Determining optimal levels of conservation land use: the limitations of economic analysis

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Summary *– The paper considers the analytical difficulties economists face in determining the socially optimum levels of output of public goods associated with farmed areas. This includes the problem of deciding the policy effort which should be devoted to discouraging practices which reduce the output of such goods, and which diminish the conservation stock of hedgerows, biodiversity, and desired physical features in the countryside.*

Consideration of these issues is conducted in relation to land use conservation policies in the UK; there is a brief description of some of these. The basic theory of optimal taxation and subsidisation is briefly presented, and is used to emphasise that the cost of agricultural conservation subsidies in the UK is inflated by the pattern of property rights which has been established. The problem of identifying the optimal scale of policy expenditure on rural conservation is restricted by the limitations of available methods of valuing non-use value. A brief consideration of this is presented, before reviewing the comparative cost of alternative conservation instruments in the UK.

As a tradeable asset the land market does provide members of society with the opportunity to buy the use-rights in land and to devote the land for conservation purposes. Although this option is used to a limited extent, the paper argues that market forces cannot be relied upon to produce society's optimal level of public good outputs from agricultural land.

Key-words: *public goods and agriculture, UK policy, optimal policies, property rights, contingent valuation*

Le choix d'un niveau optimal de préservation des terres: la portée de l'analyse économique

Résumé – Cet article rend compte des difficultés qu'ont les économistes à déterminer, de façon analytique, le niveau optimal de fourniture de biens publics par l'agriculture. Cela suppose de fixer les mesures que doivent prendre les pouvoirs publics pour restreindre les pratiques agricoles qui dévalorisent ces biens, diminuent le nombre de haies, réduisent la diversité des espèces et altèrent les caractères spécifiques du paysage.

Cette étude s'appuie sur les manifestations d'une volonté politique en faveur de la protection du patrimoine naturel du Royaume-Uni. Certaines de ces actions sont brièvement décrites. On fait une présentation rapide de la théorie de la taxation optimale et de la subvention optimale; l'auteur en profite pour souligner que le coût des subventions en faveur du maintien de l'agriculture se trouve majoré au Royaume-Uni par l'état des droits de propriété. Evaluer au plus près le montant optimal des dépenses publiques en matière de protection du patrimoine rural est un exercice qui se heurte aux limites des méthodes de calcul des valeurs de non-usage. L'auteur y fait référence avant de proposer une comparaison du coût des différentes méthodes de préservation utilisées au Royaume-Uni.

S'agissant d'un bien négociable, le marché foncier offre en l'occurence au public la possibilité d'acquérir des droits d'usage sur des terres qui sont consacrées alors à des fins de protection. Bien que cette solution trouve peu d'adeptes, l'auteur soutient que l'on ne peut s'en remettre aux seules lois du marché pour que l'agriculture produise un niveau de biens publics qui soit socialement optimal.

Mots-clés: biens publics et agriculture, Royaume-Uni, droits de propriété, choix politiques, estimation des aléas, patrimoine rural

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AGRICULTURAL land use generates large external benefits and costs which are of a public goods and bads nature. The output of public goods largely takes the forms of visual landscape attributes, biological and biodiversity characteristics, access and recreation possibilities, and of cultural attributes connected to rural society; these are the products of 'conservation stocks' built up by farming throughout history. Negative externalities are chiefly in the form of pollution products generated by the practices of farming, and they may be added to by a reduction in the conservation stock and its beneficial outputs.

It is the generally accepted perception of recent agricultural development that the output of external benefits has declined by volume, while that of external costs has increased. At the same time, the social valuation of both types of externalities has almost certainly increased (although this has not been rigorously tested) as awareness of conservational issues has increased, and as leisure patterns have been changed by greater affluence. As a consequence of these changes in quantities and values of both types of externalities, the priority to produce more environmental goods and to restrict output of bads has increased, and has been reflected in a number of conservation policy initiatives.

