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Policy Choices about Agricultural Externalities and Sustainability: Diverse Approaches, Options and Issues

by

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Clem Tisdell†

November 2007

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Policy Choices about Agricultural Externalities and Sustainability: Diverse Approaches, Options and Issues

Abstract

This paper reviews agricultural externalities as a source of market failure and as a reason for a lack of sustainability of agricultural incomes and production. It concentrates mainly on environmental externalities (which include biodiversity loss) but consideration is also given to externalities involving adverse selection. Types of agricultural externalities are classified and their nature is explored. Depending on their type and nature, different policy implications often follow. For example, no intervention may be required, or it may be reasonable for a farmer to have to pay to create an unfavourable externality or be paid to moderate or eliminate it. Adverse selection is also an externality phenomenon and some of its implications for agricultural policy are explored. Traditionally, environmental economics has focused on economic efficiency in formulating policies for environmental regulation but equity is also important in relation to public policy. The implications of various equity priciples for designing policies to address the occurrence of agricultural externalities are outlined. Attention is subsequently centred on the economic practicality of agricultural environmental policies when account is taken of transaction costs and knowledge limitations, as well as the political and social acceptability of such policies. These factors can alter the choice of ideal policies. Biodiversity change (conservation and loss) involving agriculture is considered as a particular case. By showing the relevance for agricultural policy of diverse foci, this study accords with the polycentric approach of Konrad Hagedorn. His approach should make us wary of cut-and-dried specific but narrow policy solutions that characterise traditional environmental economics. The "exactitude" of these solutions appears in many cases to be obtained at the expense of relevance.

Policy Choices about Agricultural Externalities and Sustainability: Diverse Approaches, Options and Issues

1. Introduction

As originally pointed out by Arthur Pigou (1932) and as is now well known, economic externalities (whether favourable or unfavourable) can be an important source of market failure. However, the mere presence of externalities does not mean that they are Pareto relevant. When unfavourable externalities are infra-marginal, they are often irrelevant. However, if alternative production techniques or consumption methods are available with different sets of externalities, market failure can still occur (Tisdell, 1993, Chs. 2 and 3). Even if no significant externalities are observed from an economic activity, for example when a particular type of farming is adopted, an alternative type of activity or set of farming practices may generate large positive externalities and be socially superior. In such a case, market failure also occurs even though no actual externality is observed. This implies that in order to assess whether externalities could be Pareto relevant, one has to consider not only the marginal external effects of economic activities but also their total effects (Tisdell, 2005 Ch.3). Evaluation of externalities is much more complex than has been traditionally realized and cannot be done accurately by adopting only a marginalist point of view.

Note that failure to take adequate account of externalities is not peculiar to market systems but also occurs in non-market systems, including state decision-making about resource-use. Failure to take proper account of externalities in state decision-making might also be more widespread in societies where democracy and freedom of speech and communication are limited, such as appeared to be the case in many centralized communist countries. There is considerable evidence that inadequate attention was given to the effects of adverse environmental externalities in former communist countries. One of the many examples includes the decision by the Soviet Union to extensively use waters feeding the Aral Sea for irrigating cotton with

subsequent serious adverse effects on the Aral Sea itself. Not only does state decision-making often fail to take sufficient account of environmental spillovers, but also inadequate attention is sometimes given to sustainability issues. A recent example is Indonesia's transmigration programme from Java to Kalimantan. The Indonesian government has sponsored resettlement projects intended to grow rice on peat lands in Kalimantan Their soil quality is such that agricultural production is not sustainable on these lands. In addition, these land areas are often the source of fires that cause air pollution in Southeast Asia and add to greenhouse gas emissions (Singleton et al., 2004, p.70).

However, as pointed out by Galbraith (1952, 1967), the presence of democracy and freedom of speech do not ensure that governments take adequate account of externalities in their decision-making. Political lobbying and associated mechanisms can result in economic failure of a Paretian type.

In this article, the patterns and nature of agricultural externalities and their relationship to agricultural sustainability are discussed first. The nature of such externalities has normative implications for the choice of public policies to regulate those spillovers and these implications are outlined. While the main emphasis in this article is on environmental externalities from and within agriculture, attention is also given to agricultural externalities arising from adverse selection. This aspect, together with the regulation of agriculture's environmental externalities, is being addressed under the EU's new Common Agricultural Policy. The implications are explored for agricultural environmental policy of features often associated with the New Institutional Economics, such as transaction costs and aspects of uncertainty in policy formation and implementation are considered. Subsequently attention is given to political and social acceptability as influences on choices about agricultural policy. Then agriculture's role in biodiversity conservation is considered as a particular case. In line with the polycentric approach of Konrad Hagedorn, topics in this analysis are considered from multiple points of view.

2. Types of Agricultural Externalities and their Relationship to Agricultural Sustainability: Classifying Agricultural Externalities.

