



Multifunctionality

THE POLICY IMPLICATIONS



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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Foreword

This report provides policy makers with guidelines for the development of optimal policy strategies and draws some general policy implications concerning the multifunctional character of agriculture. It builds on analytical work published in early 2001 (*Multifunctionality: Towards an Analytical Framework*) and on a Workshop (*Multifunctionality: Applying the analytical framework*) held at the OECD in July of 2001.

The main author of this report is Mikitaro Shobayashi of the Directorate for Food, Agriculture and Fisheries. The report was declassified by the Working Party on Agricultural Policies and Markets of the Committee for Agriculture in April 2003.

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MULTIFUNCTIONALITY: THE POLICY IMPLICATIONS

I. Introduction

The policy context

Over a long period, OECD work on agricultural policy has sought ways in which a wide array of objectives could be pursued efficiently and effectively, with minimum economic distortion domestically and internationally. This guiding principle was affirmed most recently when agricultural Ministers of OECD countries, meeting in March of 1998, elaborated their vision of the agriculture and agro-food sectors in their countries in the form of a detailed set of shared goals.

These shared goals confirm that the common objectives are for the sector:

- to be responsive to market signals,
- to be efficient, sustainable, viable and innovative so as to provide opportunities to improve standards of living for producers,
- to be further integrated into the multilateral trading system,
- to provide consumers with access to adequate and reliable supplies of food which meets their concerns, in particular with regard to safety and quality,
- to contribute to the sustainable management of natural resources and the quality of the environment,
- to contribute to the socio-economic development of rural areas including the generation of employment opportunities through its multifunctional characteristics, the policies for which must be transparent, and
- to contribute to food security at the national and global levels.

In addition, Ministers affirmed that agro-food policies should strengthen the intrinsic complementarities between the shared goals and ensure that the growing concerns regarding food safety, food security, environmental protection and the viability of rural areas are met in ways that maximise

benefits, are most cost-efficient, and avoid distortion of production and trade.

It is this pursuit of complementarities among the shared goals that has inspired much of the analysis of agricultural and agricultural trade policies that has been undertaken in the intervening period and the work on multifunctionality in particular. OECD countries have explicitly committed to further progressive reductions in domestic agricultural support and border protection, and a shift away from policy measures that encourage higher levels of food production and input use, towards measures that are less distorting of markets and trade. At the same time, there is a growing awareness of the positive and negative effects of agriculture beyond commodity production among rural and urban citizens, and governments are increasingly looking for ways to ensure that the non-commodity outputs of agriculture correspond in quantity, composition and quality to those demanded by society.

However, some OECD countries are concerned that reductions in production-linked support and trade liberalisation may, through a decline in food production, reduce some of the non-commodity outputs of agriculture that are jointly produced with food and for which no markets exist, below the levels desired by society. Conversely, there are fears on the part of the trading partners that those countries might try to safeguard their non-commodity outputs through the continued protection of their domestic food markets, or even expand these outputs through measures that lead to increased food production.

This policy context is critical to the explanation of many of the analytical choices that were made in our examination of the concept of multifunctionality. There are three distinct but connected issues. The first relates to the production relationships underlying the multiple outputs of agriculture and their externality and public good aspects. This work led to the development of an analytical framework appropriate for classifying the economic relationships associated with multifunctionality, which was agreed by all the OECD countries and subsequently published (*Multifunctionality: Towards an Analytical Framework*, OECD, 2001a). The second element relates to measurement issues. A Workshop, devoted to the issue of demand measurement was held under the auspices of the USDA, the Environment Directorate, the Territorial Development Service and the Directorate for Agriculture, Food and Fisheries of the OECD in June 2000 (*Valuing rural amenities*, OECD, 2000a). A further Workshop held at OECD in July 2001 assembled available data and research findings with a view to testing the applicability of the analytical framework and to identify areas in which further research or data collection would be helpful.¹ The present report,

drawing on the work that has been done to date, addresses the third element of the work on multifunctionality, *i.e.* the policy implications.

There are strong complementarities between the work on multifunctionality and other work carried out in the Agriculture Directorate (on sustainable agriculture, agri-environmental policy, agri-environmental indicators, structural adjustment, farm household income, income risk management, the Policy Evaluation Matrix, decoupling and trade) and in other parts of the Organisation, notably the Territorial Development Service (work on rural amenities and on rural indicators) and the Environment Directorate (work on biodiversity). There are also links with the OECD horizontal activity on sustainable development. The work on multifunctionality builds on these efforts, while trying to address the commodity and other impacts of agriculture within a unifying framework that reflects the way in which they are generated and in which they impact on producers, consumers and taxpayers.

From analytical framework to policy design

This section recalls some of the basic concepts and terminology and summarises the main elements of the analytical framework. An understanding of this material is prerequisite to the development of the policy implications contained in this report.

The analytical framework (OECD, 2001a) provides the overall basis for the policy discussion which is the subject of this report. It consists of three different elements, jointness, market failure and public goods.

Jointness: We first need to examine the degree to which a non-commodity output may be jointly produced with a commodity and if so, whether it can be released from this jointness. If production is non-joint, the non-commodity outputs can be supplied independently. Similarly, if production of a non-commodity output can be separated from the production of a commodity output without any cost, the non-commodity output can be supplied independently. In these cases, there may be no policy link between the goal of agricultural trade liberalisation and the goal of pursuing domestic non-commodity concerns.

There are many ways to relax or weaken the linkages between commodity and non-commodity outputs. Changes in farming technologies and practices, for example, can reduce the degree to which environmental outputs are linked with commodity production. There are also various possibilities for lower cost non-agricultural provision of non-commodity outputs.

Box 1. Concepts and terminology

Is multifunctionality specific to agriculture?

Multifunctionality is not specific or exclusive to agriculture but there are specific issues that relate to the sector. One important characteristic is the land-using nature of the activity. Others are its biological characteristics, and the fact that there are multiple intended and unintended “other outputs” from the primary production activity. Perhaps, most important is the existence of high levels of support and protection which, in some countries, is increasingly attributed to the need to preserve these “other outputs.”

How to describe the multiple outputs?

In addition to commodities, agriculture produces a range of positive and negative effects. The term non-commodity output (NCO) is used throughout this report to encompass the full range of positive effects that are listed as pertaining to the multifunctionality of agriculture and includes those that are weakly (or not at all) jointly produced, positive externalities of agriculture and positive externalities of agriculture that have been internalised. The negative effects are referred to as negative externalities. Underlying the use of this terminology is the recognition that no treatment of multifunctionality is complete unless both negative externalities and non-commodity-outputs are dealt with.

What is covered by the multifunctionality of agriculture

There is no need to establish a listing of the multiple “non-commodity-outputs” or negative externalities of agriculture, although examples are often used in this text and in the analytical framework to illustrate the points being made. What is important is that the different steps in the analytical framework are followed with a view to determining whether a policy intervention is required and, if so, what the nature of that intervention should be. There is therefore no need to establish *ex ante*, which effects are properly described as negative externalities and which are non-commodity outputs. Instead, all possible effects of agriculture need to be examined with the analytical framework described below.

Market failure. There may also be non-commodity outputs that cannot be released from jointness with commodity production. Non-commodity outputs that are jointly produced with commodities are by definition externalities but they do not always cause market failures. In this case, it is necessary to examine whether the non-commodity outputs in question are causing market failures. If not, there is no policy issue, either from a trade or domestic policy perspective.

In fact, some examples of situations where positive externalities do not cause market failures have been identified. For example, supply of a non-commodity output from farmers whose production cost is lower than the market price may be sufficient to meet demand. In this case, there is no inefficiency even though the benefit of the externality has not been internalised in producers' decision making. Taking negative externalities into account reduces the possibility of market failure because a decrease in supply of a positive externality may be offset by a decrease in the negative externality (see page 19 for a detailed discussion of market failure). Possible consumption relationships between externalities might also affect the outcome. The existence of some negative externalities may actually reduce the demand for positive externalities, thus reducing the risk of market failure.

Public good characteristics. There may still be non-commodity outputs for which both some degree of jointness and market failure have been established. In this situation it is necessary to determine if there are non-governmental options to minimise market failures. When market failures associated with externalities arise, measures are required to provide incentives to incorporate social effects into production decisions. The analysis to date suggests that there are various options for providing these incentives, depending on the public good characteristics of the externalities. For some types of public goods, non-governmental options may be the appropriate strategy. Applying the proposed analytical framework enables identification of potential policy issues that could conflict with the goal of trade liberalisation. In summary, the questions to be addressed are:

- Is there a strong degree of jointness between commodity and non-commodity outputs?
- If so, is there some market failure associated with the non-commodity outputs?
- If so, have non-governmental options (such as market creation or voluntary provision²) been explored as the most efficient strategy?

Finally, and only if the answer to all these questions is 'yes', then the most efficient interventions will be defined by the nature of the jointness that exists on the supply side and by the different public good characteristics of the non-commodity outputs on the demand side. Various options, including central government provision, local government provision, provision through taking advantage of consumption relationships, club provision, and community provision should be carefully examined. Transaction costs, including administrative costs associated with various options should also be taken into account. Some of these options might eventually require a very limited role for the government. Stability concerns,

equity concerns and international spillover effects may also affect policy choices.

Since its completion various attempts have been made (*e.g.* the empirical work and the workshop on multifunctionality) to assess the availability and quality of the data needed to apply the analytical framework. These attempts to apply the framework empirically have shown that much of the information needed is not, or is only partly, available. This relates to the difficulty inherent in answering the questions derived from the analytical framework, but also to the fact that, since the framework is new, often no attempt has yet been made to answer the questions. From this experience came the conclusion that practical guidelines were needed to help policy-makers to define and obtain the kind of data required.

Drawing on the lessons learnt from the empirical work and the workshops, the objective of this report is to demonstrate how optimal strategies to achieve a range of policy objectives can be identified, not to provide specific, prescriptive solutions for application in given situations. This is because the information and data required to develop optimal policy strategies are unique or specific to conditions in a country or region.

This report first proposes practical guidelines for policy makers concerning how to answer the questions concerning jointness, market failure and public goods. Then, optimal policy options are proposed for a plausible range of situations that could arise in practice. It is recognised that it will not always be possible to acquire all the information needed. Alternative strategies are proposed for these circumstances. Finally, policy makers are asked to examine whether the most efficient strategies are consistent with other concerns such as equity, stability and international spill-over effects. The structure of the report follows this logic.

The following factors have emerged as critical in the determination of optimal policies, and therefore as the areas in which policy-makers should especially concentrate when assembling the data and information needed to apply the analytical framework:

- Choosing the appropriate unit of enquiry is fundamental in the examination of jointness, market failure and public good characteristics, because most parameters will be site or region specific
- Negative externalities and non-commodity outputs need to be taken into account simultaneously
- In examining jointness, identifying the source of jointness is the most important factor in determining who is the most efficient supplier of NCOs. The notion of economies of scope is proposed to translate the degree of jointness into a policy-oriented tool. Examining whether the linkage is

directly with production intensity or not is critical to judging the appropriate policy intervention and particularly the extent to which targeted and decoupled policies are optimal.

- The geographical distribution of NCOs determines the correct geographical application of policy measures.
- Demand measurement although difficult, should be attempted because it is key in determining whether there is a welfare loss or a gain following a policy change involving a commodity price decrease. How to incorporate issues related to possible irreversibility is also a challenge.
- Identifying public good characteristics (*e.g* pure versus local) is important in the policy context particularly because it may determine who should finance the provision of NCOs.
- Transaction costs need to be taken into account when comparing policy options if differences between them (*i.e.* in transactions costs) are likely to be large.

Although this report consists mainly of "guidelines" or "templates" to assist policy makers in determining optimal strategies, some policy implications are also presented. These policy implications are derived from the analytical framework and the empirical work. They are presented in the final sections of the report with the intention again of serving as general guidance not prescriptive solutions.

II. Structure and underlying principle

(1) Operationalising the analytical framework — guiding policy makers towards optimal strategies. This report first proposes a set of questions or guidelines designed to operationalise the concepts inherent in the analytical framework. Specifically, it proposes concrete ways in which policy makers can go about getting the information they need concerning jointness (economies of scope), market failure and public goods. These are key elements needed to define the best strategies. The degree of jointness determines who can provide non-commodity outputs (NCOs) most efficiently. The existence or non-existence of market failure determines whether intervention is required to support efficient provision of NCOs. Finally the nature and degree to which NCOs exhibit public good characteristics are important in determining who should implement and finance policy interventions.

It is critically important that negative externalities arising from agricultural production be incorporated when implementing the above process. Failure to do so will lead policy makers to sub-optimal solutions.

It is recognised from the outset that some difficulty is likely to be encountered in assembling the information needed to answer the questions that are proposed. Consequently an important principle that needs to be established is that market mechanisms such as auctioning/bidding systems should be used wherever feasible to elicit the information that is needed. For example, the existence or otherwise of economies of scope could be revealed in this way if non-agricultural ways of providing a non-commodity output exist. More specifically, a bidding system could be designed that is open to both farmers and (potential) non-agricultural providers of the non-commodity output (see Box 5 for a more detailed discussion of this point).

It should also be noted, however, that market mechanisms may not work well in the presence of distortions caused by agricultural support. In this instance farmers' bidding prices could be lower than without support. In this case, policy makers need information on the true underlying jointness. The emphasis in subsequent sections on techniques that are designed to assist policy-makers to elicit the required information reflects the pervasiveness of support and protection measures that obscure the true values of many of the parameters being examined.

(2) Benchmark policy options from an efficiency perspective. Based on the information that has been gathered this section goes on to recommend the most economically efficient³ strategies. More specifically, the report presents a policy table showing the best strategies reflecting the different degrees of jointness, market failure and public good characteristics. The report then deals with transaction costs proposing some basic guidelines on how to determine whether or not they are likely to affect policy choices.

(3) Policy implications of missing information. Up to this point, the discussion has been based on the assumption that the required information can be obtained and that, as a result, policy makers are in a position to make optimal decisions. However, this assumption may not always be true, particularly with respect to demand measurement and predicting the affects of policy change on NCO provision. Therefore, strategies to deal with incomplete information are also proposed.

(4) Equity, stability and international spill-over effects. Going beyond the purely efficiency concerns discussed so far, the report then also deals with the complexities introduced into the decision making process when issues related to equity, stability and international spillovers are also taken into account. Finally, the major conclusions drawn from the work to date are summarised and preliminary implications concerning appropriate policies are drawn.