The key to conservation is management and changes in management. That which is worth conserving is the product of management which has maintained or created high qualities of landscape, wildlife, or traditional man-made features. Such management may have entailed minimal interference at the extensive margin, as in the uplands and in the remaining broadleaf forests, or it may have involved a commitment to traditional management in the great lowland country estates surrounded by intensive farming. In order to maintain the output of positive externalities, policy needs to support the viability of those who are operating systems responsible for their production and, where necessary, to provide incentives for the generation of additional public goods (*e.g.* footpaths, restored traditional buildings and walls). It is also obviously desirable to have policies to restrict the generation of additional external costs by land users. This use of disincentives for negative management, as discussed below, has not been as successfully pursued by policymakers in the UK as the provision of incentives for positive management.

One of the obvious problems in designing and implementing land use conservation policies is to decide how much of any type of public good should be produced, or alternatively to decide how much diminution in output should be accepted. This problem is associated with that of 'what is the most effective instrument or mix of instruments to achieve the desired level of output', where the effectiveness criterion includes considerations of cost. This paper is intended to debate some of these issues and to explore some of the limitations which economic anal-

ysis currently encounters in addressing them in the context of UK land-use conservation policy[1].

The paper begins by outlining the main types of conservation instruments currently employed in the UK, and then proceeds to consider the basic theory of the optimal level of conservation outputs, taking into account property rights issues. Since determining optimal levels of conservation requires valuation of costs and benefits, the paper then reviews the limited approach adopted to analyse the cost of conservation instruments in the UK and considers briefly the problems of valuing benefits and costs.

CONSERVATION POLICY INSTRUMENTS IN THE UK

One of the most important elements of UK conservation policy involves identification of Sites of Special Scientific Interest (SSSIs). This was introduced in the National Parks and Access to the Countryside Act 1949, as part of a series of post-war measures to set up a new urban and rural planning system. The Act provided machinery for designating SSSIs to safeguard places with special flora, fauna and geology, as well as to create National Parks and designate Areas of Outstanding National Beauty. Aided by subsequent legislation the number of non-geological SSSIs (*i.e.* those under some form of agricultural or forestry) had risen by 1989 to over 5,000, which covered 1.5 million hectares, throughout England, Scotland and Wales[2]. The mechanism for conserving these areas involves notifying their owners that there is a range of "potentially damaging operations" which cannot be undertaken by the owners without notifying the appropriate authority. This process of notification then triggers negotiations relating to the amount of compensation (either as a lump sum or annual payment) which owners would accept in order not to proceed to damage the site – the offer, in the form of a management agreement (MA) by the authority, is based on the principle of compensation for profit foregone[3]. Not all owners do threaten damage, and compensation in 1989 was only paid on 8.4% of the agricultural land in SSSIs. This is a small proportion in view of the moral hazard potential created by the possibility of landowners receiving payment for threats which they have no intention of carrying out. It is important to note

[1] The author wishes to acknowledge the contribution of George Hutchinson and Sue Chilton of Queens University Belfast to the passage evaluating the use of Contingent Valuation Methods, and the general help of Lucy O'Carroll. All remaining errors are wholly the responsibility of the author.

[2] In England and Wales the area of SSSIs, at 1,350,000 ha, is about 4 percent of the total land area.

[3] For extensive details of payment rates see Whitby *et al.* (1990).

that the compensation payments are individually negotiated for each management agreement; this contrasts with the management contracts involved in other instruments in the UK which are based on standard payments and are of shorter duration.

It is interesting that nearly all landowners threatening damage do accept the negotiated compensation, and do not proceed to defiantly damage the SSSI or risk the ultimate sanction of compulsory purchase by the state. Nevertheless it has not proved possible to protect all SSSIs adequately[4].