Externalities involving agriculture can be classified in varied ways. The public's attitude about how externalities involving agriculture should be regulated are likely to be influenced by their nature, as is discussed below. The following types of spillovers involving agriculture can be identified:

(1) **Spillovers from non-agricultural sectors of the economy affecting agriculture**. Agriculture can experience adverse environmental externalities from airborne pollution caused by emissions of particulate matter, metallic dust, acidic vapour and particles as well as water pollution from wastes from factories and mining. For instance, horse breeders from the Scone area in the Hunter Valley of New South Wales, Australia, complain that coal dust from open-cut coal mines causes their naturally alkaline soils to turn acidic. It is claimed that this has adverse consequences for the development of the bones of the thoroughbred horses and makes them less fit for racing.

(2) **Spillovers from agricultural to non-agricultural sectors of the economy**. Agriculture may, for example, create and sustain landscapes favoured by the public, such as heathlands, or in some cases, ones that are disliked by the public, such as weedy areas, for example areas of gorse in New Zealand. Similarly, while some types of agriculture conserve wild species wanted by the public, they also result in the loss of other species desired by the public. Water run-off from agricultural land containing chemicals leached from fertilizers and livestock manure as well as soil particles results in nutrient enrichment of water bodies and this stimulates growth of aquatic algae and weeds and accelerates eutrophication of some water masses. Run-off from agricultural lands (particularly land for growing sugar cane in northern coastal Queensland) is claimed to have an adverse impact on corals in parts of the Great Barrier Reef. Corals do not survive in dirty, nutrient-rich water.

(3) **Spillovers confined to agriculture itself.** Unfavourable ones include dryland salting (if the effect extends beyond a farm where land clearing occurs),

salination of watercourses as a result of land clearing, herbicide or pesticide drift, adverse externalities from water use and possible cross-fertilization of GM (genetically modified) and non-GM crops. Favourable externalities within agriculture can result from pest control by farmers having pests on their property.

To what extent should agriculture have to bear the economic burden of having to take action to moderate or add to its spillovers? Let us consider this matter.

Marginal and total impacts of externalities

As mentioned in the introduction, the marginal effects of externalities and their total effects can be quite complex. These complexities are not adequately accounted for by traditional marginal economic analysis. Some of these complexities can be illustrated by a case in which agricultural production creates landscapes favoured by the public. These provide the basis for some subsidization of agricultural activities in the European Union (Van Huylenbroeck and Durand, 2003; Vanslembrouck and Van Huylenbroeck, 2005).

For simplicity, assume that two methods of producing an agricultural product are available. Method I has no external costs or benefits and involves the least private cost of production. Represent the market demand for this agricultural product by line DD in Figure 1 and let S_1S_1 represent its market supply curve when technique I is adopted. Using this method of production, the market could come into equilibrium at E_1. Suppose that a second method is available but involves higher costs of production. Consequently the supply curve S_2S_2 applies in this. This alternative method generates a favourable externality, for instance by creating favourable landscapes and marginal external value obtained is assumed to be equal to the difference between curve ABCF and line DD. Production using method II generates no marginal externality once its level exceeds X_4.

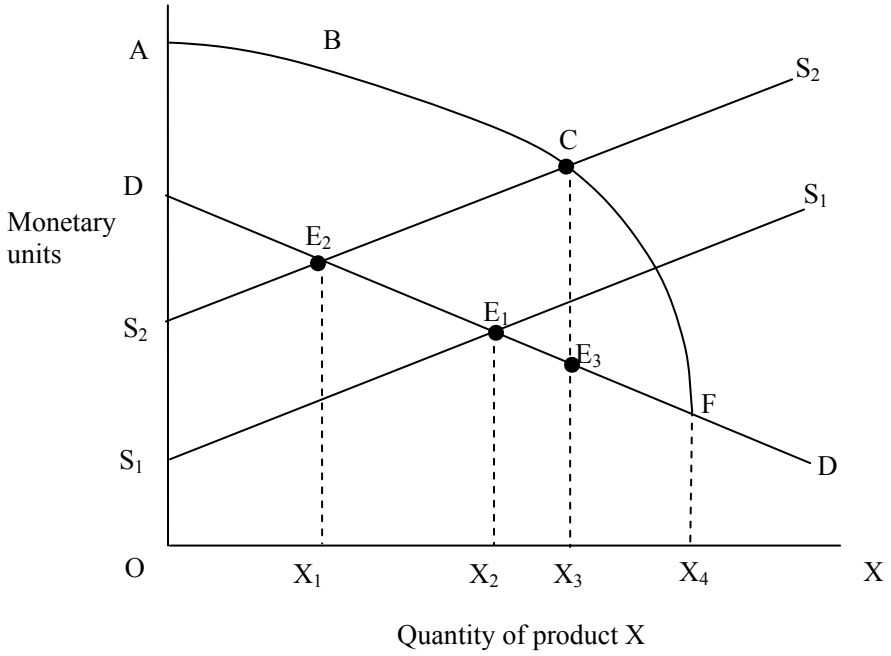

Figure 1: An agricultural externality which favours from an economic welfare point of view a different method of production to that which would be adopted under free market conditions.

Taking into account the favourable externality, economic welfare benefits from agriculture production are maximized when only method II is used and X_3 of the agricultural product is supplied. This could be achieved by only allowing the use of method II and paying a subsidy of CE_3 on each unit of product X supplied. However, the externality could be infra-marginal in some cases.