III. Operationalising the analytical framework

Three issues: jointness, market failure and public goods

The approach taken is to define, for each issue (jointness, market failure, public goods), a set of sub-questions and/or guidelines. These questions are specific to each NCO, reflecting the particular characteristics of each one. If there is only one NCO involved, the answers obtained by this approach should guide policy makers to the most efficient strategy.

However, if there are multiple NCOs and negative externalities, they must be considered simultaneously. This applies to both jointness and market failure. For example, the existence or otherwise of economies of scope can only be judged if the costs of de-linking all multiple NCOs have been taken into account. Similarly, the occurrence of market failure or not can be judged only if all NCOs and negative externalities as well as inter-linkages among them are taken into account.

**Box 2. General implications of standard cost benefit analysis
for investment projects**

Although methodologies used for cost benefit analysis of investment projects differ between countries and sectors, one of the most common features is that there is difficulty in obtaining information. Yet investment projects, even in developing countries where information is particularly difficult to acquire, are rarely implemented without cost benefit analysis. In many cases, proxy indicators are developed in place of the missing data.

Although some strong assumptions might need to be made and the resulting precision of the data can be challenged, the most important message is that the exercise is essential in order for a sensible policy decision to be made. Notwithstanding, some fundamental uncertainties (*e.g.* demand measurement of public goods, complicated linkages between NCOs and production) the same conclusion can be drawn concerning the application of the analytical framework to determine policy choice in the context of multifunctionality. Indeed, in so far as has been possible, the sub-questions proposed in this report require a similar level of practicality as the methodologies used for investment projects. Considering that, in many countries, government support to agriculture involves much greater costs than any single investment project, there is no valid reason to omit the “evaluation of policy options” exercise which is at the heart of the analytical framework.

Gathering the information necessary to apply the analytical framework requires substantial resources and may not always lead to clear-cut solutions. Nevertheless, this process should not be neglected. Generally,

investment projects require cost benefit analysis. Decisions concerning the provision of NCOs should be subject to the same process since there are strong cost implications to society in the same way as for investment projects (Box 2). The process itself is important, providing policy makers with the opportunity to design and develop different policy options. The process could also be a useful tool by which policy makers and stake holders communicate with each other on the most appropriate policy options.

Preparing the framework

The appropriate unit of enquiry

Most parameters that are required to answer the questions, such as the cost of producing commodity outputs, the cost of de-linking commodity and non-commodity production and demand for NCOs or for reductions in the level of negative externalities, are region specific. The response of farmers to commodity price changes is also determined largely by region or farm specific factors. Therefore, the smaller the unit of enquiry, the more precise the results. On the other hand, availability of data could be a major constraint. A balance between precision and the availability of data needs to be sought. A practical approach is to use data at the most detailed or micro level at which they are collected in each country. This could vary from prefecture or departmental level to, in some cases, individual farm or household data.

A local unit of analysis is not necessarily appropriate if demand for some NCOs is not region specific. This could be the case for food security or for the preservation of agricultural landscape in general although the production cost parameters would still be region-specific. Practical ways to address this issue are proposed in the following sections.

Lessons from the empirical work

In designing the sub-questions, it is very important to draw on the experience of the empirical work on multifunctionality, as this was the first systematic attempt to answer the questions.

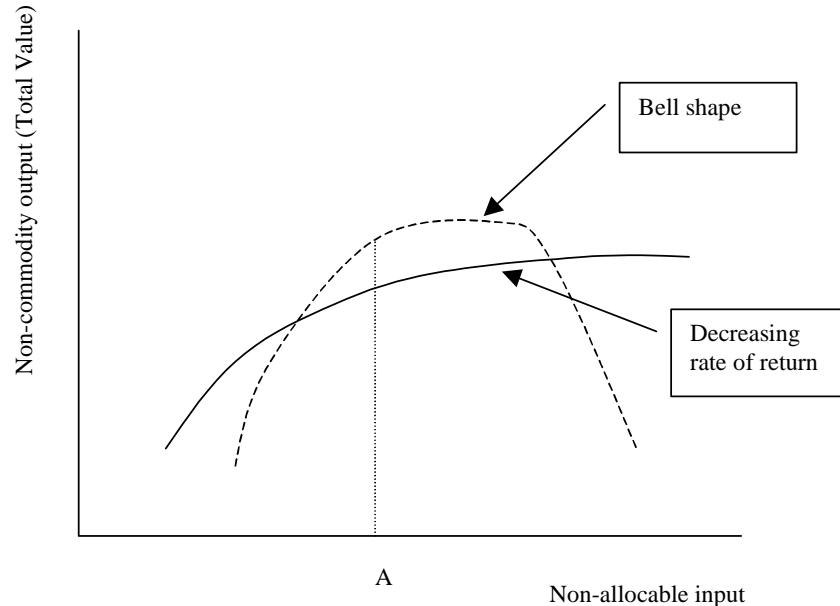
One of the most important and policy relevant messages obtained from the empirical work is that most NCOs, especially those related to land use, may be linked to the existence of a certain level of commodity production but not directly to the level of production (*i.e.* production intensity per hectare at farm level). The policy implications of this observation are potentially of enormous significance. If an NCO is not linked to production intensity but is linked to the existence of a certain level of commodity

production, a policy that stimulates production intensity beyond this level will not affect the provision of the NCO.⁴

A possible explanation for the observation concerning production intensity is that some NCOs are linked to *fixed* non-allocable inputs (*i.e.* NCOs and commodity production share the same fixed inputs). For example, flood control capacity is linked to the production of rice in the sense that the maintenance of dykes as an integral part of paddy fields in the process of producing rice contributes to the preservation of flood control capacity. However, these maintenance activities do not affect the intensity of rice cultivation (*i.e.* these activities are required regardless of the production intensity at farm level as long as some rice production takes place).

Another possibility is that some NCOs are linked to *variable* non-allocable inputs but the linkage takes a bell shape form implying “a decreasing rate of return”. In other words, output of the NCO first increases with increasing use of the non-allocable input, then remains unchanged, even as use of the non-allocable input continues to increase and then, beyond a certain threshold, begins to decrease. For example, in Figure 1 beyond the point A⁵ there is no linkage (or there could be a negative linkage) between NCOs and production intensity.

Figure 1. Illustration of linkages between NCOs and variable non-allocable inputs



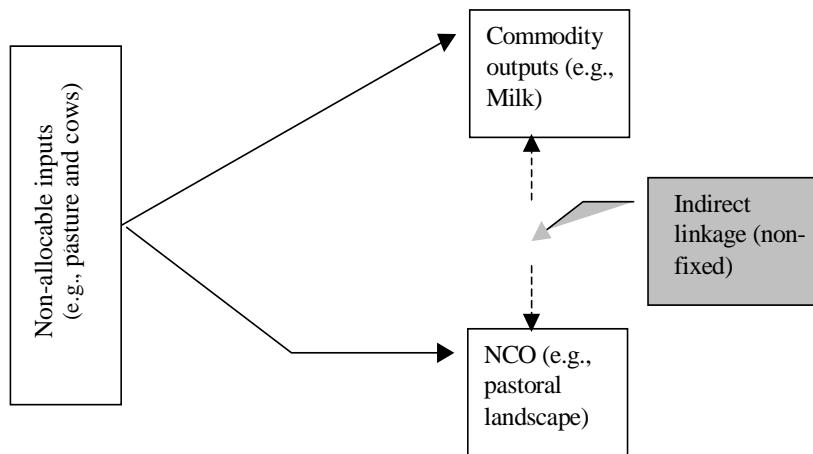
In these situations, our focus should be on identifying the minimum level of commodity production at which the quantity of non-allocable input(s) used is sufficient to ensure the provision of the NCO. Beyond that level, there is no linkage. If, however, the production intensity is below this level there is indirect jointness up to that minimum level. Another possible exception is where the link is between an NCO and a variable non-allocable input but without “decreasing returns”.

Our interest even in these cases of indirect jointness, when trying to find the optimal policy, should be in the relationship between the input and the NCO, not between the commodity output and the NCO. This is because the relationship between the latter will not be the same as the former. In other words targeting the level of the commodity output will not, even in these cases, necessarily provide the quantity or quality of NCOs sought. For example, a price incentive to produce milk, in order to preserve a pastoral landscape of which grazing cows are an element, could result in a deterioration of the landscape if farmers choose to move to an intensive feedlot system of producing milk. This situation is illustrated in Figure 2.

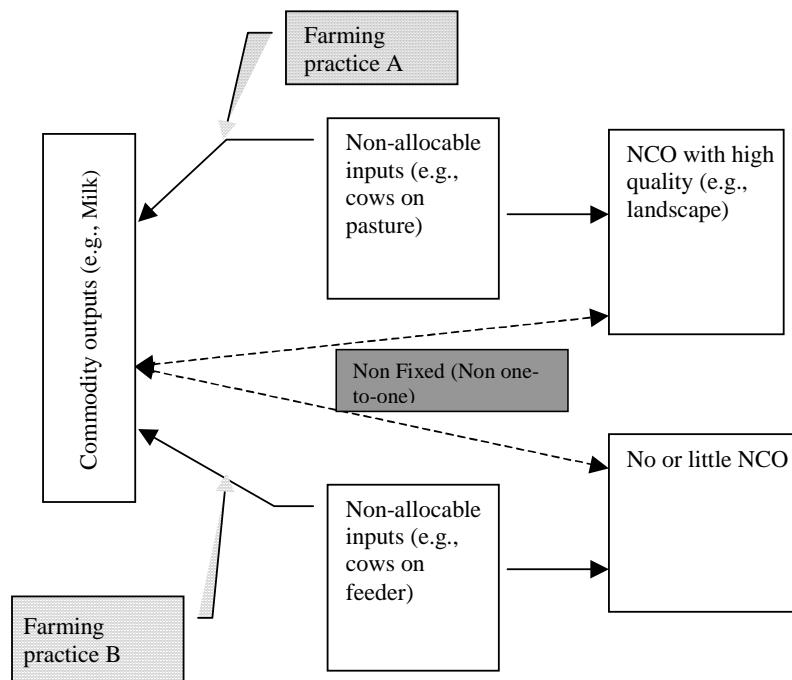
The recommendation to target the non-allocable input would be invalid if there is a fixed (one-to-one) relationship between the input and the output. In the example above it would be efficient to target milk as such if there was a fixed relationship between the number of cows on pasture land and the output of milk. This is generally not the case as farmers usually have considerable choice in how they combine different inputs to produce a given output. The degree of choice varies by product, the level of production, scale and structure, by the physical and environmental conditions, the technology available to farmers, and the regulations applied to farming practices, etc. It should be also noted that developments in technology could change (widen) the possibility of technical substitution among inputs. Policy makers should pay attention to these dynamic aspects also (see Box 3 for examples of linkages between NCOs and non-allocable inputs).

Figure 2. Illustration of indirect linkages between NCOs and commodity production

<Linkages with non-allocable inputs may create "indirect" linkages between NCOs and Commodity outputs



<However, indirect linkages are not "fixed" because they depend on farming practices>



Box 3. How are NCOs linked to non-allocable inputs?
An illustration

As discussed in the main text, there are three types of jointness between NCOs and non-allocable inputs: linked to fixed non-allocable inputs; linked to variable non-allocable inputs with decreasing rates of return; and linked to variable non-allocable inputs without decreasing rates of return. Although the classification is an empirical issue and depends on many factors, a general characterisation could help policy makers to understand the nature of the issue. An actual classification can only be done when the sub-questions on jointness presented in the following section have been answered.

Examples of NCOs	Jointly used fixed non-allocable inputs	Jointly used variable non-allocable inputs
1. Linked mainly to fixed inputs		
Flood protection	<i>Land</i>	Maintenance of dykes (<i>e.g.</i> use of labour and machine)
Regulating water supply	<i>Land</i>	Use of irrigation water
2. Linked to variable inputs with decreasing		
Pastoral landscape with grazing cows	<i>Land</i>	Maintenance of pasture, hedges Maintenance of cows <i>The number of cows may be linked to the landscape value. However, as long as the number of cows reaches some "threshold level" the desired landscape quality may be achieved. Above a certain number, landscape quality could deteriorate.</i>
Open field landscape of wheat	<i>Land</i>	Maintenance of wheat plants <i>The number of plants per area (<i>i.e.</i> the density of plants) may be linked to the landscape value. However, in practice there has been no evidence that the density could have substantial effects on landscape values.</i>
3. Linked to variable inputs without decreasing rates of return		
Positive effects of agricultural employment in a remote area		Labour <i>For labour intensive farming in remote areas, there may be a correlation between agricultural employment and its positive effects.</i>

Finally, the existence or otherwise of a direct correlation between an NCO and the level of production, for example in the case of food security, needs to be carefully examined along the lines suggested in chapter III, section 3 and Annex 3, in which various factors including the differences in risks among supply options (domestic production, stockholding and imports) are examined. For example, Romstad *et al.* (2000) represent the linkage between food security and production intensity as another bell shaped curve which implies that food security may increase with the level of production to a certain point and actually deteriorate beyond that level due to, for example, deterioration of soil quality. There is probably also some threshold level of production beyond which gains in food security from increased production diminish or disappear. There is also an argument that food security in the long-run may be associated more with production capacity (the amount of land and other factors actually available) than with actual production levels. If this is the case, production capacity could be maintained in different ways including no production at all or low levels of production depending on the feasibility and the relative costs of the different options. The nature and degree of jointness, in any case, depends on many factors including the nature of the risks involved. These should be carefully examined by following the guidelines proposed later.

Many negative externalities are linked to the use of inputs although the degree and nature of the linkage varies by product, farming practices, production level, and physical conditions. For example, there is a considerable body of evidence that pesticide usage has negative impacts on biodiversity (*e.g.* OECD, 2001*j*). Water pollution from nutrients has been reported in most of the country studies undertaken for the empirical work (Abler, 2001). Irrigation can contribute to salinity, water-logging and degradation of water-related ecosystems. In addition to these input-linked negative externalities, agriculture may also have negative impacts on the natural environment when land is converted into agricultural use.