An additional instrument, which is applied throughout the European Union and which was established in 1985 under EC Structures Regulation (797/85), is the designation of Environmentally Sensitive Areas (ESAs). The total agricultural area within the boundaries of ESAs in the United Kingdom in June 1993 was 1,652,000 hectares or 9.1% of the total agricultural area; this will rise to 2,722,000 hectares or 15.0% of the total agricultural area when the fourth set of ESA schemes begin to operate at the end of 1994. With this policy instrument, each ESA has up to three standard contracts, with higher payments for contracts with more stringent environmental restrictions. Hence this policy may be described as operating with standard payments, where each ESA has a different scale of payments related to the environmental objectives of that area and with the average opportunity costs of complying with the management guidelines.

It may be argued that both management agreements and standard ESA contracts involve the **rental of certain property rights** from land owners and users by society. The period of rental varies according to the specific contract. As an alternative to renting or hiring property rights, public policy can be directed to buying all usufruct rights through a policy of land purchase. Public funds can be used to purchase land to be managed by public bodies, or they can be used to subsidise (grant-aid) the purchase of land by quasi-public and private bodies dedicated to conservation uses of land. Details of this type of policy in the UK are fully presented in O'Carroll (1993)[5] and Colman (1991), but it is worth noting that among the quasi-public bodies are the National Trust

[4] This was acknowledged in a report by the NCC (1990, cf. 5.1.5), which states:

"The Wildlife and Countryside Act has proved inadequate to fully maintain a SSSI series. The Act does not protect sites completely from activities subject to planning control, nor does it make them available for the functional uses of nature conservation resource outlined earlier. Additionally sites often require specialised management which an owner may not wish to contemplate. SSSIs are also potentially at risk when ownership changes, despite being registered as a land change. Thus nature reserve acquisition through purchase or long lease remains as important as ever within a strategy to maintain our heritage of nature and to develop those functions associated with it."

[5] O'Carroll (1994) compares public ownership of conservation land in France and the UK.

and the Royal Society for the Protection of Birds (RSPB). Both of these organisations are charities supported by private membership, and dedicated to conservation. The National Trust currently owns around 235,000 hectares of land (excluding Scotland) and the RSPB owns 38,000. Both bodies regularly receive grants of money from government to assist in the purchase of land of conservation value.

Another way in which existing landowners can safeguard land from change of use, (and current use may be environmentally friendly), is to take the legal step of placing a 'covenant' upon its use. This procedure has its limitations, and it may be difficult to police and enforce, but it places legal restrictions on changes of land use. Details of this approach are provided by Hodge *et al.* (1993).

Little use has been made of statutory control of agricultural land use in the UK. There is some control over buildings, most particularly in National Parks and Areas of Outstanding Natural Beauty, but there are no direct statutory controls on agricultural land use. There are however indirect statutory controls relating to water pollution which give the National Rivers Authority the power to impose penalties for water pollution; to avoid these does often require investment and changes in management practice.

HOW MUCH CONSERVATION IS OPTIMAL? ISSUES OF PROPERTY RIGHTS

The ability of producers to force external costs (of say water pollution) onto others, or the inability of an industry to capture the returns from benefits it produces (such as leisure access, or higher house values from an enhanced view over farmland), are perceived by economists as instances of market failure. This failure is often attributed by economists to the absence of an appropriate set of property rights. If all water courses which ran through farms were owned by other private owners they and the farmers could in theory bargain, so that any use made of the water course was fully paid for, including compensations for any pollution damage. In reality such a solution is impractical: watercourse owners would possess local monopoly, transactions costs would be high, information is imperfect and there is a chain of knock-on effects downstream. Nevertheless a good deal of light is shed onto land-related conservation policy by placing it in the context of property rights issues.

Landowners and tenants (subject to their leases) typically have complete control of the agricultural use made of their land. They are not free to build houses or non-farm commercial premises, but there has been little to prevent them from removing hedgerows and walls, draining land, or felling trees. In the UK, society currently has few or no prop-

erty rights in these matters, even though many members of society have a strongly felt interest and express a sense of loss when such changes are caused by farmers or foresters.