Such a case is illustrated in Figure 2. As in the previous case, demand for greater quantities of the favoured landscape eventually falls to zero but in this case, satiation with the supply of the landscape occurs before market equilibrium is reached. Satiation with the landscape incidentally supplied as a result of agricultural activity occurs when X_1 of product X is produced using technique II. Otherwise the same assumptions as in the previous case are made. In the absence of intervention, X_3 of product X will be supplied using only technique I. However, because of landscape externalities, it is socially optimal that X_0 of the product be supplied

using technique II with $X_3 - X_0$ being supplied by technique I. At X_0, the marginal value of the externality, BG, is just equal to the difference in the marginal cost of production using the alternative technique.

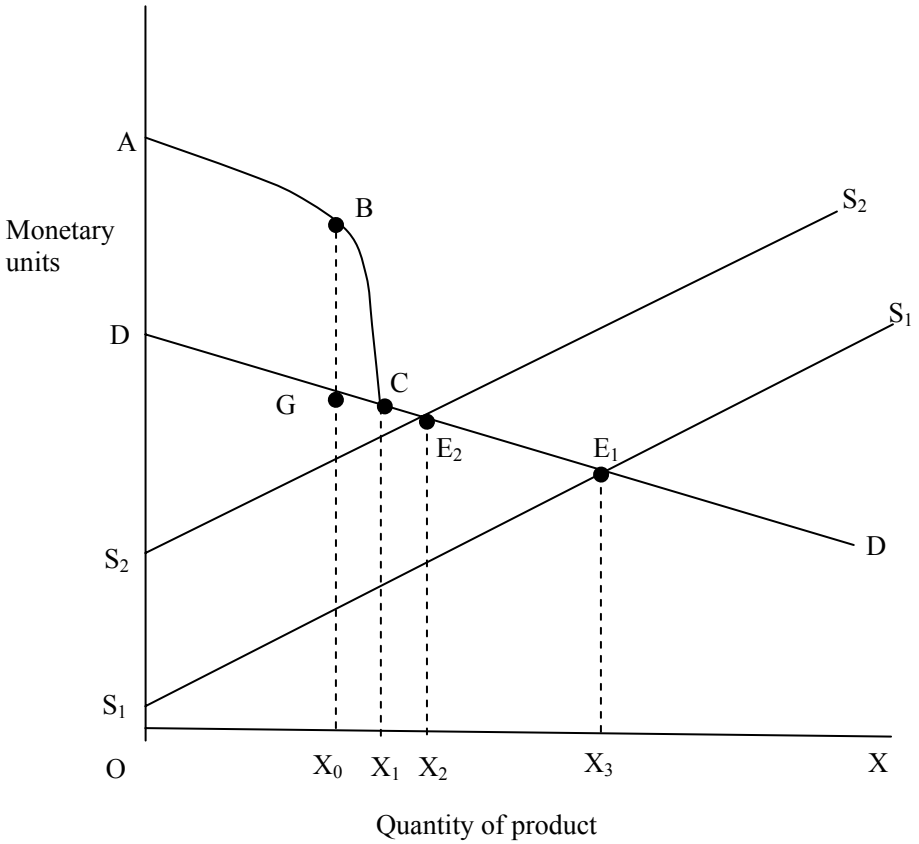

Figure 2: The infra-marginal externality in this case implies that only a part of agricultural production should be obtained by using the technique with the favourable externality.

In this case, economic optimality can be achieved by paying a minimum subsidy on each unit of X produced equal to the excess marginal cost of its production using technique II rather than I up to an aggregate level of production of X_0. No subsidy is paid for production exceeding X_0. The per unit subsidy is lower in this case than in the previous case.

The optimality condition given the situation in Figure 2 can be clarified by reference to Figure 3. There curve KLM represents the marginal value of the

externality when technique II is used. This falls to zero for a level of production of X_1 or more. OH represents the marginal opportunity cost of using technique II rather than I to produce X. It is the difference between S_2S_2 and S_1S_1 in Figure 2, the difference in the per unit production cost between the techniques. The optimal outcome corresponds to point L. At this point, the marginal external value obtained by using technique II just equals the marginal opportunity cost of using it.