On the demand side, there are also some lessons that can be drawn from the empirical work.⁶ First, although measurement may not always be reliable, efforts should be made to estimate demand, especially if particular methodologies are actually already used in policy making in a country (see Table 1 below for a summary of standard methodologies). For example, the replacement cost method has been used in many countries for certain goods which it is assumed will be provided anyway (*e.g.* flood protection). CVM⁷ has also often been used to estimate demand, especially for site-specific goods. Conjoint methods have recently been applied to many environmental policy issues and could be useful in identifying the best option among alternatives with different costs and benefits. This methodology could be powerful especially when multiple NCOs and

negative externalities need to be taken into account simultaneously. Secondly, supplemented with other information, demand measurement may provide policy makers with sufficiently reliable information on which to base their choices. For example, the credibility of a result of a CVM study for a landscape site would be confirmed if voluntary contributions to preserve the landscape were, more or less, within the range of the CVM result. Thirdly, the information that is provided to interviewees is often an essential factor in designing valuation methods and, if properly chosen, can help to avoid bias. Selecting the appropriate unit of enquiry is important also in this context because the appropriate unit provides interviewees and policy makers with detailed information on what is being valued.

Table 1. Classification of valuation techniques

	Indirect	Direct
Methods based on individual preferences		
Revealed Preferences (RP)	Household Production Function (HPF) Approach: Travel Cost (TC) Method Averting Costs (AC) Hedonic Price (HP) analysis	Simulated markets Market prices Replacement cost
Stated Preferences (SP)	Contingent Ranking (CR) Choice Experiments (CE): Conjoint Analysis	Contingent Valuation Method
Methods based on decision-makers'/experts'/interest groups' preferences		
Revealed Preferences (RP)	Implicit Valuation (IV) Delphi Method	Multi Criteria Analysis (MCA)
Stated Preferences (SP)		

Note: Cited from Navrud in OECD (2000), *Valuing Rural Amenities*, Paris.

Determining economies of scope and market failure

Economies of scope

Economies of scope exist when a single firm producing various products jointly can produce them more cheaply than if each product is produced by a separate firm. The concept of economies of scope is therefore useful only if

there is a possibility of separate provision. If separate provision is physically impossible, there is no choice but to provide the goods jointly.

If separate provision is physically possible, the costs should be compared to joint provision to judge whether there are economies of scope. In the context of multifunctionality, the correct comparison is between the costs of joint provision through agricultural production (*i.e.* the production cost of a commodity) and the costs which would result if the commodity was imported and the NCOs provided through measures de-linked⁸ from domestic commodity production (*i.e.* the sum of the cost of imports (the international price) and the cost of de-linkage).⁹ If delinked provision of NCOs results in lower quality provision (*e.g.* landscape with or without commodity production), this factor also needs to be included in the calculation (see Annex 2 for more details).

Economies of scope is an important concept through which the degree of jointness is translated into a policy-oriented indicator. If there are economies of scope domestic production is the most efficient supplier of both commodity and NCOs. If not, provision of commodity outputs through trade and NCOs through de-linked measures is more efficient. Clearly the policy implications are quite different. This is explored in detail in Chapter IV. The procedure to establish whether or not there are economies of scope is described in Chart 1, Annex 1.

Economies of scope judged to exist under one set of assumptions may not exist under different conditions or *vice versa*. This is particularly the case with respect to the international prices. Moreover, the policies implemented may themselves affect the opportunity costs or shadow prices used. For example, a tariff reduction by an importing country could (at least in the short-run) increase the international price of the commodity in question, as could a reduction in export subsidies by an exporting country (see Annex 7 of OECD, 2001a) for more detailed discussion of this issue). Technological change could also affect production costs. Strictly speaking international price changes of the kind being discussed here can only occur if the country adjusting its policy is large¹⁰ (or if several countries take similar action simultaneously). These factors could be incorporated in the evaluation of economies of scope through a simple sensitivity analysis that would incorporate plausible ranges of prices (Box 4). These considerations apply also to the evaluation of market failure. These issues will be further taken up later in this report when information problems and how to overcome them are discussed.

If it proves possible to use market mechanisms to determine the most efficient provider of NCOs (*i.e.* to examine the existence or non-existence of economies of scope (Box 5), the process described in this section could be

skipped. Nevertheless some investigation of the cost of de-linkage would still be useful as it would help the policy maker to design mechanisms that ensure that the bidding process is efficient, for example, by putting a ceiling on the payments that is determined by the costs of delinkage.

Box 4. Some technical notes on the application of sensitivity analysis for international prices

Estimating plausible ranges is important, before going to the stage of actually implementing the sensitivity analysis.

How might a country's own policies affect the international price?

In standard cost benefit analysis of investment projects, it is usually assumed that prices will not be affected by the implementation of the project. In other words projects are assumed to be small relative to the size of the economy. However, in the context of multifunctionality, policies to address positive and negative externalities may affect international prices if the country is a 'large' one. It is, therefore, possible to imagine a situation in which a country opens its borders to imports, leading to a rise in world prices. Economies of scope may now emerge where they were not previously observed. More generally, it follows that if the international price change likely to result from reform is significantly under or over estimated, incorrect policy decisions may be made. This argues for a serious effort to estimate likely ranges of international price changes in the 'large' country case, using available models and techniques.

How might other countries' policies affect the international price?

Efforts by other 'large' countries to reform their policies by increasing imports, reducing export subsidies or internalising negative externalities may also affect the international price and therefore the assessment of economies of scope in a third country. Again a standard sensitivity analysis should allow these possibilities to be taken into account.

Exchange rates

Similarly, movements in exchange rates could alter the international price leading to a different assessment of whether or not there are economies of scope or market failure. Given the difficulty of forecasting exchange rate movements this is a classic situation in which the establishment of plausible ranges using sensitivity analysis is a useful device.

Box 5. Bidding to reveal the most efficient supplier of NCOs

Assume that farmlands in a region are providing both a commodity output and an NCO through the use of a non-allocable input (*e.g.* pastoral landscape, ignoring for the purpose of this illustration whether or not animals affect the value of the landscape). Assume also that the domestic price of the commodity output is equal or close to the international price. Then, an auction can be designed in which bidders are required to state their price for the provision of the NCO. If there are enough potential bidders, farmers in the region ask for the amount required to continue current farming (*i.e.* the difference between their production cost and the market price) or the cost to provide only the non-allocable input (*i.e.* maintenance of pasture and hedges), which ever is the cheapest. The former is the opportunity cost of domestic production, and the latter is the de-linkage cost, both of which are required to determine economies of scope. Bidders other than farmers would submit their proposals: *e.g.* maintenance of existing pasture and hedges or the provision of similar landscape by converting abandoned lands nearby into pasture.

These mechanisms will not work well if agricultural support is available and/or if there are not sufficient potential non-agricultural bidders. In these cases farmers may not reveal their true costs. If property rights are such that access to lands requires the permission of the owners, farmers (when they are owners of farmlands) are likely to bid strategically (by, for example, setting conditions for access by others). Additionally there are transaction costs associated with designing and implementing these mechanisms including those associated with co-ordination of adjacent farms which also need to be taken into account.

Despite these drawbacks, these or similar mechanisms should be tried whenever possible to allow policy makers to avoid one of the uncertainties associated with obtaining information (see Chapter IV for the discussion on the lack of information).

Market failure

Market failure associated with externalities may relate to under-production of a positive externality or over-production of a negative. This occurs because producers have not been able to “internalise” the value of the externality. However, if production is higher than the market equilibrium because of supply inducing support the current production level could also be higher than the social optimum. A fall in production will not necessarily cause market failure as long as the production level is higher than the social optimum. This holds only for positive externalities. Where only negative externalities are involved, a fall in production to the market equilibrium will

always increase welfare. In fact, even at market equilibrium there may still be over-production of the commodity output. More specifically in the context of the work on multifunctionality, market failure occurs when there is a net loss in welfare as a result of a policy change (OECD, 2001a). The context is one of agricultural policy reform leading to lower producer prices for commodities and increased trade. In this situation gains arise from the production cost savings resulting from the elimination of high cost farms, increased consumer satisfaction due to increased consumption and a fall in negative externalities. Losses relate to a fall in provision of NCOs. The existence of economies of scope therefore does not necessarily imply that there is market failure or that market failure would occur in response to reform.

In practical terms, as long as the gain due to trade (*i.e.* the difference between domestic production costs and international prices) is greater than the loss associated with the decrease in provision of relevant NCOs, trade will always increase a country's welfare (Annex 1)¹¹. This is a sufficient condition for the non-existence of market failure (Box 6¹²).

It is also possible to imagine situations in which productivity increases in response to a price change and the production level is sustained. Farming practices could change (*e.g.* from intensive to extensive¹³) in response to a price change but NCOs would be preserved.

In principle, marginal values (*i.e.* costs and benefits associated with marginal changes) should be used although it is recognised that estimating marginal values is more difficult in practice. When the unit of enquiry is small, the total value of NCOs in the area could be a proxy to the marginal value. For example, agricultural landscape is in general assessed for a certain landscape site as a whole, not for a marginal piece of it (*e.g.* the value attached to 1% of the total landscape in the site). However, the total value in each unit could be considered as a reasonable approximation for marginal values from a macro point of view. This could justify comparing total demand and total production costs in each area to judge the likelihood of market failure.

Finally, the work on valuation of public goods as well as that on multifunctionality indicates that to estimate simultaneous demand for multiple NCOs consumption relationships between the NCOs may need to be taken into account.¹⁴ If there are complementary relationships, the combined demand will be greater than the sum of individual demands and *vice versa* if the NCOs are potential substitutes.

Box 6. What is meant by market failure?

The starting point begins with a hypothetical situation where there is no agricultural support and the market determines the price and quantity of a commodity output. There is a positive externality associated with the commodity production. To simplify, the relationship between commodity production and the externality is assumed to be fixed. In this case, the quantity B will be produced. This is smaller than the social optimum, production level A, at the intersection of the market price (*i.e.* international price) and the social cost (private cost – the value of the externality). This situation is usually referred to as market failure. The market failure can be represented by the shortfall in production, a quantity equal to the difference between A and B.

Now assume that the current production level is C (greater than A), as a result of a tariff, as illustrated in the graph. In this case, the elimination of the production from (C) to (A) does not constitute market failure. In fact, welfare increases until the production level falls to (A). More generally, as long as the difference between the production cost and the international price is greater than the loss of the externality (the vertical difference between private and social costs), the elimination of the relevant production due to trade will always increase welfare and does not cause market failure.

This same diagram can be used to explore the case of a negative externality by switching the social and private cost curves so that the social cost curve now appears above the private cost curve, and by switching points A and B. Then, moving to market equilibrium would reduce production from (C) to (B), a point at which there is no market failure. Market failure would be represented by the difference in production between (B) and (A).

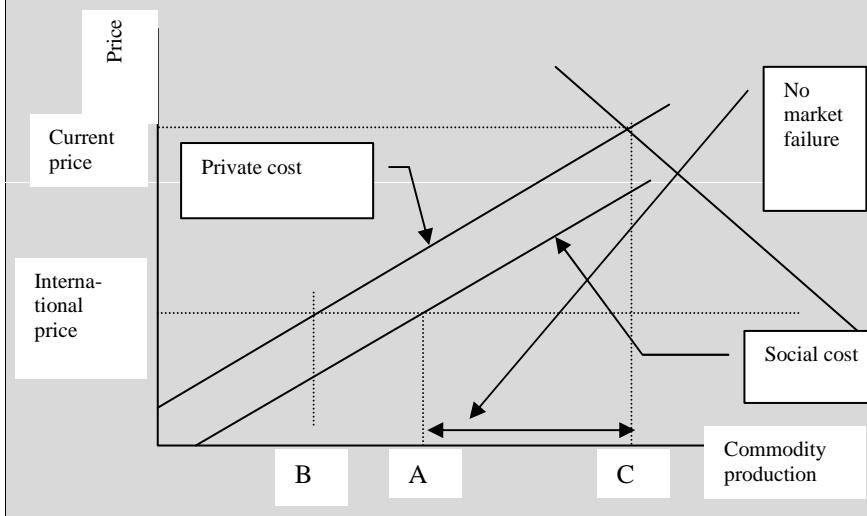


Chart 2 of Annex 1 indicates schematically the different steps to be taken to establish whether or not there is market failure. As for economies of scope, there are dynamic elements which should be taken into account. In particular, the determination of market failure depends crucially on the assumptions concerning certain opportunity costs, particularly international prices.

Mixed farming

The discussion so far implicitly assumes mono-cultural farming. However, mixed farming (*i.e.* growing of crops combined with farming of animals¹⁵) could be important in the context of multifunctionality.¹⁶ First, there is an inter-dependence between livestock and crop production, in which animals depend on by-products and surplus crop production, while crops depend on manure as fertiliser. This technical inter-dependency affects the production costs of both outputs. Secondly, there are complicated inter-dependencies among the commodity production, NCOs and negative externalities. For example, biodiversity clearly depends on complex interactions between these two systems. Landscape may also be influenced by the combination of grassland and arable land.

In examining economies of scope, mixed farming should be dealt with as a single and unified system. It would be difficult and inappropriate to estimate production costs of livestock and crop outputs separately because of complex inter-dependencies associated with producing these two different outputs. De-linkage costs should also be estimated in a similar way. For example, landscape associated with mixed farming is composed of pastoral landscape and open-field landscape associated with crops. Probably, the non-allocable inputs producing the landscape are too complex to be separated.

In examining market failure following agricultural policy reform, careful attention should be paid to how farmers might respond to the price change(s). If reform reduces the price of livestock output alone, farmers may move towards specialising in crop production. In this case, the value associated with landscape and biodiversity may change. Similarly, if specialisation in livestock occurs, the value of the NCOs may be different from that of mixed farming. Analysing the historical trend of the change in the number of mixed farms may guide policy makers as to what would happen to mixed farming following reform.¹⁷

Format of the sub-questions/guidelines

The questions prepared for the empirical work in connection with the July 2001 Workshop are the starting point for the design of the detailed sub-questions presented here. Although the specific characteristics of each NCO determine the precise content of the different sub-questions, there is nonetheless a common format and sequence that can be applied. Note also that it may not be necessary to answer all possible questions in the sequence. For example, if there are no economies of scope, market failure resulting from a change in agricultural support policies can be avoided by de-linking the provision of NCOs from commodity production, and if there is no market failure there is no need to explore the public good nature of the NCOs.