Answering questions about the effectiveness of different conservation instruments would ideally involve assessing whether the optimal level of conservation has taken place, in relation to all the different environmental and wildlife characteristics towards which policy is directed.

Applying the most basic economic principles, and assuming (following Pearce, 1988): (i) that below a certain threshold level land using activity does not generate any external costs (*i.e.* that at low levels of output there are no social costs, only private ones), (ii) beyond that level of commercial activity marginal external costs progressively increase, and (iii) that marginal social benefits decline as production intensity and commercial output increase, then the social optimum level of conservation would be achieved where marginal social cost equals marginal social benefit.

Figure 1. **Optimal tax on a competitive firm generating external cost**[6]

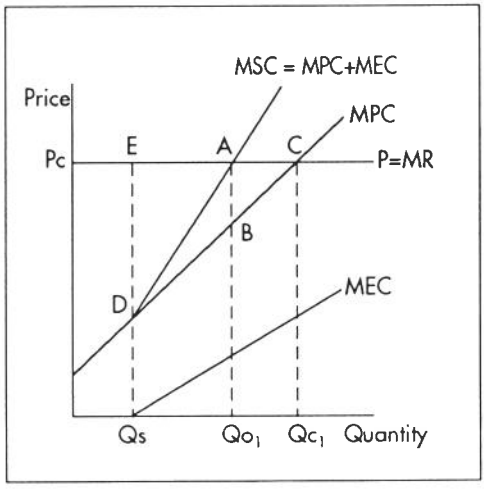
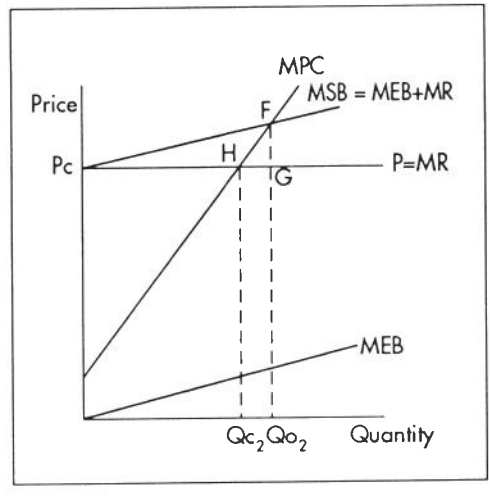


Figure 2. **Optimal subsidy where commercial production is linked to external benefits**[6]



MPC: marginal private cost; MR: marginal (private) revenue; MEC: marginal external cost; MSC: marginal social cost; MEB: marginal external benefit; MSB: marginal social benefit

According to economic theory, control of external costs can be achieved by taxing activities which pollute. In Figure 1 an optimal (Pigovian) tax AB levied on the producer would reduce equilibrium output

[6] Figure 1 may be interpreted as representing intensive farming output, whereas Figure 2 can be interpreted as representing extensive upland farming, which maintains walls and heather moorlands or extensive grazing livestock production in the lowlands.

from a competitive equilibrium Q_{c1} to Q_{01}, at which level buyers would pay the full social cost of production P_c, but producer revenue would be taxed by AB to eliminate incentives to produce more than Q_{01}. Alternatively, if policy was to restrict output to Q_{01} the producer could be offered compensation for the profit foregone (area ABC)[7] by producing less than Q_{c1}. It is essentially this second alternative that in the UK is embodied in restrictive management agreements and ESA contracts.

However, it might be argued that an outcome at Q_{01} was inadequate in terms of conservation policy, that no further degradation of the environment is acceptable, and that a complete halt to species and landscape loss is desired. That is, following Pearce (1988), that a sustainability criterion be imposed. In that case output from land-using activities would have to be cut to Q_s and could be achieved if taxation was raised to ED, with the producer bearing the full cost of achieving sustainability. The alternative to taxation in this case would be to compensate to the producer for any profit foregone by cutting production to Q_s; this would require an amount of compensation equal to area EDC in Figure 1.