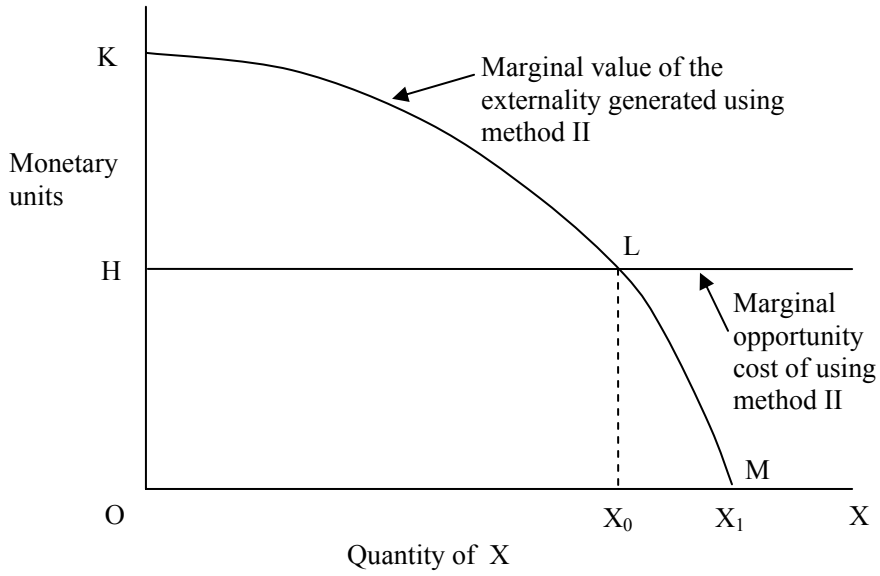

Figure 3: Socially optimal extent of use of technique II in a situation corresponding to that illustrated in Figure 2.

In the situation illustrated in Figure 2, a regulating authority requires more information than in the case shown in Figure 1 to regulate externalities so as to achieve a Paretian optimum. In most cases of this type, a regulatory authority is unlikely to have sufficient information to regulate economic activity optimally. However, it may be able to obtain an idea of when beneficiaries are likely to be satiated by a particular favourable environmental feature. It will never be optimal to proceed beyond the satiation point and if opportunity costs are involved, it will usually be socially optimal to supply less of the environmental amenity than results in satiation with it.

Adverse selection as an unfavourable externality

Adverse selection involves asymmetric information about a product and occurs when buyers are unable to easily ascertain the quality of a product by inspection, even though it is known to suppliers. The problem then arises when products of inferior quality cost less to produce than those of superior quality, that the inferior ones my be traded as being of top or acceptable quality. This can cause the whole market for the products to collapse or result in only the inferior products being traded. (Akerloff, 1970; Varian, 1987, pp. 630-635). This happens even though buyers have an effective demand for the superior products.

The conditions under which agricultural products are produced are often difficult to determine by inspecting the final product. It is often not clear from inspection whether food products are produced under hygienic conditions, are organic produce or not, or are derived from free-range animals or not. Furthermore, it is usually not clear from inspection whether agriculturally based products are derived from GMOs or not, whether their production involved a lack of consideration of animal welfare, whether production techniques were used that pose a potential health risk to humans, (for example, mad cow disease), or whether they actually come from regions or areas from where they are claimed to come.

Governments can help to overcome some of these problems by requiring correct labelling of such products and imposing penalties for non-compliance and by ensuring that minimum hygiene conditions are complied with. Standards may also be attested to by trusted organizations.

Adverse selection can result in lack of sustainability of agricultural production of superior products, can reduce regional production of specialities and in some cases could lead to the complete collapse of individual agricultural markets. Elimination of adverse selection benefits both buyers as well as sellers of superior or sought after products.

Environmental externalities and sustainability

Lack of sustainability of agricultural production and of incomes often, but not always, arises form adverse environmental externalities affecting agriculture. Examples include depletion of shared water bodies such as aquifers, as a result of open-access or poorly regulated access to the water, spillovers from salting such as reduced water quality, or environmental pollution caused by other industries that adversely impact on agricultural production. It is also possible that loss of genetic diversity could eventually have adverse consequences for agricultural production.

However, lack of sustainability of the productivity of agriculture cannot always be attributed to environmental externalities. Taking into account the discount rates which landholders apply, it may pay them to mine their land. The higher their discount rate, the more likely landholders are to do this. A higher discount rate results in stronger preferences for farm income now rather than in the future. Rising relative returns from investing off-farm rather than on-farm and easier access to off-farm investment opportunities can also have a similar effect. In both cases lack of agricultural sustainability is a consequence of private decisions by farmers rather than a consequence of externalities.

3. Equity, Efficiency and Agricultural Externalities

The presence of externalities is often believed to provide a case for public intervention in an economy in order to bring about a Paretian improvement, particularly if the transaction costs involved in intervention are low or zero. Nevertheless, externalities can be Paretian irrelevant and infra-marginal in which case there are no economic efficiency grounds for intervention.

Whether there are equity grounds for public intervention in this case is less clear. If infra-marginal externality is favourable should those who benefit from it have to pay those who generate it? The case for this seems to be weak because those who engage in the activity already gain from it and it is coincidental that the external beneficiaries also gain. Compared to its absence, there is a Paretian improvement as

a result of the activity. But what if an adverse externality is involved? Those creating the adverse externality gain but those that suffer from it lose compared to the original situation. Even though the adverse externality is Paretian irrelevant, there could be a case in such circumstances to compensate the victims on distributional grounds.

The above indicates that the case for transferring income to agriculturalists on the basis that they create favourable externalities is sometimes weak on economic grounds. The externalities may be infra-marginal and Paretian irrelevant. However, compensation to farmers seems justifiable when it is intended that they should alter their activities at a cost to them in order to change the nature or extent of the favourable externalities they generate so as to bring added external benefits to others. The minimum necessary compensation in such cases would be the extra cost the agriculturalists incur. To the extent that farm income supports under the Common Agricultural Policy (CAP) focus on this aspect, they could be regarded as being equitable and as promoting economic efficiency. In practice, however, it is debatable whether environmental policies can be so finely tuned. It may be that some agricultural subsidies are being paid for the generation of Paretian irrelevant externalities or that a greater amount is being paid than the costs of generating additions to favourable externalities.