Group 1. Sub-questions/guidelines: jointness

- **Identify the source of jointness.** Which farming activities (*e.g.* use of inputs including land and labour, production level, etc.) are directly linked to the provision of an NCO (defining technical linkages)? Do the linkages originate from non-allocable inputs and if so do the non-allocable inputs affect the intensity of commodity production?
- **Explore possibilities of de-linkage and estimate the cost (Examine economies of scope).** Can technical jointness be altered or completely de-linked. If so, what is the cost? (Box 7) A difference in quality of an NCO following delinkage should, of course, be taken into account in the decision making (Annex 2). The cost of de-linkage determines if economies of scope exist or not (Chart 1, Annex 1). Use market mechanisms to determine the existence or non-existence of economies of scope whenever feasible.
- **Identify scale factors.** What is the spatial distribution of NCOs? Are they site-specific, local, regional or national in occurrence, common or rare?

Box 7. Cost of de-linking non-commodity production from commodity production

There are several possible ways of de-linking. The least cost option should be taken to represent the cost of de-linkage.

Option 1. Non-agricultural provision

Estimate the cost of providing an NCO by a non-agricultural measure (including any negative effects that non-agricultural provision may cause): *e.g.* estimate the construction cost of a flood protection reservoir to replace the flood protection role of paddy fields

Option 2. Provision on farmland but without commodity production

Estimate the cost of maintaining non-allocable inputs that are linked to the provision of an NCO: *e.g.* estimate the cost of maintaining the production capacity of land, but without production, as a way of ensuring food security

Option 3. Provision on farmland by changing the farming system

Estimate the cost of changing the farming system (most likely from intensive to extensive farming) so that NCOs continue to be provided but commodity production falls: *e.g.* estimate the difference in cost between intensive and extensive farming.

Option 4. Provision on farmland without commodity production but the quality of de-linked NCOs differs from that of linked NCOs

Estimate the cost of maintaining non-allocable inputs that are linked to the provision of an NCO and add to this cost the monetary value of the difference in quality (see Annex 2 for a detailed discussion).

Group 2 Sub-questions/guidelines: market failure

- **Estimate demand for the NCO.** What is the demand for NCOs? Use formal measurement techniques where feasible (*e.g.* CVM, conjoint method, travel cost method, hedonic pricing, replacement cost method, multi-criteria analysis, citizens' juries). Collect as much supplementary information as possible. The difference between current values and those that would result from possible changes in commodity production should be measured in each area. If the demand for an NCO is attached to agricultural land in general, not region specific, a different procedure might be required to allocate the total demand to each unit of enquiry (Box 8).

Box 8. Demand for some NCOs may not be region specific

Demand for food security associated with domestic production may be attached to agricultural land in general in a country. If the demand is constant (*i.e.* constant marginal value), unit values may be obtained by dividing the total demand by the total area. However, if the demand is not constant (*e.g.* decreasing marginal value), as is likely in actual situations, the demand attached to each piece of land depends on the production cost. In this case, the demand can be estimated only by comparing production cost across areas (*i.e.* if the production cost in an area is high, the risk of that area losing a linked-NCO may be high). Therefore, the value of the NCO in that area is smaller than that in areas with higher productivity due to the decreasing marginal value of the NCO). Demand for some other NCOs such as general agricultural landscape may have similar characteristics.

- **Judge market failure.** Judge the likelihood of market failure in the light of possible changes in farming practices due to a price fall (Chart 2, Annex 1). Special attention should be paid to how price decreases might affect land use patterns (Box 9).

Box 9. Possible changes in land use in response to a commodity price fall

- Increases in farm size (*e.g.* efficient farmers buy or rent lands from farmers exiting from agriculture).
- Switches in product mix.
- Shifts from intensive farming to extensive farming.
- Land abandonment or land use change (from agriculture to other uses) if laws and regulations allow agricultural lands to be converted to other uses.

Group 3. Sub-questions/guidelines: public good characteristics

- **What are the pertinent public good characteristics including spatial factors.** Does the NCO meet the non-excludability¹⁸ and/or non-rivalry conditions. Is it a pure, local or other type of public good?¹⁹ spatial factors are important in differentiating between pure and local public goods. Identify the relative importance of use values as a way of gauging the possibility of market creation.
- **Examine institutional arrangements.** examine institutional arrangements in place in the area or in other similar areas. Pay special attention to different ways in which excludability has been or could be

established (Box 10). Examine whether the same mechanisms could be applied to the area in question.

Box 10. Examples of (non-governmental) institutional arrangements

- Community supported agriculture.
- Trusts (Environment, Amenity, etc.).
- Contracts between the tourism industry and farmers.
- Contracts between consumers and farmers.
- Clubs with explicit excludability mechanisms (*e.g.* entrance fees for use values, etc.).

Negative externalities. Negative externalities are an essential element of the analytical framework and must be incorporated in all attempts to apply it. If the supply of a particular NCO is threatened by a non-internalised negative externality, the first step in any strategy must be to correct for the negative externality. Secondly, both NCOs and negative externalities²⁰ must be accounted for in determining whether there is a market failure following a policy change. Although some of the proposed questions to be asked for NCOs could be applied to negative externalities, this issue is considered to be sufficiently important and distinct to warrant a separate set of sub-questions. These are proposed later in the text.

Irreversibility: taking future generations into account²¹

Any risk of irreversible changes in non-commodity provision related to reform-induced changes in commodity production needs to be taken into account although, in practice, this is extremely difficult. In particular, it is not possible to estimate the demand of future generations for NCOs. One possibility, however, would be to estimate “bequest values”, *i.e.* the demand of the current generation to preserve NCOs for future generations. This approach would be appropriate where the NCOs are local in nature, and, as a result, the danger of irreversibility easier to judge. These factors will be incorporated in designing the sub-questions below.

From a policy perspective, the frequency with which an NCO occurs can be crucial. For example, preservation of very rare and single-site NCOs (*e.g.* endangered species depending on farmland in a particular location, a spectacular agricultural landscape) may require strict regulation and direct financial support from the government. Commonly occurring NCOs may require a lesser level of intervention (OECD, 2002). Policy approaches emphasising precaution are best suited for preserving very rare and single

site NCOs while gradual approaches (as discussed below) may be suitable to preserve more commonly occurring NCOs. If such differentiated policies are not applied the result could be irreversible damage to rare NCOs and over-supply of common NCOs.

Developing an inventory is one way to establish how rare an NCO is. For example, in Norway, a national inventory of agricultural landscapes has been prepared in 1994 (OECD, 2002). It classifies national landscapes into three categories: (1) cultural landscape with specially high conservation value; (2) cultural landscape with special value; and (3) ordinary agricultural landscape. Efficient and effective monitoring systems are also key in addressing potential irreversibility and its impacts on future generations. Resources may be wasted, at the expense of future generations, if efforts are made to preserve “ordinary landscapes” that are not in fact scarce.

It is also important that institutional arrangements with built-in mechanisms to avoid myopic behaviour should be established. For example, land prices in a residential area may be affected by agricultural landscape surrounding the area. Then, the owners of the residential land have an incentive to take action to maintain the price of their own land in the long run if the quality or quantity of the landscape provided by the agricultural land is threatened.

Some technical considerations: using appropriate prices

It is standard in cost/benefit analysis to use opportunity costs or shadow prices, rather than observed or purely financial values. This procedure should also be adopted here. This is of particular importance in determining the existence or non-existence of economies of scope and market failure. For example, commodities should be valued at international prices as detailed below (although with appropriate caution, including the use of sensitivity analysis as discussed elsewhere in this report). The opportunity cost of labour should be used when it is necessary to estimate labour costs. If input prices are affected by tariffs, international prices should be used. If methodologies to convert observed prices into shadow prices have already been operationalised in the context of standard cost benefit analysis, they should be applied.

Sub-questions/ guidelines for negative externalities and a sample of individual NCOs

Some prerequisites: For each area (*i.e.* the unit of enquiry), negative externalities and NCOs must be identified with a clear understanding of their characteristics.²² The sub-questions developed in the following sections should then be asked. The flow charts presented in Annex 1 should be used to establish whether or not there are economies of scope and/or market

failure. As much information as possible should be collected concerning all negative externalities and NCOs before economies of scope or market failure can be established. Box 11 establishes a sequence that is consistent with the analytical framework from which the questions and procedures are derived.

Box 11. Sequence

- For each area identify negative externalities and NCOs.
- Gather information to answer the sub-questions for each negative externality and for each NCO in each area.
- Follow the flowcharts to examine economies of scope and market failure.
- After examining all areas, go to the benchmark policy table in Chapter V.

In following this procedure, it is essential that negative externalities be taken systematically into account. If negative externalities exist and no remedial measures have been taken, the social cost needs to be estimated. If a regulation is in place to eliminate or reduce negative externalities, it will be reflected in farmers' production costs. If an agri-environmental measure is providing payments to encourage farmers to reduce negative externalities, the payments should be added to the private cost (see OECD 2001c for a more detailed discussion on the reference level and the determination of who should bear the cost of addressing negative externalities). There is an impact in each case on the evaluation of market failure.

Some NCOs may be affected by negative externalities. Examples are biodiversity, landscape, natural habitat or regulatory water supply. Where agricultural activity is generating negative externalities the first policy action should be to deal with that negative. For example, to claim that biodiversity or natural habitats are the major NCOs in a region is not credible if in reality agriculture is causing loss of these amenities and no measures have been taken to alleviate that loss.

Sub-questions and guidelines for landscape, flood control and negative externalities are presented below to provide a flavour of the types of individual guidelines that have been developed. Additional examples covering regulatory water supply capacity, habitat and biodiversity, food security and rural employment, are presented in Annex 3. The selection of these examples is only for illustrative purposes. The framework can be applied to any or all negative externalities or NCOs for which a link to agricultural production is claimed.

Landscape

Sub-questions on jointness

Identify the source of jointness

- Make sure that negative externalities affecting landscape are fully internalised.
- Identify non-allocable inputs that are linked to landscape such as pasture, hedges, crops and animals, farm buildings, and farm dwellings.
- Examine how landscape is linked to those non-allocable inputs. For example, is the landscape value of a field of sunflowers or a terraced paddy field related to the yield from those fields? Is the landscape value of a mountain pasture dependent on the number of animals? Note that answering these questions requires demand measurement. Examine if there is any evidence that the level of non-allocable inputs matters beyond some minimum threshold (Box 2).

Explore possibilities of de-linkage and estimate the cost

- Explore possibilities of de-linkage (*i.e.* maintaining landscape without maintaining the current or any level of commodity production).
- Estimate the costs associated with implementing those options, for example, by providing a minimum level of the above identified non-allocable inputs without commodity production, by reducing yields or by reducing the number of grazing animals.
- Compare the above costs with the cost of implementing non-agricultural measures to preserve the relevant landscape. For example, replacement by forests could be an option unless society values agricultural land specifically.
- Let the smallest cost be the cost of de-linkage.
- Judge whether there are economies of scope by following the procedure detailed in Chart 1, Annex 1.

Identify scale factors associated with the supply side

- Sum the areas that have been identified in the above process as providing landscape in association with agricultural production with economies of scope.
- Compare the summed area with the total farmland used for the commodity production in question in a country. If the area with economies of scope covers a large proportion of the total area, then the

scale factor is "wide-spread". If it is a small proportion the scale factor would be described as "limited".

Sub-questions on market failure

Estimate demand

- **Demand by local residents.** Estimate demand for the preservation of landscape by applying standard methodologies such as CVM and travel cost method and where appropriate also use benefit transfer. Bequest values may have to be taken into account when landscape features are in danger of irreversible loss.
- Since demand measurement for landscape is likely to be problematic, all relevant supporting information should be collected. For example, financial support from local government or NGOs might provide confirmation of the results of CVM studies. If some use values are observed (*e.g.* entrance fees for a specific landscape site, etc.), the resulting information could supplement demand measurement.
- **Demand by the general population.** Examine whether there is a more generalised demand for preservation of landscape, and to what extent non-use values dominate, taking into account the difficulty in estimating the latter.
- Since marginal values of non-use values are difficult if not impossible to obtain, a proxy should be sought, for example, by simply dividing the total value to be obtained by CVM with the total area used for the commodity production in question. It should be noted that this method is likely to overestimate the marginal value.
- Examine whether there is demand from the general population to preserve site-specific landscape, for example, by reviewing the results of CVM studies focusing on the impacts of distance from actual sites on demand.
- If local demand (*i.e.* use and non-use values by the local residents) is substantially greater than non-use value by the general population the latter may be ignored.

Judge market failure

- Judge whether there is market failure by following the procedure detailed in Chart 2, Annex 1.

Sub-questions on public good characteristics

Identify public good characteristics

- **Non-use values.** Examine whether the demand by the general population for non-use values of landscape is substantial/dominant. In this case we are dealing with a pure public good.
- If not, we may be dealing with non-use values associated with a local public good. The following sub-questions on **institutional** arrangements could be used to judge whether club arrangements are possible.
- **Use values.** Examine whether it is possible to establish exclusion mechanisms for use values. In this case, use values are club or private goods.

Examine institutional arrangements

- Collect information on institutional arrangements that exist to preserve landscape including those organised by local governments, environmental trusts, and markets. Examine all possibilities of creating market mechanisms for use values. Special attention should be paid to how these arrangements have tried to avoid free rider problems. Examine whether these arrangements could be applied to the area in question.

Flood control

This arises from the fact that water is retained in paddy fields surrounded by dykes. It occurs mainly in Asian countries, in association with rice farming.

Sub-questions on jointness

Identify the source of jointness (technical jointness)

- Identify the volume of flood control
- Identify non-allocable inputs that contribute most to flood control (e.g. dyke maintenance, bed-soil maintenance).

Explore possibilities of de-linkage and estimate the cost

- Could the paddy fields be maintained and therefore flood control be preserved, without any rice production. Could the flood control function be achieved with more extensive production systems involving lower production overall?

- Estimate the costs associated with implementing these options. For the first option, the main cost would be associated with providing relevant non-allocable inputs without commodity production, in other words the labour and machinery costs to maintain the dykes and bed-soil. For the second option the main element is the increased cost of extensive farming.²³
- Estimate the cost of constructing a flood protection reservoir with the same capacity as the paddy fields (*i.e.* a non-agricultural alternative), including the cost associated with negative impacts of constructing the reservoir.
- Let the lowest cost be the cost of de-linkage.
- Judge if there are economies of scope by following the procedure detailed in Chart 1, Annex 1.