In the opposite case (Figure 2), where the commercial market equilibrium is suboptimal because of the inability of producers to capture payment for external benefits, a production subsidy of FG per unit of output would increase output to the social optimum Q_{02} with producers receiving, in addition to the market price P_c, a subsidy equal to the marginal social benefit conferred by the last unit of output. This type of policy is reflected in Management Agreement and ESA contracts which require farmers to invest in specific works (such as rebuilding walls or raising water tables), and in conservation grant policy.

This analysis at firm level provides a satisfactory basis for explaining the principles of taxation and subsidisation in conservation policy, but it leaves aside the important issue, raised by Bromley and Hodge (1990), that the amount which has to be paid by (or taxed by) society to secure a certain level of **countryside and community attributes**[8] (CCA) depends upon who owns the property rights. If society owned the conservation rights, farmers would have to pay society for the right to undertake farming activities which diminished the output of these CCAs. On the other hand if, as at present in the UK, farmers effectively own these rights, society has to pay farmers to increase the output of CCAs and reduce farming intensity. It is generally accepted, as noted by Bromley and Hodge, that many studies *(e.g.* Knetsch and Sinden, 1984) reveal that individuals are only willing to accept larger sums to give up some-

[7] Strictly speaking, rather than profit foregone this is the loss of producer surplus when output is reduced to Q_{01}.

[8] The term 'countryside and community attributes' is that used by Bromley and Hodge.

thing than they would be willing to pay to acquire it. In the context of producing more CCAs and reducing farming intensity, this principle implies that farmers require higher payments from society to adopt a particular pattern of farming which produces a desired level of public goods, than would be required if society owned some of the rights which custom has ceded to landowners. If these arguments were applied to Figure 2, they suggest that the marginal private cost of expanding forms of agriculture which produce external benefits from Q_{c2} to Q_{02} is inflated by farmers' own estimates of the marginal cost (because it is based on their willingness to accept payment), and that the marginal subsidy rate FG and total compensation FGH are also inflated. A further implication, in the real world of budgetary constraint, is that there will be less output of CCA public goods where society has ceded land-use property rights to landowners and has to 'buy' CCA output from them.

ISSUES IN ASSESSING ECONOMIC EFFECTIVENESS

Determining non-market values

While the principles of policy may be explained at the farm level by diagrams such as those in Figures 1 and 2, and by their counterparts in aggregate level diagrams presenting society's demand curve for CCA and agriculture's supply curve of them, there are severe limitations to our ability to estimate the relevant functions necessary to determine optimal levels of CCA output. A considerable amount of effort is being expended on the valuation of non-market goods using such approaches as the travel-cost method (TCM), hedonic pricing method (HPM) and the contingent valuation method (CVM).

In the UK a range of studies using these methods has been undertaken by Willis and colleagues at the University of Newcastle-upon-Tyne, and a summary of some of their results is presented in Table 1. These provide a useful basis on which to reflect upon the capacities and limitations of these methods, as discussed *inter alia* by such authors as Anderson and Bishop (1986), Cummings *et al.* (1986), Schultze *et al.* (1981), Coursey *et al.* (1987), Hanley (1989), Mitchell and Carson (1989) and Hutchinson and Chilton (1993).

In all the cases reported in Table 1 the objective has been to try and value the benefits of various types of amenity associated with the countryside, and to compare these to budgetary costs incurred; thus there are no studies reported of the type conducted in the USA relating to the environmental damage caused by such accidents as the Exxon Valdez oil spill in Alaska. The travel cost method is inevitably restricted to meas-

uring use values of an amenity by those who use it, and it cannot cope with establishing existence, option and bequest values of those who are concerned by the potential loss of a particular environmental characteristics even though they may have no intention of visiting or using it.