The presence of infra-marginal and extra-marginal externalities complicates the formulation of environmental policies. A neat simple solution to the presence of externalities of the type suggested by the Coase theorem (Coase, 1960) hardly seems to be attainable. A serious shortcoming of this theorem is that it ignores equity issues and only concentrates on economic efficiency. The theorem asserts that in the absence of transaction costs, a Paretian optimum can be achieved if either polluters have the right to pollute or if others have the right to a pollution-free environment. However, the distribution of income is entirely different depending on whether those generating the adverse externality are given the right or those affected by it. A choice between the alternatives must be made on the grounds of

justice. It is less well known that Coase's efficient solution to the externality problem is sensitive to the distribution of rights.

Research by behavioural economists finds that the willingness of individuals to pay for an environmental good is generally less than their willingness to accept compensation for its loss. This has been described as the endowment or status quo effect (Kahneman et al., 1991, Knetsch, 1987, 1990). This effect results in a different bargained outcome given Coases's approach depending upon whether those creating an adverse externality have the right to create it or whether those adversely affected by it have the right to disallow it. Hence, the efficient economic solution is sensitive to the distribution of rights. This can be illustrated by a simple example.

Suppose an area of land is in a relatively natural state that is privately owned and suitable for agriculture. The owners are basically agriculturalists and would like to transform the land so its agricultural productivity can be raised. They need to clear the land of trees (of forest) but this creates adverse externality for others whom we shall call conservationists.

If agriculturalists do not have the right to clear the land of trees, their marginal willingness to pay conservationists to allow this might be as indicated by line ABC in Figure 4. On the other hand, if agriculturalists have the right to land clearing, their marginal willingness to accept compensation to forgo land clearing might be as indicated by line DEF. Similarly, the marginal willingness to pay curve (to avoid deforestation) for conservationists might be as indicated by line GEH and their marginal willingness to permit deforestation might be as shown by line JBK. It follows if landowners (agriculturalists) have the right to clear their land, that E is the Coasian bargained solution. If on the other hand, conservationists have the right to tree-cover of the land, B is the Coasian bargained solution. In the former case, a larger percentage of the land is cleared, x_2, than in the latter case which involves x_1 of the land being cleared. The efficient economic result is therefore sensitive to the distribution of rights.

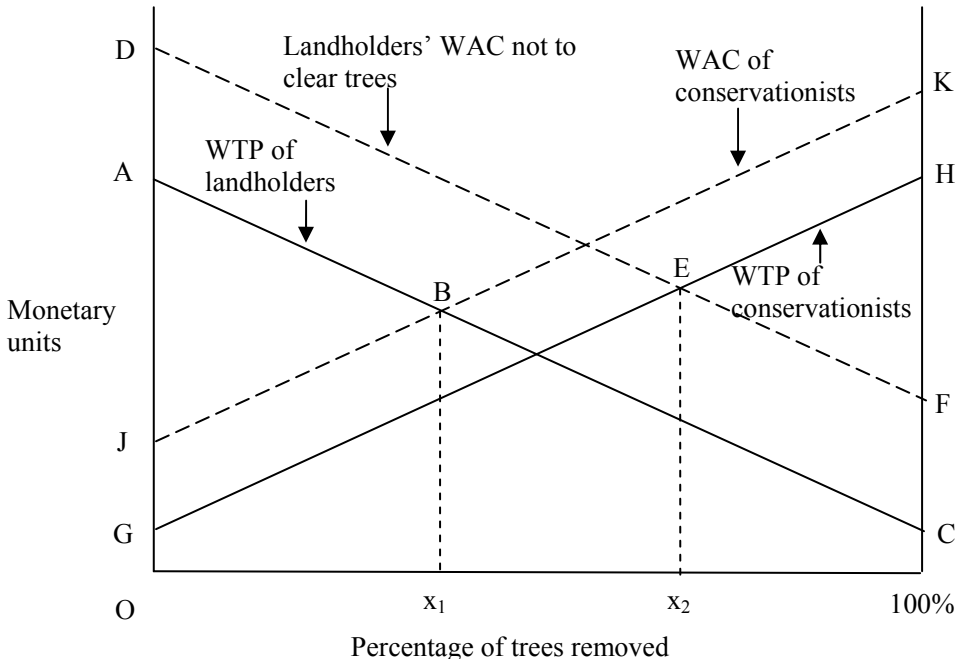

Figure 4: The Coasian solution is sensitive to the distribution of environmental rights.

The reasons why the endowment or status quo effect exists and can be quite large has not yet been fully explained in the available economic literature. It may, however, be reinforced by the income effect.

In reality, the presence of transaction costs can be expected to hinder or block the realization of an efficient Coasian bargained outcome to the control of environmental externalities. In some cases, transaction costs will be least if the government intervenes to address the externality problem directly. Direct government intervention to regulate environmental externalities is sometimes the most economical policy option.

