below the potential at $I_1$. An increase in the return received by agricultural production to $MNB_2$ indicates one means of moving the combination of outputs produced to $I_1$.

Clearly these sorts of relationships may be constructed to illustrate a range of different situations, some of which are discussed by Russell (1993). It is, of course possible that the levels of agricultural prices and costs will produce an

FIGURE 3
Agricultural Returns and Countryside Services




MNB which maximises returns to agriculture over the range where there is a trade-off between countryside services and agricultural output, in which case a reduction in prices would lead to an increase in welfare.

The aim here is to illustrate the potential for policies in support of the environment, that raise the overall level of welfare by correcting for unpriced environmental benefits to promote an increase in agricultural production. This is simply analogous to the development of a market for wool in Australia leading to an increased supply of sheepmeat. This illustrates the different implications of the two models of agricultural-environmental relationships. The 'input model' and context implies that policies to improve the environment will restrict agricultural activity. As noted above, the implications of the 'output model' are less clear cut, but often imply that policy should support agricultural systems, perhaps especially in less favoured areas where the major environmental threat arises from a decline or abandonment of agricultural uses leading to a loss of rare or characteristic habitats and perhaps also to a decline in local communities.

## 7. CHOICE OF POLICY MECHANISM

The arguments for public intervention in rural resource management arise primarily from the absence of markets for certain outputs. In the case of rural

land, some of the joint products have at least some public goods characteristics so are not marketed (e.g. Whitby, 1990). Pure public goods in this context are defined as non-depletable (consumption by one person does not reduce the amount of good available for consumption by other people) and non-excludable (once the good is provided, the producer is unable to exclude people from consumption). Given these characteristics, markets for countryside services are incomplete and they will tend to be undersupplied. We must then anticipate that some form of state intervention will be necessary in maximising the social value of land uses.

We cannot however assume that the incentive for environmental improvement should be achieved through an increase in the level of agricultural product prices. Indeed, there would be a preference for payments that are directly linked to the level of countryside services provided. It might be argued, following the Tinbergen rule (e.g. Harvey and Whitby, 1988), that each of the environmental attributes should be identified and priced and addressed by a separate policy instrument. Payment could then be offered to landholders according to their contribution to the value of countryside services arising from their land uses. Land holders would then face appropriate returns for the provision of the individual attributes and so could plan their combinations of outputs and land uses accordingly. This is recognised by Fischler:

> each function [within the European model of agriculture], i.e. agricultural production, biodiversity and environmental protection, upkeep of the landscape and various services, must be paid for as far as possible individually, so that sufficient incentive remains to provide all these services and meet society's expectations (Fischler, 1998).

However, in practice it would be impossible to identify each individual value arising from every parcel of land. There is thus a need to identify indicators that can proxy for bundles of countryside services and to link payments to them. For example, payments for the provision of wetland wildlife services might be made according to the numbers of birds observed to be feeding on landholders' fields through the winter. But even with this simple example there are obvious complications. Monitoring costs would be high and inevitably imperfect. There would be questions as to what species of birds to be included and what measures might be taken to attract and retain them in a particular place.

There would also be interdependencies between decisions made across space. The numbers of birds on one area would depend upon the land uses provided on adjoining areas. This might in principle lead to some form of collective action among local landholders, although again there would be difficulties of excluding free-riders from benefits from the group's actions. Thus the scale of analysis needs to be taken into account.

Finally there would be problems associated with risk. The environmental outcome, in this case the numbers of birds observed, would be subject to a wide

range of factors which would be outside of the control of landholders, such as weather conditions or breeding success of wildlife populations in other parts of the world. There is also likely to be uncertainty about the appropriate ecosystem management required in order to produce particular environmental outcomes. This type of risk is assumed to be greater than that generally associated with conventional agricultural production, although the differences may fall as more experience is developed with forms of ecological management. Landholders would be reluctant to take on this risk, and would accordingly demand higher payments in order to persuade them to enter into environmental contracts. However, government could spread the risk by taking out contracts in a range of areas. In the absence of markets within which such ecological risks might be shared, the implication would seem to be that government should take the risk by contracting for landowners to provide the inputs over which farmers have control rather than to deliver the more uncertain environmental outputs.