Identify scale factors associated with the supply side

- Sum the areas where economies of scope exist between rice production and NCO(s) including flood control.
- Compare this area with the total area of paddy fields in a country. If the area with economies of scope covers a large proportion of the total area of paddy fields, then the scale factor is "wide-spread". If it is a small proportion, the scale factor could be described as "limited".

Sub-questions on market failure

Estimate demand

- How dominant or otherwise are paddy fields in the relevant river catchment area? Are they greater than a certain percentage of the total catchment? If they are not, they will have limited impact on flood control.
- Where paddy fields are dominant, are they located in hilly areas or surrounded by cities? If they are not, they will be providing no or little flood control and there will be negligible demand for this service to be provided by rice production.
- If paddy fields dominate and they are located in hilly areas or surrounded by cities therefore providing significant flood protection, estimate demand for this protection capacity applying standard methodologies already used in policy making, *e.g.* the replacement cost method.

Judge market failure

- Judge whether there is market failure by following the procedure detailed in Chart 2, Annex 1.

Sub-questions on public good characteristics

Identify public good characteristics

- Is there a possibility that people could be charged for benefiting from flood protection? If they can be charged, determine what kind of charging mechanisms could be used (see also Box 13).
- If not, categorise paddy fields into local public goods or pure public goods depending on how widespread the benefits are. For example, whether rivers in the area are managed by the national or the local government could be a proxy.

Examine institutional arrangement

- Examine whether institutional arrangements exist between beneficiaries and/or local governments and farmers in other, similar circumstances and whether these arrangements could be applied in the area in question.

Negative externalities

All negative externalities should be taken into account in the evaluation of economies of scope and market failure. In the preceding text attention was also drawn to the fact that negative externalities could affect the values of NCOs. This is the case, *inter alia*, for landscape, biodiversity, and habitat. This section proposes a more generalised treatment of negative externalities that formalises the need to take them into account in formulating the policy conclusions.

Sub-questions on jointness

Identify the source of jointness

- Identify negative externalities associated with production in the area concerned.
- Identify the source of each negative externality (*e.g.* use of inputs such as fertiliser, livestock manure, use of land, etc.).
- Identify all policies to regulate or alleviate negative externalities including taxes, regulations, or restricting use rights.
- Examine the cost associated with implementing the above measures (*e.g.* monetary value of the tax). Ensure that this cost is included in estimating production costs in order to judge economies of scope.²⁴

Sub-questions on market failure

Estimate demand

- Estimate demand for reductions (or elimination) of negative externalities from the current level to the reference level, for example, by applying the results of CVM studies.
- If agri-environmental measures are taken, use the cost of implementing those measures as a proxy for demand for further reductions.
- Judge whether there is market failure or not by following the procedure detailed in Chart 2, Annex 1.

IV. Policy options from an efficiency perspective

The process

This chapter proposes a range of policy options reflecting, as the analytical framework suggests, the degree and nature of jointness and the public good characteristics of the NCOs. The answers to the questions proposed in the previous chapter provide the information needed to proceed to this step. The degree of jointness is related to the extent to which policies can be de-coupled and targeted while the public good characteristics relate to the possibilities of market creation and, where market creation is not an option, to who should finance the policy measures judged to be necessary.

The options presented constitute “first best” solutions under the assumption that sufficient information is available to answer the questions implied by the analytical framework and that there are no transaction costs involved in implementing the different policy measures. These assumptions are unlikely to hold in reality. Moreover, the classification by public good characteristics could itself depend partly on transaction costs, *e.g.* on the costs of setting up exclusion mechanisms. Nevertheless, the definition of these benchmark strategies is an essential first step. How information deficiencies or transaction costs could effect policy choices is taken up in later sections of this report.

Non-efficiency concerns such as equity, stability and international spillover effects will be discussed in Chapter VI.

Bench mark policy options

The basic structure

Policy options, corresponding to the different types of public goods and the differing degrees and types of jointness, are summarised in Table 2. The row headings refer to the degree and nature of jointness while column

headings show different public good characteristics. Each cell contains the “theoretically optimal solution”.

Row (degree and nature of jointness). The nature and degree of jointness is first defined with respect to the existence or otherwise of economies of scope. Where strong jointness exists (*i.e.* economies of scope exist), the row is further subdivided according to the occurrence or otherwise of market failure. Finally, where there is market failure a distinction is drawn according to spatial incidence (widespread, geographically limited, or some combination).

Column (public good characteristics). The first division relates to whether all the NCOs in question exhibit the same public good characteristics. If they do, there is a strong possibility that a single policy recommendation can be made. If they do not, a more complex policy mix may be required. Each column is then further segmented according to public good characteristics. There are four main categories: pure public goods, local public goods, club goods including private goods and common property resources.²⁵ Where there is a mixture of NCOs with different public good characteristics two columns are proposed to cover the situation in which at least one of the NCOs in question is either a pure or a local public good.

Box 12. Definition of the terms used in the benchmark policy options

Weak jointness

"De-linked" payments: payments are not linked to any production activity or to any commodity output (*e.g.* payments for preserving dykes, maintaining hedges, etc, without commodity production).

Strong jointness

"NCO-linked" payments: payments that are not linked to the production level but are conditional on continuation of farming in order to provide NCOs

"Input-coupled" payments: payments that are linked to the amount of inputs (*e.g.* headage payments) when NCOs are directly linked to the amount of non-allocable inputs

Geographical concept

"(Geographically) Targeted" payments: payments that are *geographically* targeted to the specific areas where non-commodity outputs are provided.

"Broad-based" payments: payments that are provided to all areas at the same rate.

Bench mark policy options under perfect information and without transaction costs (Table 2)

		Multiple NCO with the same public good characteristic			Multiple NCO with different public good characteristics		
		Pure Public Good	Local Public Good	Club Good (and private good)	Common Property Resources	Pure Public Good	Local Public Good
						Others	Others (exc. PPG)
Weak Jointness (Non-economies of scope)	De-linked payments to the providers of NCOs by central government (see Box 12 for the definition of payments)			Creation of single or multi-product clubs (or markets for use-values) with institutional assistance of mainly local government	Creation of rules for using NCOs	Combination of de-linked payments by central and local governments, or clubs and communities	Combination of de-linked payments by local government, and clubs or communities
	No Market Failure	No policy required	No policy required	No policy required	No policy required	No policy required	No policy required
Strong Jointness (Economies of scope)		Market Failure Wide-spread (W)	NCO-linked and targeted payments by central government	Creation of single or multi-product clubs (or markets for use-values) with institutional assistance of mainly local government	Creation of rules for using NCOs	Policy mix (e.g. NCO-linked and targeted payments to be financed by local government and other relevant parties (e.g. Trusts comprising local government and other government and other parties))	Policy mix
		Limited (L)	NCO-linked and targeted payments by central government				
		L and W	Combination of targeted payments				

a. As discussed below, positive effects of agricultural employment, for example, might exceptionally justify an input-coupled payments, in this case a labour subsidy.
Only when a fixed or direct linkage between the production intensity and an NCO is found, could payments coupled with commodity outputs be a policy option.

Weak jointness, or absence of economies of scope

In this case separate provision is optimal since, by definition, the provision of NCOs by de-linked measures and the provision of commodity outputs through imports is more efficient than joint provision. Market mechanisms should be used to reveal the most efficient provider whenever possible. De-linked measures should be based on the activity that generates the desired NCO or on the NCO itself.²⁶ Payments should not exceed the de-linkage cost (to be estimated by following the guidelines presented in the previous chapter). Who should finance the payment depends on the public good characteristics (including the geographical or spatial incidence) and could range from government to voluntary provision. These aspects are discussed below in the section dealing with strong jointness and market failure.²⁷

Examples: Payments for maintenance of hedges, historic farm buildings or other non-joint landscape or cultural features that are available to those who provide them by de-linked measures. Payments to providers are "performance" related in the sense that delivery of the desired NCOs is monitored and policed.

Strong jointness (presence of economies of scope) but no market failure

In this case, there is no need for policy intervention.

Example: A landscape feature related to a specific commodity (sunflowers, vines, terraced rice paddies) where provision by efficient producers is equal to or greater than social demand.

Strong jointness and market failure

In this case, payments will most likely be made to farmers. Unless the linkage is to the level of production itself or to the volume of a non-allocable input (*e.g.* linked to a fixed input or to a certain level of a variable input), the payment should be constant, regardless of the level of production and based on delivery of the NCO in question (NCO-linked payment).²⁸ The payment should not exceed the amount of price support that would be necessary to elicit the minimum level of commodity production necessary to also provide the required level of the NCOs.²⁹ In many cases, area payments conditional on delivery of the NCOs would be recommended since many NCOs are attached to land. Output coupled payments (*e.g.* output subsidies) to sustain this minimum level of commodity production would generally be inefficient since they are likely to stimulate the production intensity above this minimum level. If the linkage is to the volume of a variable non-allocable

input, the payment should be based on the non-allocable input. By definition such payments would be sufficient to ensure the continuance of farming. For example, it is possible to envisage headage payments, associated with stocking density restrictions in order to avoid excess supply or the creation of negative externalities (see Table 3 for possible types of payments). Who should finance the payments depends on public good characteristics, (including geographical or spatial incidence) and could range from central government to voluntary groups as detailed below.

Output coupled payments under the assumption that transaction costs are not included are an option only when a direct or fixed (one-to-one) linkage is observed between an NCO and production intensity at farm level. As discussed above, there could be a direct link between some NCOs and intensity-related non-allocable inputs, and this could imply, in turn, a link between the NCO and the commodity output. Nonetheless, that linkage is not fixed (one-to-one). This is because the farmer may choose the different input bundles to produce the same output, and there is always some degree of choice involved although the degree of choice varies by product, the level of production, scale and structure, by the physical and environmental conditions, the technology available to farmers, etc. Of course, a government could choose to regulate in a way that obliged the farmer to use technology that fixes the input/output ratio. This would be a measure, however, that the objectives, rationale and costs of which should be carefully examined (see the discussions on transaction costs in the next section).

The existence or nature of jointness between production intensity and food security can only be established if the guidelines presented in Annex 3 are followed. Again, it should be stressed that various factors including the difference in risks associated with different supply options should be carefully examined. Demand for food security could depend on current total production, production capacity, the relative level of imports or stockholding (or combinations of these with domestic production), the potential difference between demand and supply capacity under different emergency scenarios and other factors. People may feel indifferent to the degree of intensity at farm level when the total production in a country exceeds a certain level, which then may imply that their real interest is in production capacity and not production *per se* beyond that level. The demand for food security could decrease as the total production increases. These questions can only be answered empirically. The answers will reflect conditions and characteristics that are specific to each situation.

Negative externalities should be internalised correctly before payments, if any, to farmers are made to ensure that decisions are based on full production costs.³⁰ (See OECD 2001c for a more detailed discussion on the

reference level and the determination of who should bear the cost of addressing negative externalities).

Example: A landscape feature related to a specific commodity (sunflowers, vines, terraced rice paddies, pasture associated with milk or meat production,) where provision has fallen below the optimal level as a result of a reform induced fall in commodity prices.

Table 3. Examples of possible payment types when jointness is strong but when there is no fixed or direct linkage between NCOs and production intensity

Nature of jointness	Payment type	Payment amount	Payment condition	Negative externalities
Linked to land and fixed non-allocable inputs	Area payments: Payments based on area planted	See endnote 27	Farming practices need to meet the criteria that NCOs are provided in the quantity, quality and location desired.	Policies to internalise negative externalities should be in place
Linked to variable non-allocable inputs	Input-coupled payment: Payments based on input use (e.g. per employee for positive effects of agricultural employment)	Demand for NCOs per unit of the input	None	Ditto
Linked to variable non-allocable inputs; however, the linkage is not continuous	Input-coupled payments: Payments based on input use but with a ceiling on the level (or number) of inputs to be supported (e.g. headage payments for a landscape of pasture with cows)	Demand for NCOs per unit of the input	Farming practices need to meet the criteria that NCOs are provided in the quantity, quality and location desired.	Ditto

When jointness is "widespread"

Pure public goods only: Reflecting the widespread occurrence of the NCO, the payment could be “broad-based”³¹ by which is meant that it would be made available at the same rate in all areas. This solution should not be adopted if there are significant differences in demand for the NCO or in production costs between regions. If this is the case, a combination of broad based and geographically targeted payments could be optimal. Reflecting the pure public good nature of the NCO the most efficient provision is likely to be by central government.

Example: General landscape associated with agriculture in a country, where provision has fallen below social demand as a result of a reform induced fall in commodity prices. The payment could be for the specific landscape feature with the condition that the feature is preserved.

Local public goods: The basic strategy would be the same as for a pure public good with the exception that local government should, in principle, finance the payment.³² Local taxes would be the major financing sources.³³ If beneficiaries can be identified, an earmarked tax may be appropriate (e.g. beneficiaries of flood control could be assumed to pay through local property taxes). Technical difficulties may arise when areas benefiting from relevant NCOs are not the same. For example, landscape associated with commodity production in an area may benefit people living in that area while natural habitat associated with the same area may benefit people living in other cities as well. In these cases, negotiation among them is required to determine cost-sharing arrangements

Example: Each area has an agricultural landscape site mainly enjoyed by local residents. The payment could be made by each jurisdiction to farmers.

Club goods (or private goods): In this case, the potential for club provision is determined by the feasibility of setting up exclusion mechanisms (Box 13). Clubs in this context would include a wide variety of arrangements ranging from commercial firms to non-profit organisations, with the common feature that they would organise the transfers to farmers in return for NCO provision.

There may be considerable flexibility in organising excludability ranging from, for example, entrance payments to a particular landscape site to a levy on hotel revenues or a tourist tax. In both examples the revenue would be redistributed to the farmers whose production activities create and maintain the desired landscape. In the case of the hotel levy, strict excludability cannot be guaranteed, but if the site is sufficiently distant to

make day-trips difficult, the hotel levy could be considered as a sufficiently practical and accurate exclusion mechanism (*i.e.* in practice only those who stay in a hotel can enjoy the landscape).