Table 1. **Comparative result of some environmental evaluations (1990-1992)**

Site	Evaluation Method	Value of Benefits	Comparator	Comments
Forestry Commission recreation	TCM	£8.665m	£8.5m FC expenditure on recreation and amenity	Lower bound estimate.
Inland waterway recreation	TCM	£15m	–	Benefit net of subsidy.
Visiting botanic gardens	TCM	Visitor Benefits	Net Costs	Disregard scientific and other benefits.
Cambridge		£1,002	£267,600	
Edinburgh		£33,664	£4,355,745	
Sheffield		£3,826	n.a.	
Westonbirt		£3,236	£161,000	
Price of private houses				
+ 1% Broadleaved trees	HPM	+£43/house		Amenity of broadleaves exceeded loss on timber.
+1% Conifers	HPM	–£141/house		Income elasticity of demand for broadleaves greater than for housing.
Waterfront housing				
London	HMP	+£1,909/house		
Midlands	HPM	+£1,589		
Yorks Dales National Park	CVM	£42m		Today's landscape.
landscape scenarios	CVM	£40m		Conserved landscape.
	CVM	£5m		Planned landscape.
Norfolk Broads day visits	CVM	£7.8m per annum	Capital cost of coastal defence	Open ended format.
	CVM	£24.9m per annum		Discrete choice format.

Source: Willis and Garrod (1990-92) Countryside Change Unit, working papers 5, 12, 13, 21, University of Newcastle-upon-Tyne.

TCM: Travel Cost Method; HPM: Hedonic Pricing Method; CVM: Contingent Valuation Method.

The hedonic pricing method is likewise restricted to trying to estimate the use values placed upon environmental characteristics by those who trade houses or land, as these are reflected in price premia paid for the view or other desirable locational characteristics. However, a good view, or nearness to a river, are public goods which are valued by a wider society and are not the excludable privilege of local residents. Hedonic pricing analysis cannot capture all of the value to those who are not prospective house buyers.

In the case of conservation schemes such as ESAs and SSSIs, their environmental value is more related to non-use values, such as existence or bequest values; this is true of biodiversity and landscape characteristics in general. It is only the Contingent Valuation Method (CVM) which can be used to estimate these types of non-use values, although it can be used to estimate use values, as in Willis *et al.*'s case of day visits to the Norfolk Broads shown in Table 1.

It is, however, a much more difficult process to apply CVM to the estimation of non-use values, because respondents in this type of contingent market will almost certainly be much less familiar with the good in question. Hence, they will undoubtedly encounter many more problems in actually conceptualising it. As respondents' level of familiarity with a real world context in which to frame their value decreases, the potential for many and varied (and confused) definitions is great, and the danger arises of the researcher being faced with a collection of almost meaningless values.

In these cases it is suggested (Hutchinson and Chilton, 1993; McClelland *et al.*, 1992) that the questionnaire itself should provide the respondent with the necessary information and context to value the good, and a range of psychological techniques should be used (both in the survey design and administration stages) to test the adequacy of respondent knowledge and comprehension.

Researchers, *i.e.* McClelland *et al.* (1992); Hutchinson and Chilton (1993), suggest that in order for respondents to construct meaningful values for the good in question, they require not only unbiased information on the good itself, but also information on substitute commodities and how changes in the level of provision of the commodity will affect the respondent. Specifying all the relevant features of the good (and the contingent market), and ensuring they have been understood, is essential in staging transactions (Fischoff and Furby, 1988).

Clearly, in the case of ESAs etc., this would involve informing respondents of the number of others (especially those of a similar type) already in existence, the basic scientific importance of the designation and any different levels of conservation/protection available within the scheme. Unless such procedures are followed, the credibility of the resulting estimates is at least questionable.