Thus we will see policy mechanisms linked to a range of indicators thought to correlate with the provision of countryside services. Where outputs may not be quantified, such as in the provision of characteristic landscapes, the selected indicator might represent some input to agricultural production or some aspect of the agricultural production process. However, in some cases the best available indicator might be the output from the agricultural activity itself, although as illustrated in Figure 2, there may need to be some limit placed on the total production level in order to prevent excessive production leading to environmental damage. Generally, with complex and imperfectly understood ecological and cultural systems, multiple and interrelated outputs, and high transactions costs, we may anticipate that a variety of mechanisms will be required in order to generate the composition and levels of countryside services demanded. And that some policies will stimulate agricultural production in excess of levels that would prevail at world market prices.

However, it must be appreciated that this approach is not peculiar to the treatment of environmental benefits from agriculture even though the problems facing policy-makers may be more extreme. Policies introduced for the control of pollution are similarly rarely, if ever, targeted directly on an external cost. All policy mechanisms have to be linked with a measurable indicator that may be correlated to varying degrees with the actual external cost of environmental impacts. This may be an ambient environmental standard, an emission from a production process, the characteristics of a production process or an input to a production process. While in general, *ceteris paribus*, we will prefer indicators that are closely related to the external cost, in practice such indicators may not be available. For instance, Vatn (1998) argues the case for taxes on inputs in preference to taxes on emissions on the grounds that the transactions costs are likely to be lower. Thus, here too the choice is determined by the availability of information.

## 8. CONCLUSIONS

Resources in rural areas give rise to a variety of different types of countryside goods and services. This is termed 'multifunctionality'. Some, especially agricultural products, are marketed in a conventional way. Others are consumed directly and yet still provided through a market, such as by admission to a public park. But many have significant public good characteristics with the consequence of missing markets. These other services are in many instances impossible to measure and in some instances may not be individually identified. They are commonly produced jointly with agricultural products under varying technical relationships. We may characterise the interrelationships between agricultural production and the environment through two alternative models, one where environmental impacts are typically associated with input use and the other where they take the form of joint products.

This leads to public involvement in the provision of countryside services. The non-point character of provision, problems of measurement and uncertainty in supply indicate that policy mechanisms will often be linked to agricultural input use, processes and activity levels rather than directly to the output of countryside services. This is not unusual. Few if any environmental policies directly target environmental damage. Many are linked to variables believed to be associated with environmental values, such as emission levels, production techniques or location.

The introduction of policies to support the provision of countryside services may either tend to reduce or to increase agricultural output depending on the technical relationships between the two categories of output. In these circumstances, payments to farmers can represent the correction of a market failure rather than a distortion to trading relationships. Consequences for agricultural output are to be expected and are analogous to a change in the demand conditions for one product, such as wool, having an effect on the market conditions for a joint product, such as sheepmeat. It is thus important in respect of the Uruguay Round Agreement on Agriculture to distinguish between 'domestic support measures' and other payments made to farmers for the provision of public goods. The latter may well have effects on agricultural production but should not be included within the AMS.

This will clearly not apply to all payments made to agriculture. The case is likely to be strongest with respect to relatively extensive systems in 'Old World' contexts as represented in the 'output model'. As Ervin (1999) suggests, it is then necessary to assess against a variety of criteria claims that particular transfers represent payments for a good or service provided rather than a subsidy. These criteria will include:

- whether the provision of the value is regarded as an external benefit, such that the Provider Gets Principle applies,

- whether in the absence of that payment, the environmental value would be below the level demanded,
- whether there is a demonstrable link between the action that is supported through the payment and specific external benefits, and
- whether the policy mechanism is targeted on the most appropriate indicator.

These will often be difficult to determine unambiguously. Transparency with regard to these issues will thus be an important factor in assessing particular policy measures. Where transfers do meet these criteria, support payments should not be seen as 'compensation for natural constraints and disadvantages' as suggested by the European Commission (1998). This will be interpreted as 'thinly disguised protectionism' (Swinbank, 1999). Rather they should be seen as payments to promote the production of valued countryside services and set at a level reflecting their costs of production.

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