Box 13. Some issues associated with setting up exclusion mechanisms

The technical feasibility of setting up exclusion mechanisms is not the only consideration determining the feasibility of club or market approaches. As discussed in the analytical work, some countries have laws or regulations guaranteeing free access to farmland. These arrangements reflect social, cultural or historical factors.

There are also equity related issues associated with excluding non-payers from the enjoyment of NCOs. in particular that the less-well off will suffer as a result of exclusion.

Careful attention should be paid to these issues which go beyond purely technical excludability. However, setting up exclusion mechanisms also brings advantages. Demand measurement, which is probably one of the biggest sources of government failure, can be avoided. Another advantage is that NCOs that are preserved by user charges may also have non-use values. which are also preserved.

Another example of quasi-excludability could be a trust,³⁴ collecting contributions from its members. In return, and subject to the necessary institutional or legal framework being created, the trust would partially transform non-use values into private values by making information about those non-use values available only to trust members through publication of newsletters. Of course, if there are use values for which property rights can be defined, creation of markets should also be pursued.

Government (both central and local) could play an important role in establishing the institutional infrastructure to encourage club creation.³⁵ This could include: defining property rights enabling clubs to charge their members, publicising information on NCOs to enhance demand, establishing institutional frameworks by which non-profit organisations can work effectively, preparing regulatory frameworks, and providing knowledge, training and research tools. For example, income tax exemption schemes for non-profit organisations could be a useful tool. A regulatory framework whereby clubs could be registered as corporate bodies could assist (for example, registered corporate bodies can more easily open bank accounts). If economies of scale exist, clubs covering wide areas may be established (even national level clubs may be possible).

Example: Formation of a national or local trust financed by member's contributions to pay farmers whose farming activity contributes to the maintenance of habitat necessary to the survival of certain species of birds. Such trusts could be aided by central and local governments in a variety of ways including the granting of charitable status, being given access to information about farmers in the areas concerned, etc.

Common property resources. Communities obtaining benefits from these NCOs³⁶ should collaborate to make payments to farmers whose commodity production is generating the NCOs. The role of the government (both central and local) could be confined to facilitating discussions among community members on the use of the NCOs including how the payments should be financed and organised. Alternatively, if the number of community members is large, local government structures could be used to organise a levy or earmarked tax which would be redistributed to the farmers providing the NCO.

Example: Regulating water supply capacity provided by farmers upstream. If the number of beneficiaries is small (*e.g.* only a few municipal water supply companies are using groundwater), co-ordination among them to make payments to farmers is practical and possible. Users of municipal water would pay eventually through their water charges.

Multiple NCOs consisting of a mixture of pure public goods and others: In this situation, it is possible to envisage a two-tier provision mechanism with a broad-based payment aimed at provision of the pure public good and a targeted payment aimed at provision of the other NCO(s). Then, financing should be shared by central government and other organisations in accordance with the demand for each type of public good.

Complementary relationships (or preference interdependence) on the demand side between pure public goods and other types of NCOs should be exploited where possible to avoid unnecessary interventions, especially by central government and to reduce costs. If, for example, local residents value local landscape more because the general population also appreciates the landscape, the latter could be automatically incorporated by the demand by the local residents for the landscape. Their "willingness to pay" might be sufficient to preserve the NCO without any intervention from central government.

Example: An area payment available locally for landscape provision (a local public good) could, by maintaining a particular type of farming in the area, also preserve biodiversity and habitat with pure public good characteristics. No central government intervention is required to ensure provision of these NCOs.

Multiple NCOs consisting of a mixture of local public goods and others but excluding pure public goods. Partnership between local government and clubs is likely to be the most efficient solution in this case. The types of partnership would depend on the characteristics of club goods with again the sequence starting with market/quasi-market/club provision.

Example: A levy on the tourism industry to generate agricultural landscape payments to farmers in a locality might supplement the financing of flood control by local government (**partnership** between commercial firms and local governments). Alternatively, the local government may want to co-establish trusts to organise provision of multiple NCOs, using contributions from members and from the local government (partnership between voluntary trusts and the local government).

When the scale factor of jointness is "geographically limited"

Pure public goods. The only difference here is that any payment should be targeted to the precise area in which the NCO is being generated and no broad-based payment can be justified.

Local public goods. The strategy should be the same as when the scale factor is "widespread;" *i.e.* local government should finance the payments to farmers.

Club (or private) goods. The only difference here is that the role of encouraging the creation of clubs should be a local government one.

Common property resources. Arranging collaboration by community members for the use and financing of NCOs might be more easily organised at local level. The role of facilitating such arrangements should be played by local governments.

When the scale factor of jointness is a "combination of widespread and geographically limited"

The same basic principles and strategies apply as before. It is possible to envisage a tiered or multi-layered system combining broad-based and more targeted interventions by the central government, or broad-based payments by the central government combined with payments by voluntary or commercial clubs, assisted by the appropriate level of government. As before, when different types of public goods are involved complementarities in demand as well as possibilities of non central government provision should be exploited to avoid unnecessary interventions and reduce costs. With the same objective in mind, there should be careful attention to sequencing.

Impacts of transaction costs on the policy options

Both the analytical framework and the empirical work suggest that transaction costs (TCs) might affect policy choices. Non-policy related TCs³⁷ could affect the feasibility of non-governmental provision. Policy related TCs could affect governmental options, both compared to non-governmental options and to each other.

Non-policy related transaction costs³⁸

Possible issues

In this context, TCs relate to market creation, the development of charging or exclusion mechanisms and other non-governmental strategies such as voluntary or club provision. For example, a potentially large number of people might wish to contribute towards preserving the agricultural landscape. However, the costs associated with gathering information on where and how to contribute could be so high as to discourage the formation of such voluntary schemes. Lack of trust between farmers and non-farmers in a community could result in high TCs and thus prevent the two groups from co-operating to preserve NCOs. TCs associated with the lack of well-defined property rights is a classic example of an obstacle to market creation. Reducing these TCs in order to encourage market and voluntary provision may therefore be an important issue and one in which many social, legal, cultural and technical factors come into play.

Policy implications

Sound institutional arrangements are necessary to reduce TCs. Defining property rights for use values is essential to encourage market or commercial type club provision, and may require legal changes. Preparing incentive schemes, whenever it is possible, to encourage voluntary contributions will be a prerequisite for any government intervention.³⁹ Existing social infrastructure should also be utilised to generate flexible arrangements that are not too costly as in community supported agriculture,⁴⁰ in which neighbouring non-agricultural communities support farming activities to preserve non-commodity outputs. This could be a good example of utilising social trust between farmers and non-farmers. Instead of formal contracts between farmers and non-farmers that may involve very large TCs, this approach is flexible concerning the relationship between these two groups, as in the case of vertical integration in the industrial sector.

Innovative approaches to set up exclusion mechanisms should also be tried. A "road pricing" scheme using the latest information technology could be applied to charge cars automatically when they enter into an area of

beautiful agricultural landscape if certain conditions are met (*e.g.* there are alternative roads, etc.). Investment in research and development could be an important role for the public sector.

From a policy perspective, reducing non-policy related TCs should be a continuous process, responsive to the potential provided by modern communication and information technology. Exploring ways of converting pure or local public goods into club or private goods should be viewed as a dynamic process.

Policy related transaction costs

Possible issues

Policy related TCs are defined in this paper as the administrative costs associated with designing, implementing, monitoring and enforcing different policy interventions.⁴¹ It has been suggested that the TCs associated with implementation of some policy options could be so large as to actually determine the optimal policy choice. In other words, when TCs are included the ranking of different measures according to their overall efficiency could be changed. If such a situation were to arise it would most likely involve a pure public good whose occurrence is widespread. In this case targeted policies may have to be compared with production-linked support. Specific examples could include the following:

Case 1: Targeted payments versus output subsidies. The assumption is that we are faced with a pure public good that is “widespread” and that economies of scope (although not direct or fixed jointness) and market failure exist. In most cases applying the analytical framework will lead to the implementation of targeted measures. The question that arises is whether the costs associated with the design, implementation, and monitoring of the targeted measure could be so large as to make a production-linked (by which is meant a payment made to everyone) measure such as an output subsidy (*i.e.* payments per output) more efficient. To answer this question several additional items of information are required.

The first obvious information required concerns the transaction costs associated with each of the options. Unless they are significantly greater for the targeted payment there is no issue. To make the correct comparison between the two options it is also necessary to know just how “widespread” the incidence of the public good is. If it does not occur in association with all or most of the areas in which the associated commodity is produced, then significant waste will be incurred in providing the production-linked measure to producers who do not provide the public good. In this case, a regionally differentiated measure (*e.g.* different payments for each region) could be considered and consideration given to the impact on TCs as well.

Secondly, it must be acknowledged that, except in the rare case of jointness in fixed proportions⁴², an output payment will not produce the same result in terms of the quality, quantity and location of the public good. There could therefore be under-supply of the public good in some areas and over-supply of the commodity in others.⁴³ In some circumstances, an output subsidy will generate larger negative externalities than targeted payments if measures to control negative externalities are not taken. In general, the greater the degree of technical substitution among inputs including non-allocable inputs generating NCOs, the greater the efficiency loss associated with the lack of precision. These costs should, of course, be considered in the comparison between the two options. On the other hand, if it is decided to impose some cross-compliance requirements (obligation to observe particular rules concerning farming practices) in order to improve the performance of the output subsidy the transaction costs associated with designing, and monitoring such arrangements must also be taken into account. It is only when all these factors have been accounted for that a precise evaluation can be made of the role of transaction costs in determining the ideal policy strategy.

Case 2: Targeted payments *versus* market price support (generated through a tariff). In this case, all the same arguments apply as for the output subsidy except that the application of the tariff has potentially smaller transaction costs associated with it than an output subsidy. On the other hand it results in a loss of consumer surplus which must be entered into the equation.⁴⁴ ⁴⁵ As with an output subsidy because the measure will not provide precisely what is required in terms of public goods, new costs to initiate and monitor regulatory measures may be necessary. Market price support and output subsidies may stifle any possibility of voluntary or club provision, thus eliminating a possibility for some cost saving.

On the other hand, market price support does not generate the kind of dead-weight losses associated with tax collection (*i.e.* consumers' surplus forgone due to a tax), and which occur with direct payments.⁴⁶ The loss of consumer surplus associated with market price support is conceptually equivalent to the dead-weight loss of a tax to finance payments to replace the market price support [see, for example, Corden (1997)]. The relative magnitude of each loss is an empirical issue. However, it should be noted that the taxes charged to finance payments would be broad-based (*e.g.* income taxes or VAT) so as to minimise the dead-weight loss. It could therefore be assumed that the dead-weight loss associated with payments policies (*i.e.* broad-based taxes) is smaller than that associated with market price support (*i.e.* a tax on a single product) (see, for example, Corden, 1997). See Table 4 for an illustration of major efficiency losses of different options.

Table 4. Major efficiency losses of policy options: an illustration

	Targeted payments	Output subsidies	Price support through tariffs
TCs	Large ¹	Medium	Small
Efficiency losses due to lack of precision	None ²	Yes	Yes
Efficiency losses due to forgone consumers surplus	None	None	Yes
Dead-weight loss associated with tax collection	Yes	Yes	None

1. Terms such as small, medium, large indicate relative magnitude. They have no quantitative implications.

2. Assuming that the information on jointness, market failure and public goods has been correctly obtained.

Other cases where TCs might matter — central *versus* local government provision. Economies of scale associated with provision of government services, if they exist, might favour direct provision of local public goods by central government. Probably such economies of scale do exist to some extent, explaining why debate on the optimal size of local government occurs in many countries. However, many examples of economies of scale relate, in fact, to co-operation between geographically close areas; *e.g.* setting up public companies for water supply covering multiple cities within the same hydrological boundaries; sharing fire engines by multiple municipalities; or merging two municipalities into one. In the case of NCOs with local public good characteristics, there may be ways of organising co-operation between several municipalities especially when demand and supply are not confined to a single jurisdiction. However, this does not seem to support the argument that economies of scale favour direct provision by central government. Nonetheless central government may have an important role to play in providing pure public goods such as research and development to value NCOs. Such information could be widely shared by local governments.

Joint *versus* separate provision when jointness is weak. Another argument is that TCs associated with implementing de-linked measures for each NCO might be costly and therefore a policy supporting joint provision could be more efficient. This argument can be incorporated into policy design by including, into the calculation of de-linkage costs, TCs unique to the implementation of de-linked measures (*e.g.* establishing new institutions for implementing the measures).

Measurability/availability of data to examine possible trade-offs

Almost no work has been done in the area of comparing TCs and efficiency losses associated with different policy options with the result that it is very difficult to gauge how important the issue might be. To try to overcome these difficulties the following sections propose some basic principles and guidelines to be followed.

As was the case in establishing the guidelines for operationalising and answering the questions derived from the analytical framework, an appropriate balance between precision and the availability of data should always be sought, in order to make the exercise as practical and meaningful as possible.

Some basic principles

First, as implied above, only TCs that are unique to the option under study should be taken into account. TCs that are common to all options can be ignored.

Existing administrative structures should be exploited. The very first step should be to investigate how existing administrative structures might be utilised.⁴⁷ Major policy changes may not always have resulted in substantial changes in administrative systems, implying that there is "room" for adjustment in allocating new policy tasks among the existing administrative structures. Examining experiences of government restructuring could also be useful to evaluate how much scope is available to use or adapt existing systems. In reality, we are interested only in the incremental costs, which may not necessarily be very significant in countries with very sophisticated information and administration systems.

In this context, consideration should also be given to using the existing administrative structures of local government and even NGOs (if any) with capacity, for example, to disburse funds (*e.g.* environmental trusts in some countries). This could be done on a contract basis between central and local government or between central government and NGOs.

Experience in implementing similar types of policies either in agriculture or in other sectors should also be studied when the design of new administrative structures is being considered, including indirect costs such as those associated with convincing relevant groups.

Even limited information may provide some policy guidance. Even though serious difficulties are anticipated in obtaining the required data, the effort should be made to estimate as many factors as possible, so that policy makers have some idea as to whether TCs are a real policy issue or not. For example, a targeted measure will be implemented unless the transaction

costs are so big as to offset the savings that would be generated by moving from a production-linked measure to a targeted one⁴⁸. Without being able to measure this precisely it should be possible to obtain some “ballpark” estimates which in most cases would be sufficient to inform the policy maker about whether he is really facing a policy dilemma (see next section).