Comparing budgetary costs

Because of the limited amount of information on social costs and benefits, much economic analysis in the UK to date (NCC, 1990; Whitby *et al.*, 1990; Colman *et al.*, 1992) has been confined to comparing the fiscal and budgetary costs of conservation policy. The only mean-

ingful framework for doing this has been to consider some fixed standard of conservation (the protection of an individual site, protection of the character of an area, or the creation of some additional quality of repairs, woodland or stone wall etc.). From this perspective it has been possible, given a whole range of assumptions, to derive conclusions about the cheapest annual budgetary cost of achieving a narrowly defined conservational goal. O'Carroll (1993) compares the two alternatives of (i) outright public purchase of land and (ii) a grant to a voluntary body to cover a proportion of the purchase price for six particular sites. For most sites the results indicated that grant-aided purchase would generally have been cheaper than the outright purchase. However, where the site is in an ESA, it may be cheaper for a government agency to buy land outright and manage it, so avoiding the need to pay an annual ESA contract sum to a voluntary body as well as giving that body a grant for part of the cost of buying the land.

Table 2. **Cost and returns categories incurred by conservations instruments**

	Costs					Returns
	Lump sum purchase cost	Pre-"launch" administration cost	Annual Costs			Rental and farming income
			Compensation and grants	Administrative	Monitoring	
Public purchase	+	+		+		+
Grant-aided purchase	+	+				
Management agreement (annual payments)		+	+	+	+	
ESA		+	+	+	+	
Covenant purchase	+	+			+	

Source: Colman *et al.*, 1992, p. 60.
ESA: Environmentally Sensitive Areas.

Earlier analysis of this budgetary type across a broader range of conservation instruments by Colman (1989) and Colman *et al.* (1992) was conducted on the basis that the instruments were mutually exclusive alternatives, such that there would be no ESA payments on land purchased by the public or voluntary bodies. (The cost elements considered in that analysis are summarised in Table 2). As relates to the major instruments designed to preserve or re-establish traditional land use management the conclusions were:

a) Management agreements, negotiated only where necessary, were likely to be budgetarily less costly over an ESA-sized area than an ESA would be, because they would be targeted on key areas and areas under threat, while ESA payments are made on land under no threat of change.

b) ESA payments accepted on land which might have been under threat may well be cheaper than a management agreement payment cal-

culated on the basis of profit foregone, but overall cost will be higher because more land is eligible as of right for payment in ESAs.

c) ESA payments, in restrictive tier contracts, are best interpreted as rewards for an existing style of management, and as income supports since many farmers can comply with the management restrictions without foregoing much, if any, profit. Payments for converting arable land back to grass, or for regenerating heather moorland etc., meet costs incurred in environmental improvement. These payments for positive action do not incur the same problems of moral hazard as payments to obey restrictions on farming practice, since many farmers would not violate those restrictions.

d) Grant-aid to a voluntary body for a proportion of the cost of land purchase is invariably cheaper in annualised terms than having a government agency meet the full cost of purchasing and then managing land (under the assumptions in Table 2). However this overlooks the fact that in the latter case the public sector owns an asset which could be sold if appropriate, whereas in the former case it has merely helped a voluntary body to acquire an asset.

e) Covenants, which place legal restrictions on land use, should in principle be a cost-effective method of protection, but lack of evidence on compliance and monitoring gives insufficient empirical evidence for that conclusion.

Clearly such conclusions, and the researches behind them, represent a very limited form of economic analysis, since they do not constitute a full cost-benefit analysis of the instruments concerned, and do not indicate the extent to which re-allocation of budgetary expenditure between instruments would generate additional benefits.

The market in conservation goods

Because, self-evidently, most agricultural land is privately owned it should, according to the arguments put forward by Coase (1960), be theoretically possible for the market to provide a reasonable approximation to the socially optimal allocation of land to alternative uses, *i.e.* to provide the appropriate amount of low intensity farming, of natural vegetation, etc. The existence of the land market permits those who wish to increase the wildlife and landscape values associated with land use to buy land in competition with would-be commercial farmers. They can do so provided the highest price they are prepared to offer for environmentally sensitive management exceeds the highest price offered by a commercial farmer.