4. Transaction Costs Involved in Public Regulation of Externalities

While public regulation of externalities can bring Paretian gains, this is by no means assured. Agency costs (transaction costs) are involved in the public regulation of externalities. This can be so high as to prevent a Paretian gain which would

otherwise occur. Information deficiencies on the part of regulators are also a problem and improved knowledge can only be obtained at a cost which in some cases, can prove to be excessive.

Furthermore, principal-agent problems can arise if public servants look mainly towards their own self interest. They may try to maximize their income and that of their agency from their regulatory activities. They may fail to regulate environmental spillovers in a least cost manner and could absorb all the revenue obtained from environmental charges (or more if funded from general public revenue) in their administrative expenditure.

The problem can be illustrated by the Figure 5. For simplicity, suppose the point emission of a water pollutant that adversely affects agriculturalists and other water users. Suppose that the marginal externality costs imposed by the emission of the pollutant are as indicated by line OBD in Figure 5 and that line ABC represents the marginal benefit to polluters of being able to pollute. In the absence of regulation, polluters will emit x_2 of the water-borne pollutant per cent of time. This results in a social economic deadweight loss equivalent to the area of triangle BCD. A potential Paretian improvement is possible by reducing the level of these emissions from x_2 to x_1.

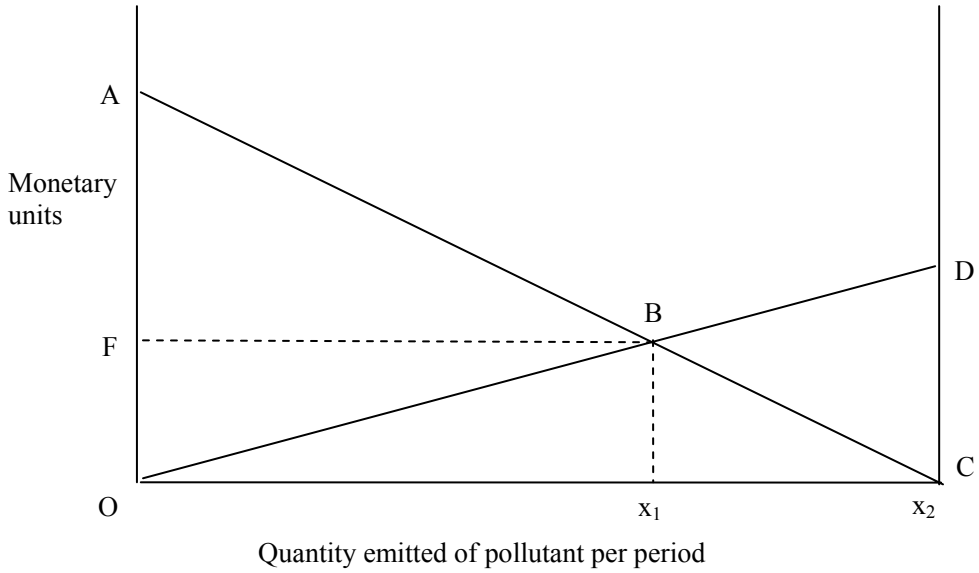

Figure 5: Illustration that the cost of public regulation of externalities can annul the social economic benefits from such regulation.

This could be achieved by the government imposing a charge of OF on each unit of the pollutant emitted. This would yield the equivalent of the area OFBG in public revenue. However, if public servants spend this much to administer the scheme, there will be a net social economic loss. Such a loss will occur if the cost of administering the scheme exceeds the area of triangle BCD. Furthermore, the equity question would remain of whether the victims of the water pollution should be fully compensated for their losses. In this case, even if emissions are reduced to x_2, victims of the pollution still suffer an economic loss equivalent to the area of triangle OBG and so the reduction in emissions from x_2 to x_1 does not fully satisfy them.

5. The Political Acceptability of Economic Policies

Economic policies cannot, usually be implemented unless they are politically acceptable. This means that the policies likely to yield to greatest economic benefits cannot always be implemented. What factors influence the political acceptability of policies?

Social values and ethics play a role. These change or evolve with the passage of time and are subject to influence by propaganda and other means. Secondly, institutional constraints may also impact on what is politically acceptable. Given these constraints, constituents will be limited in the ways in which they can object to political decisions and the costs that they must incur to try to change these decisions will also be affected. Such costs can result in passive acceptance of political decisions that may be unpopular. Therefore, those policies that are politically acceptable will vary with the historical background and institutional structures of nations.

While economists are often only concerned about the ultimate economic consequences of policies, political approaches tend to put much more emphasis on the procedures used for social decision-making. Some of these politically acceptable procedures can actually add to economic costs but constituents seem to be prepared to on occasions accept these in return for greater political or social involvement.

The type of conflict that can arise between preferences for political procedures and social economic benefits can be illustrated by Figure 6. There on the X-axis a set of political procedures are in theory valued from the least acceptable which are closest to its origin to the more acceptable which are further from the origin. For simplicity, these procedures are assumed to be continuous but need not be. The Y-axis indicates the social economic benefits from these alternative political procedure only one of which may be chosen. These social economic benefits may for example be for alternative possible policies relating to the regulation of environmental externalities in agriculture. Curve ABC represents the frontier of possibilities, and W_1W_1 and W_2W_2 are social indifference curves of the Bergson type.