Guidelines

First the alternative policy options must be clearly defined including payment methods, conditions, etc., and then the TCs associated with each option and the differences among them must be estimated, using an existing administrative structure as a benchmark. The main elements of this comparison are outlined in Table 5. The magnitude of each element depends on various factors such as the number of farms, the spatial distribution of farms, the existence or otherwise of measures that already involve making payments to farmers, possibilities of technical substitution of inputs (related to monitoring), and the social and cultural environment, etc.⁴⁹

Table 5. TCs associated with different policy options¹

Administrative activities	Targeted payments	Output subsidies	Price support through tariffs
Designing a policy (determining the modalities of payments (<i>e.g.</i> amounts, selection criteria, etc.), or defining cross compliance conditions).	X	X	X
Obtaining consensus on the policy² (informing the public of the proposed policy).	X	X	X
Collecting revenues (collecting taxes)	X	X	
Selecting areas (getting applications and judging whether they should be approved or not based on the selection criteria)	X		
Implementing the policy (disbursing the payment)	X	X	
Monitoring the policy (monitoring whether the condition required by the policy is met)	X	X (cross compliance)	X (Regulation)
Enforcing the policy (taking actions when the condition is not met)	X	X	X

1. TCs incurred by farmers (*e.g.* getting information on application guidelines, preparing and submitting applications, etc.) could be substantial enough to be taken into account.

2. It should be noted that this TC would not only occur with respect to a new policy, but also with respect to current policy; *i.e.* government needs to establish that the current policy is the most efficient option to address issues associated with NCOs and negative externalities.

Then, the magnitude of the difference in TCs should be examined. If a pragmatic judgement that the difference in TCs is "small" is possible, the next step of estimating the efficiency difference need not be undertaken. The cost to society, common for all options, can be measured by the difference between domestic production costs and the international price. We can think of it as a "virtual budget". The difference in TCs needs to be compared to this "virtual budget". Finally, differences in efficiency among the options must be quantified as far as possible. A few illustrative examples of attempts to estimate efficiency losses are shown below.

- For output subsidies, estimate the difference between the commodity production cost and the international price of the commodity output in areas where non-commodity outputs are not provided. Sum of the differences would be a proxy to the possible inefficiency associated with output subsidies.
- For price support through tariff, estimate the price elasticity of demand for the commodity output. Then, calculate the potential loss by approximating the decrease in consumers' surplus, which could be estimated by using: the domestic price of the commodity output; the international price of the commodity output; and the price elasticity of demand for the commodity output (see Annex 4 for more details).

The impact of TCs on policy choices

Considering the fundamental uncertainties associated with measuring efficiency losses prior attention should in practice be paid to examining the differences in TCs. If the differences in TCs are not substantial compared to the "virtual budget", they are unlikely to be a policy issue. In any event, all possibilities of reducing the TCs associated with targeted payments should first be sought. Only then should an attempt be made to compare the efficiency of alternative options.

V. The policy implications of missing information

Which information is likely to be unobtainable?

The information required to fully apply the analytical framework is extensive and often difficult to obtain. Even if significant investment is made to gather data, some gaps will remain. This problem of missing information may itself have a direct influence on policy choices.

There are two major areas where information gaps are likely. First, measuring demand for non-commodity outputs will always be a major challenge, especially when non-use values are involved. Experience in applying the many different methodologies that have been developed show

that they often provide very different values for the same non-market good. Unlike private goods for which the market provides the correct information to guide resource allocation, the accuracy of demand measurement can never be proven. Issues associated with demand measurement relate mainly to pure or local public goods. If club goods are involved, demand can be automatically revealed in the process of selecting members.

Secondly, predicting farmers' responses to price changes is generally difficult. Possible responses include the introduction of new technologies, reduction in production costs, conversion to different crops, a shift to less intensive farming, or the abandonment of land. Which response occurs depends on micro factors at the farm level such as availability of capital, access to new technology, the number of families dependent on farm incomes, etc. If policy makers cannot incorporate these factors there is a risk that support is provided to areas where, in fact, no market failure has, or is likely, to occur.

Establishing alternative policies where information is incomplete: institutional approach

Demand measurement: decentralising decision making

One of the main problems associated with demand measurement is that the hypothetical questions used (e.g. CVM) may not reveal people's true willingness to pay for public goods; they may behave strategically so that they can free ride on others' contributions. However, in situations where people have to make a decision on an actual contribution to the provision of public goods, they tend to reveal their true willingness to pay. For example, if they are asked to accept a tax increase to finance the provision of a public good knowing that the actual decision depends on their answers, they are likely to reveal their willingness to pay more accurately than in response to a hypothetical question.

Although this kind of poll has been used by some governments, there is a counter argument which says that the normal political process in parliament can accurately represent demand for various combinations of public goods. In other words, social demand for public goods is automatically reflected in the decisions made by parliament, through the democratic process. Obviously, the more information parliament members have on the nature of the goods in question and the real costs of providing them the more valid this argument becomes. However, a parliamentary decision will not be a reliable measure of social demand if it has been influenced by lobbying on behalf of vested interests other than those related to provision of public goods.

Local government initiative

The above discussion suggests that political decisions at local level⁵⁰ could reflect social demand for non-commodity outputs reasonably well as long as local governments have information on the nature of the public goods and the real costs (the economic costs that society needs to bear) of providing them.⁵¹ If the issue is one concerning local public goods, local governments are likely to have the information needed. If, in addition, they are financially autonomous, political decisions made at local level may be a very good proxy for demand measurement.

In practice, however, local governments are often financed by grants from central government in the context of a regional income distribution strategy. If this is the case, and the grants are earmarked for specific activities such as the preservation of non-commodity outputs, there is a risk that local governments will overstate demand in order to free ride. Then, local government decisions may no longer be a good representation of social demand. In this case incomplete information remains a policy issue.

A possible option would be to establish a mechanism under which the decision on how to spend the grants is decentralised to local government (*i.e.* stop earmarking the grants for specific uses). In this case, local government would be forced to estimate the opportunity costs and trade-offs associated with public good provision in order to decide on an optimal expenditure pattern and there would be little incentive to overstate demand.

Where we are faced with a mixture of pure and local public goods but are not able to measure demand a possible option is for local government to provide payments to farmers based on the institutional arrangement recommended above. If demand for local public goods outweighs that for pure public goods, payments at local level might be sufficient to ensure provision of commodity outputs as well as NCOs and the uncertainty about measuring demand for the pure public good is no longer an issue.

Government/voluntary partnerships

The existence of voluntary groups (*e.g.* environmental trusts) supporting preservation of non-commodity outputs by making their own contributions indicates that there is demand for those NCOs that is at least equal to the funds collected by those groups. If these non-commodity outputs are pure public goods (*e.g.* non-use values), the "real" demand for them may be greater because of free-riders. There is therefore an argument that governments should supplement the funds collected by voluntary groups. However, once financial support from the government is guaranteed, the voluntary groups have strong incentives to rely on the support.

This kind of problem can be solved. Central government could decide to impose a ceiling on the support it provides, for example, by not allowing it to exceed some percentage (say, 50%) of the voluntary funds collected. In this case, voluntary groups have an incentive to continue to collect funds from their members. This "matching funds" type of arrangement has some other advantages. Support would be provided only to areas where there is concrete evidence of demand for non-commodity outputs⁵². Central government can minimise the administration burden by relying on voluntary groups. Although such arrangements have no theoretical foundation the potential benefits are considerable, justifying adoption of a pragmatic approach.

The approaches described here may not always provide the solution when information is incomplete. Particularly intractable is the case of pure public goods where no voluntary organisation has intervened⁵³ in a region. Where they are observed resources should be allocated to collect as much information as possible on demand.

Equalising payments to the difference between production costs and international prices, not to demand

As stated in the previous chapter, payments could be based on the cost of supplying the non-commodity output rather than on demand. By definition, payments are justified only when the cost is smaller than demand.

If payments are made on this basis, the precise value of demand may not be required. In applying demand measurement methodologies such as CVM or conjoint analysis, for example, people would be asked if they are willing to pay the cost in question to preserve non-commodity outputs. In this case, the measurement is more reliable than when vague, hypothetical or open-ended questions are posed. In practice, many agri-environmental policies may implicitly assume that demand for reductions (or increases) in negative (or positive) externalities is greater than the cost of the measures, since often such measures are implemented without demand measurement.

Farmers' responses to price changes: gradualism

When it is difficult to predict how farmers will respond to a price decrease, a gradual approach that allows marginal changes in commodity and non-commodity production to be observed could be the solution. Until non-commodity provision changes in a way that amounts to market failure, no policy is required. Once market failure is observed or firmly predicted, the information needed to determine whether policy intervention would be required or not may be sought. Policies based on this approach could be more efficient than those based on simple assumptions concerning response to a price change.

Another advantage of this approach is that marginal values of NCOs may be accurately observed. As stated in the previous chapter, this is preferable to estimating total values in defining the most efficient policy. For example, disappearance of a small part of the landscape could be acceptable to a local community while bigger changes would cause problems.⁵⁴ This implies that marginal values increase as the total supply of a non-commodity output falls. For some widespread non-commodity outputs (*e.g.* food security), marginal values may be accurately revealed by this approach.

This approach has the added advantage that it copes with concerns about irreversible changes in provision of NCOs. The gradual approach allows policy makers to take actions exactly when they are needed. As long as the loss is marginal, policies to stop the losses can be put in place. For example, if a marginal price change causes land abandonment and consequently irreversible loss of valuable landscape in an area, a policy could be quickly established to prevent any further losses.

Similarly this approach could reduce uncertainty about the impacts of TCs on policy choices. Gradual changes would provide the existing administrative structures with sufficient time to adjust to the new policy requirements.

This approach could also lead to automatic incorporation of dynamic aspects of relevant parameters, such as changes in the international prices of commodity outputs.

As the gradual reform proceeds, the introduction of market mechanisms to determine the existence or non-existence of economies of scope could be more easily implemented. This is because farmers increasingly face the true costs of providing NCOs as reform goes ahead.

Finally, the gradual approach could also contribute to establishing clubs and trusts because it would provide them with sufficient time to become established. If a gradual approach is taken, people have time to observe the marginal changes in the provision of NCOs and to decide whether they would like to contribute to preserving those non-commodity outputs. This would also allow central and local governments to explore the possibilities of partnership before simply proceeding to policy intervention.

The gradual approach requires a monitoring system. Any policy actions should be based on the information provided through monitoring the changes as they occur. For efficient and effective monitoring, clearly defined indicators are needed. Environmental indicators for agriculture such as those developed by OECD could be used for this purpose (OECD, 2001j). The importance of a monitoring system favours decentralised decision-

making. The changes occurring depend on specific factors and vary substantially among regions. Change should therefore be monitored at local level.

There may be a risk of inducing moral hazard with the gradual approach. Farmers may not adjust their farming practices in the expectation that support will be forthcoming. To avoid this, the adoption of a structural adjustment strategy could be made a prerequisite for receiving non-commodity output related support.⁵⁵

Sequencing

Sequencing is important in itself in order to avoid inefficient outcomes, but may also be important in surmounting problems related to missing information. The following general guidelines are proposed based on the analysis to date.

First, policies to alleviate negative externalities where they exist should be in place before or alongside any examination of possible policy intervention for NCO provision. This is a fundamental recommendation related to efficiency in general as the costs associated with negative externalities have to be taken into account (*i.e.* simultaneous consideration of both negative externalities and NCOs). In addition it avoids the otherwise difficult task of trying to estimate the cost of internalising negative externalities. Simultaneous consideration is also important if the imposition of a tax or regulation as a means of reducing a negative externality led to a fall or to the elimination of production of a commodity output causing also the loss of some NCOs. To avoid this, measures to preserve NCOs should be put in place simultaneously. This situation is, however, not likely to occur when agricultural support is still high compared to production costs (*i.e.* when increases in production costs due to policies to reduce negative externalities are less likely to lead to the termination of production of the commodity).

Secondly, policies to encourage structural adjustment that is conducive to the preservation of NCOs (*e.g.* increasing farm size for land intensive products such as cereals) should be implemented before or alongside any measures (if necessary) to address NCOs directly. This is important because farm structure affects the level of provision of both positive and negative externalities. Support for the preservation of NCOs may be a disincentive to otherwise beneficial structural adjustment.

Thirdly, where possible market mechanisms should always be tried to determine economies of scope or to reveal demand (Box 5).

Fourthly, institutional arrangements for encouraging non-governmental provision, whenever feasible and efficient, should be established as early as possible in the process. Otherwise, non-governmental options will not even be tried. For example, tax exemptions for voluntary groups such as trusts, as already observed in some places, should be put in place before more direct policy interventions are considered. Governments should also be prepared to act as facilitators to co-ordinate people interested in preserving NCOs at an early stage. Similarly for schemes involving mixed voluntary and governmental financing.

Fifthly, in the case of NCOs of a local or regional nature decision making should be as decentralised whenever feasible and efficient although this does not preclude financing from central government. Arrangements for decentralised decision making should be put in place at an early stage if they do not already exist. This measure should of course be consistent with the government's overall strategy for demarcating the responsibility of the different levels of government. For example, decentralisation of decision making on NCOs to the lowest level of government would not be appropriate if the general policy is towards centralisation to a higher level to benefit from economies of scale.

VI. Equity, stability and international spill-over effects

The analytical framework indicates that policy implications based exclusively on domestic efficiency criteria may conflict with other concerns including equity, stability and international spillovers. If policy makers could weigh these considerations, there would be no particular problem. In practice, however, it is extremely difficult to define weighting factors.

For example, suppose we have three policy options, and each is ranked as follows with respect to efficiency, equity, stability and international spillovers:

	Domestic concerns			International spill-over effects
	Efficiency	Equity	Stability	
<i>Policy A</i>	1 ¹	2	3	3
<i>Policy B</i>	2	1	1	2
<i>Policy C</i>	3	3	2	1

1. These numbers represent rankings and are not additive.

Policy C clearly ranks below Policy B from a domestic point of view. We cannot say if Policy A is preferable to Policy B. Therefore, the choice should be between Policy A and B. However, if we take international spillovers into account, all policies become possible.