The actions of voluntary bodies and individuals buying land for conservation reflect this mechanism at work, which is why there has been so

much interest in the growth of land ownership by voluntary conservation bodies. Similarly public sector land purchase for conservation may be held to reflect society's willingness to pay for conservation.

While the operation of the market in this way is undoubtedly fascinating and important, it is clear that the existence of private property in land is not sufficient in itself to provide a socially optimal solution through the market. The rate at which land comes onto the market is slow, and tracts of land may be most at risk of degradation in a conservational sense at the hands of their current owners. In other words, potentially more conservationally minded owners may not have an opportunity to bid to buy key areas of land to save them. It might be argued that anyone can make a bid for a piece of land at any time, and that there is a price no owner would refuse. The problem here is that the information that a piece of land is under threat may not be available to potential conservators. That of course is where the management agreement system is so vital. It is the process of identifying key areas of land which should be protected and listing them as SSSIs which triggers the information that a threat is imminent and that action should be taken to try and reach a financial settlement to achieve conservation. Where a management agreement cannot be reached, notification of a potentially damaging operation can lead to public or voluntary body purchase.

Another factor inhibiting the ability of the land market to achieve the socially optimal land use distribution, it can be assumed, is the incomplete representation of the public's willingness to pay through the channels available to them. Only indirectly, and weakly, through annual general meetings and response to appeals, do members of bodies such as the National Trust or RSPB influence expenditure on land purchase and on particular acquisitions. It would be difficult to show that such bodies' land purchase and management policies are a good reflection of their members' willingness-to-pay, let alone that of the more general public. It is even less likely, indeed almost inconceivable, that public sector expenditures on land purchase (by bodies such as the Countryside Commission, National Heritage Memorial Fund and English Nature) reflect the full willingness of society at large to spend on land purchase.

Another issue: timescale

This heading is introduced in order to air questions relating to the time-horizon over which conservation policies should operate. There may be a dominant consensus that some areas should be preserved in their current land use for the foreseeable future. That may be the case with the 'majority' of SSSIs, National Nature Reserves, and National Parks. But there may be some SSSIs which have been overzealously designated and where change of use would not detract from the 'conserva-

tion stock'. What about the ESAs? Can it be said that at their current boundaries, and given the land enrolled, policy should aim to 'freeze' ESA land use in its current pattern for a long time into the future? We know little about how the optimum level of policy intervention should and will change. The prospects of a considerable reduction in agricultural intensity at the margins open up several possibilities and questions. At the extensive upland margin, stocking restrictions and de-intensification raise the question of how extensive a farming system can and should be maintained in the name of conservation. Reduction in pressure to intensify farming in the more favoured lowland areas reduces the threat of destructive change, which, when coupled with reduction in farm land prices, should simultaneously remove some of the threat that farming will continue to reduce the output of external benefits and at the same time make it cheaper for conservationists to acquire property rights in land. These changes should also reduce the size of the subsidies required to induce landowners to induce land managers to take certain actions and desist from others; indeed Whitby *et al.* (1990) have already shown that the average cost of management agreements started to fall in 1988.

CONCLUSIONS

The point of the preceding observations is to underline uncertainties about what the future policy needs for conservation will be. This makes it difficult to evaluate whether the mix and balance of policy instruments we currently have is appropriate to the future needs of conservation policy. However, the rate at which new policy experiments have been tried in recent years as new instruments have been introduced and tried out does indicate a healthy flexibility in conservation policy which augurs well, although it cannot be said that large amounts of public funds have backed these. Economics has as yet been able to say comparatively little about the socially optimal scale of such spending. Despite gut feelings that it is suboptimal, there is little empirical evidence that economists can produce to support such a contention. Hopefully methods for eliciting social values will become sufficiently robust as to permit a more solid contribution to the policy debate.

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