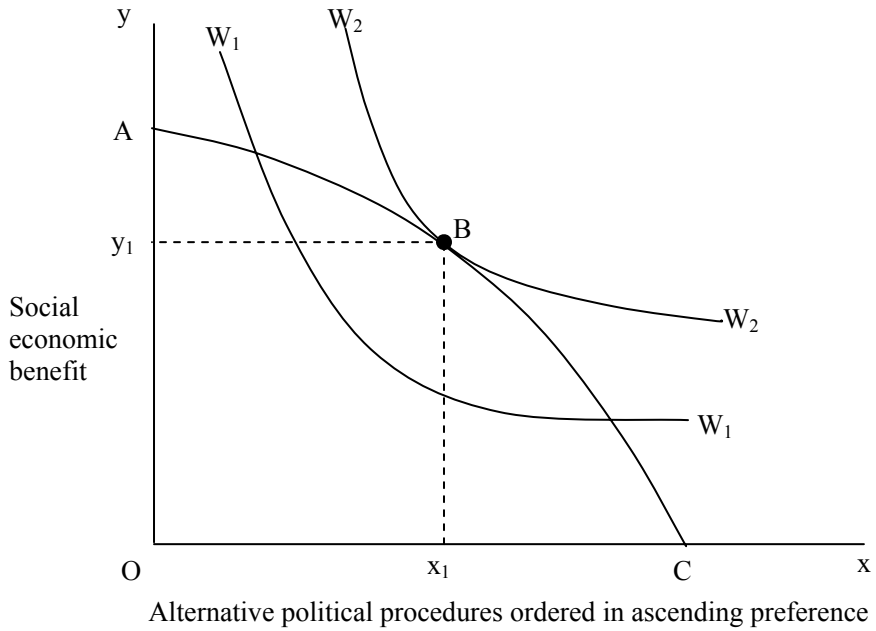

Figure 6: Diagram illustrating conflict between political acceptability of alternative political procedures and their social economic benefit.

Given the possibilities illustrated in Figure 6, the combination corresponding to point B is socially ideal. However, it does not result in the best 'attainable' economic outcome nor does it correspond to the most desired political procedure. Note that the ideal solution is Figure 6 corresponding to point B can change if the social indifference curves vary or if the ordering of possible political procedures a alters, other things being constant.

Although the presentation in Figure 6 is more illustrative than definitive, it helps to support the view expressed by Hagedorn (1993) that agricultural economists should take account of the political acceptability of economic policies when they propose these. At the same time, it can be important (from a social point of view) for economists to point out economic benefits forgone by adopting politically acceptable procedures and policies that yield inferior economic results.

6. Property Rights in Agricultural Genetic Material and Externalities

It is often difficult to retain property rights in agricultural genetic material, and in the past, genetic material was frequently taken from those originally possessing it without any payment being made for its use. This is still possible today but this possibility has now become more limited due to laws granting intellectual property rights to those who develop new plant varieties and patents or similar protection for those who create new genetically modified organisms. The introduction of new organisms usually results in incompletely or unknown environmental risks. The more demanding is the screening required to determine these risks, the less profitable is it likely to be for enterprises to engage in such development. Furthermore, the greater are the environmental restrictions on the use of new organisms by the customers of their developers, the lower is the demand for these and the less incentive there is to develop them. For example, the more restrictions there are on the use of GM soya beans resistant to the herbicide glyphosate, the lower is the profitability of this innovation for Monsanto. Thus to some extent, a company such as Monsanto, will profit from fewer environmental restrictions on the use of its GM seed. On the other hand, very loose regulations could result in serious environmental problems and in turn, this could generate a political backlash for developers of GM seed. The appropriate level of environmental risk to take with new GMOs is uncertain.

Nevertheless, public regulations ostensibly intended to protect the public against environmental risk often protect the party or parties that are the source of this risk. This is sometimes true of regulations that prescribe particular tests be carried out by those proposing to market a product for say use in agriculture. Provided the tests are conducted and show no problem, the seller may be free of further legal liability if a subsequent environmental problem emerges. The legal liability of the seller may be even curtailed further if a public body exists which authorises the use of the product (Tisdell,1993, Ch.5).

While intellectual property rights in new plant varieties and genetically modified organism could be justified on the basis that they provide economic incentives and rewards for research and innovation, the argument for property rights in existing natural genetic material appears to be more tenuous. Such rights might only be defensible on income distributional grounds or if the payment would result in conservation of the genetic material which otherwise would not occur. If the conservation of the material would have occurred in any case, payment for it would not be compensation for supplying a service. Apart from the huge transaction costs that would be involved in paying others for the use of all natural genetic agricultural material this might have little effect on the conservation of natural genetic material utilized in agriculture. Therefore, it is surprising that the Convention on Biological Diversity puts so much store on property rights in genetic material as a way of conserving biodiversity; a result that is widely believed to be environmentally desirable and to be favourable to sustaining economic development.

7. Concluding Comments

Externalities (of an environmental type and otherwise, such as those associated with adverse selection) are an important consideration in agro-environmental policy. They may result in lack of sustainability of agricultural production but are not the only factors that may do this. When agricultural externalities are infra-marginal or extra-marginal (and could be Paretian relevant, but not necessarily so) this increases the complexity of decision-making (compared to the neoclassical case in which only marginal externalities are taken into account) about whether government intervention can result in a Paretian improvement. For example, a greater amount of information is usually needed to analyze such cases and the question of whether public payments should be made to agriculturalists who generate favourable externalities and the appropriate pattern of transfers becomes complex. In some cases, there will be no economic efficiency grounds (in Pareto's sense) for such transfers, and if they are made, the justification would have to be on distributional grounds. Politically, of course, it may be propitious to claim efficiency reasons as the basis for these income transfers. It is possible that some subsidies paid to

agriculturalists under the EU's Common Agricultural Policy on the basis that farmers are creating favourable externalities are not entirely based on efficiency tests, that is that farmers are creating a mixed product which reduces economic scarcity and which would otherwise not be supplied or not be supplied to an optimal extent in the absence of the subsidy (Tisdell and Hartley, 2008, Ch.4).

Large public bureaucracies in modern nations and in bodies such as the EU may pose a particular problem when it comes to the regulation of externalities. First, they may be eager to increase their size and influence and they have some backing from economic theory that their intervention can promote economic efficiency. However, the qualifications made in economic analysis about whether public intervention will be effective in bringing about a Paretian improvement or a potential one may be overlooked.

Coase (1960) claimed that simple institutional arrangements in which the environmental rights of individuals or entities are clearly specified can be used as an effective way to manage externalities. In such cases, negotiation between the affected parties is seen as a means to provide an ideal solution to the problem. Little or no involvement by the government or public administration is envisaged in such cases. The role of public bodies is limited to defining rights and providing legal remedies for the enforcement of agreements. However, Coase's model is too simplistic. For example, it ignores the importance of transaction costs [this is surprising given that Coase (1937) is regarded as the founding father of transaction costs economics], does not take account of the endowment effect, and concentrates on the issue of economic efficiency ignoring questions of justice. When such factors are taken into account, the Coasian policy proposal may not be effective. In some cases, interventionist solutions are more efficient.

Political acceptability plays an important role in determining what agricultural policies can be implemented. In any jurisdiction, political acceptability depends on its existing institutions and its historical background. While economic policy-making needs to be related to what is politically acceptable, it can be argued that

agricultural economists should not be guided only by political acceptability in their policy formulation. They also have a responsibility to point out economic benefits that may be forgone when politically less popular policies are rejected. Otherwise, economists would merely become the passive supporters of politicians.

The granting of property rights to entities developing new genetic material, such as new plant varieties and genetically modified organisms, has become of growing importance in recent decades. In agriculture, a major concern has been that this new genetic material might give rise to unknown or unanticipated negative externalities. There is considerable debate about how one can best balance the potential economic benefits from such genetic developments against the environmental risks and uncertainties they entail and about the institutional structures that might be best to address these problems. Different countries have developed different structures presumably influenced by their varying political backgrounds and evolutionary aspects of governance. Although an economic case exists for granting property rights to entities that develop new genetic agricultural material, there is a need to be more cautious about granting such rights in all extant natural genetic material to the region where that material has originated from. The economic argument for such property rights appears to be weak except in cases where these rights would result in the conservation of wanted genetic material that otherwise would not be conserved. The Convention on Biological Diversity assumes that by granting of such property rights in genetic materials originating locally to indigenous people, traditional farmers and similar entities, this will be effective for ensuring biodiversity conservation (thereby supporting sustainable development) and will also result in an equitable outcome. However, the transaction costs involved in implementing such a policy would be huge and could more than outweigh any economic benefit. While there could be some circumstances in which this property rights policy gives the desired results, success may be restricted to special cases.

No single institutional arrangement such as the widened extension of private property rights is likely to be effective in addressing all economic externality and sustainability problems. A variety of institutional arrangements seem to be needed.

These will vary with the nature of the economic problem (such as with the exclusion costs, information costs involved) and with the political acceptability of the proposed measures. Furthermore, we know that public intervention is also subject to a variety of shortcomings as a means for dealing with externalities and lack of sustainability. Thus a critical attitude is required in assessing all alternative institutional arrangements. The most one can hope for is to choose the best one or ones from the set of attainable alternative institutional arrangements, none of which is likely to be perfect. The best attainable institutional arrangements are likely to vary from society to society and alter with the passage of time. The latter may occur because social values change, political systems evolve and transaction costs may decline with advances in technology. There are multiple factors and perspectives to be taken into account. Furthermore, not only do we not live in the best of all possible worlds unlike that imagined by Voltaire's Pangloss (Voltaire, 1947), but in all probability, we never will. Nevertheless, by relying on rationalism we can avoid some of the less attractive policy prescriptions. Thus, rationalism should still play an important role in determining agricultural policy. At the same time, we must not expect rationalism to identify policies that will create a social Utopia because such a possibility is unachievable, in my view.

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