It is therefore important to examine how the optimal policy proposed from an efficiency perspective compares to other policies when the other considerations are included in the evaluation. If the best strategies from the efficiency perspective are still the best from an equity, stability and spill-over perspective there is no policy issue. If, however, there are trade-offs policy makers need to understand their nature even if quantifying the trade-offs is difficult.

Equity (income distribution)

There are two equity issues in the context of the provision of non-commodity outputs⁵⁶ as for public good provision in general. One is related to who benefits from the provision of non-commodity outputs while the other relates to who bears the cost. The former arises when demand for NCOs is income elastic (*e.g.* disappearance of an NCO will affect the better-off disproportionately).

Decentralisation and equity

Decentralisation emerges as a key recommendation of this report whenever local public goods are involved. However, decentralising decision making, if accompanied by decentralised financing, could conflict with an objective to redistribute income among regions. This case is presented as Option 1 in Table 6. Only regions that have sufficient financial resources will be able to preserve NCOs that are local public goods.

To alleviate the problem, there are two possibilities. One is that the central government would directly provide the finance for all or part of the payments to farmers through an ear-marked provision. It could be thought of as the local government sending a bill to the central government for the costs of providing the NCOs. This is presented as Option 2 in Table 6. Alternatively local government could design and implement the payments from a general envelope received from the centre. Under this process, local government decides on how to allocate the available finances among all the different uses competing for funds in that locality. In fact this procedure (Option 3 in Table 6) is used in many countries to address issues associated with provision of local public goods and regional income distribution (Box 14).

Regarding the cost implications, as long as demand has been measured accurately all of these options aiming specifically at addressing issues associated with regional income distribution are neutral with respect to

efficiency (assuming that there is no difference in TCs among them). In other words efficiency is not affected by who finances the payments. When both efficiency and equity are considered, options 2 and 3 involving central government financing are better. Regarding benefit implications, all options are neutral.

**Box 14. Adjusting income distribution among regions:
grants to local governments**

Although transfers from central to local government (or from wealthier to poorer local governments: horizontal adjustment) are common in developed countries, the way in which the level of grants is determined differs. There are basically two types (for example, see a study conducted by Price Waterhouse Coopers (2000), covering 19 OECD countries). One is to equalise the revenues (*e.g.* per head of population) of local governments and the other is to equalise the level of provision of basic services. The latter obviously requires more complicated modalities in determining the level of grants because standard demand for local services or the minimum level of those services needs to be established (for example, "Standard Spending Assessment" in UK).

**Table 6. Possible options to address regional equity
(demand can be measured)**

Policy option	Efficiency*	Equity	Trade-offs
<i>Option 1:</i> Targeted payment to be implemented and financed by local governments (<i>e.g.</i> by tax increases)	High	Less equity	Inferior
<i>Option 2:</i> Targeted payments to be implemented and financed by central government	High	Reasonable equity	Non-inferior
<i>Option 3:</i> Targeted payment to be implemented by local governments, of which the financing depends on general, non-earmarked grants from the central government	High	Reasonable equity	Non-inferior

* Assuming no substantial difference in TCs.

However, the picture is changed when demand measurement for NCOs is inaccurate. When central government directly finances the payments, local government has strong incentives to overstate the demand in order to free ride on the contribution of the central government (Table 7). This does

not occur if the decision on allocating grants lies with the local government. In this case, option 2 is less efficient than options 1 and 3 and the choice should be between these two (again, assuming no difference in TCs). Regarding benefit implications, all options are neutral. It then emerges that option 3 is superior because it is more equitable while achieving the same efficiency as option 1.

**Table 7. Possible options to address regional equity
(demand measurement is difficult)**

Policy option	Efficiency *	Equity	Trade-offs
Option 1: Targeted payment to be implemented and financed by local governments (<i>e.g.</i> by tax increases)	High	Less equity	Inferior
Option 2: Targeted payments to be implemented and financed by central government	Low	Reasonable equity	Inferior
Option 3: Targeted payment to be implemented by local governments, of which the financing depends on grants from the central government	High	Reasonable equity	Superior

* Assuming no substantial difference in TCs.

Price support and equity

It has been shown that unless the TCs associated with targeted payments outweigh the efficiency loss associated with price support, price support cannot constitute the most efficient policy option to address non-commodity outputs. What are the equity implications of price support?

Price support could be considered, as discussed in the previous chapter, as an earmarked tax on food. This "tax" on food has a disproportionate adverse impact on the poor who spend a greater proportion of their income on food than the better off. In other words the implicit tax is regressive.⁵⁷ A payment policy financed from taxes is better than price support from an equity point of view because income taxation is usually progressive and, in many countries, lower VAT rates are charged on food. In addition, if demand for a non-commodity output is income elastic (*e.g.* landscape), the revenue collected by the "tax" on food could benefit the rich more than the poor. Then, this "tax" could transfer income from the poor to the rich. But what if demand for a non-commodity output is not income elastic? A

possible example is food security. Then, the revenue collected by this "tax" would not necessarily benefit the rich more than the poor.

In sum, as the equity implications of price support are generally negative and (without taking into account TCs) it performs badly on efficiency grounds also, a trade-off situation between market price support and an alternative policy option can only occur if the level of TCs is such that price support is the most efficient strategy.

Policy stability

Policy stability could be a major concern both to farmers and consumers. Farmers may not be able to establish long-run management plans unless they are confident that policies will be implemented in the long term. Consumers may lose benefits from non-commodity outputs if a policy is suddenly terminated.

Payments and price support

Potential differences in stability between price support and payment policies may be reduced or avoided by establishing appropriate institutional arrangements. For example, concern that fiscal conditions could bring an end to payments could be offset by the establishment of long term contracts between farmers and central governments. Regulations which currently prevent central governments from making long term financial commitments,⁵⁸ should be amended to increase stability of the payment policies.⁵⁹ Long-term planning by central governments would give a clear signal as to the stability of the relevant policies.

Payment policies and non-governmental options

Another possible choice with different stability implications could be between non-governmental provision by a club and a payment by governments. Generally, the financial foundation of a club would be less stable than that of government. There may be significant variability in the revenue raised by clubs from year to year causing uncertainty among farmers. This issue could be substantive when payments are large.

Unlike the financing of investment projects in which the fundraising is done in one shot, clubs involved in preservation of NCOs need a stable and recurrent source of revenue. This is an issue of financial management and there should be various ways to address it. Revenue could be put into "funds" that allow the establishment of long-term contracts with farmers. Where partnerships have been established between clubs and governments, the financial contribution from the latter could stabilise the overall revenue situation. Governments could also help clubs to improve management capacity.

If farmers themselves are members of and involved in the management of clubs, the development of trust might result in a more stable situation than when contracts are established between farmers and non-farmers.

International spill-over effects

Where it has been established that there is weak or no jointness (absence of economies of scope) allowing for separate provision of commodity and NCOs there are no effects on production or trade, hence no unwanted spillovers and no issue for international trade. If economies of scope and market failure exist, policy measures to address non-commodity outputs will inevitably have some effects on production and trade. Nonetheless, by focusing the measures adopted on the NCO itself, and by applying them at the appropriate spatial level and not on a commodity, unwanted production and trade effects can be minimised. In many circumstances, applying these rules will mean that the best policy option from a domestic point of view is also the least trade affecting. Where this is the case there is no additional policy issue from an international perspective.

The work on the policy evaluation matrix (PEM) indicates (OECD, 2001*i*) that area payments have smaller effects on production and trade than input or output subsidies or price support.⁶⁰ The PEM model investigates the impacts of an increase in a stylised area payment that is completely untargeted. The analytical framework and the preceding text suggest that, in reality, an area payment related to multifunctionality is likely to be targeted geographically, and to be conditional on cross-compliance with respect to farming practices. If these conditions hold and the level of the payment is a reasonably accurate reflection of the demand for the NCOs in question, the risk of conflict with international commitments can be significantly reduced or even eliminated.

However, if the best policy option has large effects on production and trade, there is potential conflict between a country's sovereign right to pursue the best strategy and its obligations to minimise the trade effects of its policies. If this occurs the issue relates essentially to income distribution among countries.⁶¹ The likelihood of a significant issue arising depends on whether all countries, importers and exporters, take the necessary steps to internalise negative and positive externalities.

The following guideline is proposed to deal with this situation. As the present discussion suggests, TCs are generally the only factor that could result in output subsidies or price support (*i.e.* the most trade affecting-measures) being determined as the best strategy.⁶² The first step must therefore be to investigate whether the most production and trade-affecting measure is truly the first best option through a strict application of the analytical framework.

Secondly and most importantly, countries (both importers and exporters) wishing to implement policies with large production and trade effects should make those policies and the rationale behind them completely transparent. However, it is once again acknowledged that the size of spillovers may be affected by other countries actions or policies, particularly if the countries in question are "large".

Table 8. Rank ordering of policy effects by support measure

Rank order *	Impact on production	Impact on trade	Impact on world prices
Group 1	IS	IS	IS
Group 2	OUTS (all)	MPS	MPS
	OUTS (main)	OUTS (main)	OUTS (main)
	MPS	OUTS (all)	OUTS (all)
	AP (main)	AP (main)	AP (main)
Group 3	AP (all)	AP (all)	AP (all)
	HE	HE	HE

Notes: *Rows are ordered from larger to smaller impact on production, trade and prices, but from smaller to larger transfer efficiency.

IS: Payments on input use; OUTS: Payments based on output; MPS: Market price support; AP: Payments based on area planted; HE: Payments based on historical entitlements; all: provided to all crops; main: provided to the main crop

Source: OECD (2001i).

VII. Conclusions and policy implications

The first phase of the work on multifunctionality concluded with the adoption of an analytical framework, which, when correctly applied, would guide policy makers to optimal strategies and policies. A first attempt to test the analytical framework was undertaken in the context of the workshop held in July 2001, when a group of experts assembled information already available from governments or from research activities. This exercise clarified many issues but demonstrated also that much information was missing. The current report tries to go a step further by developing the operational questions and guidelines necessary to elicit the required information. This step is a prerequisite to a systematic and transparent application of the framework. This section attempts to summarise the conclusions and draw the policy implications from the broad range of work, analytical and empirical, undertaken to date.

This report begins by defining a set of questions that is intended to be as operational and practical as possible. They are specific to each of the NCOs examined. Their intent is:

- to establish the nature and degree of jointness between agricultural production and a sample of the most often cited “NCOs” and negative externalities, and
- to establish whether, and in what circumstances, market failure calling for government intervention, is occurring.

It is emphasised that these questions can only be definitively answered when all the multiple NCOs and negative externalities associated with agriculture in a given area have been taken into account. A further set of questions aims to identify if the NCOs are public goods, because this factor is key in determining the nature of the most efficient intervention and who should finance it. It should also be emphasised that market mechanisms may be the most efficient and accurate way of revealing some of the information required and should be used as a way of answering the questions whenever feasible.

This exercise leads to the development of a policy table (Table 2). It defines a number of benchmark policy options to be applied according to the degree of jointness (existence of economies of scope), the existence or likelihood of market failure, and the spatial and public good characteristics of the different NCOs.

The report then goes on to define and discuss the circumstances in which the transaction costs associated with different policy options might be such as to overturn a policy implication arising from the policy table. The issue of missing information and its possible implications for the validity and practicality of the analytical framework is examined in some detail. A number of practical implications are drawn about how to overcome this type of problem. Finally, the report deals with a number of concerns that are not related to economic efficiency. Equity, stability and international spillovers are each examined. As with transaction costs, the question asked is whether and, in which circumstances a benchmark policy implication derived from the table could be overturned.

The combined knowledge derived from the analytical framework, the empirical work, in-depth review of the literature on this and related subjects and the exercise to operationalise the framework that has just been described, allows some general conclusions to be drawn and some specific policy implications to be derived from them.

On jointness

The investigation into economies of scope is essential to translate the degree of jointness into a policy-oriented indicator.

Jointness is weak (and therefore economies of scope unlikely) with respect to some of the NCOs that are cited as pertaining to the multifunctionality of agriculture. This can be asserted with some confidence with respect to cultural and heritage features in the countryside that are not directly linked to agricultural production, and with respect to agricultural employment in most OECD regions.

Where there is jointness (and therefore economies of scope), it rarely if ever depends directly on the level or intensity of production. Usually, it is dependent on some aspect of the production activity (maintenance of dykes for flood control) or on the use of a factor of production (land, animals). Another way to express this is that some NCOs depend on the continuance of a certain level of production, but do not require any output beyond that level.

Is there jointness that is fixed (one-to-one) or direct in practice? There may be some indirect relationship between NCOs and production intensity when NCOs depends on the level of variable inputs (*e.g.* the value of pastoral landscape may increase as the number of cows increases up to a certain threshold). However, even in this case, the relationship is not fixed (one-to-one) because of the possibility of technological substitution among production factors. The degree of technical substitution possible varies by product, the level of production, scale and structure, by the physical and environmental conditions, the technology available to farmers, and the regulations applied to farming practices, etc., but there is always some scope for such substitution to occur. Continuing with the example of a pastoral landscape, stimulating milk production (*e.g.* by supporting the milk price) could lead to intensive feedlot production, which is exactly the opposite of what was desired. In the case of food security it is sometimes argued that there is a direct linkage between an NCO and production intensity up to some threshold level of production. In this as in all cases the nature of jointness should be examined carefully by following the guidelines presented in this report.

Finally, with respect to the positive externalities of agricultural production, they are in many cases specific to a particular site, locality or region. It is not very common for them to be associated with all agricultural production in a country or all land in agricultural production.

Negative externalities cannot be ignored in designing policies for NCO provision as their association with agricultural production is, in many cases,

strongly joint.⁶³ They are often linked to the use of inputs, although here also the nature of the link depends on the products, farming practices, the production level and physical conditions. They are generally caused by the intensity of agricultural production and often increase with it if measures to reduce them are not taken. Examples are pollution, landscape destruction, and loss of habitat and biodiversity. It should also be noted that converting land to agricultural use can have negative impacts on the environment, even when farming is extensive. To sum up, in applying the analytical framework the nature and strength of jointness should also be carefully examined in the case of negative externalities.

On market failure

This is a complex question requiring extremely careful consideration and demanding some investment to elicit the information required. The situation of interest is one in which commodity prices fall as part of a reform process and imports are permitted to meet domestic demand. For market failure to occur the gains through the elimination of high cost production and any reduction in negative externalities must be weighed against any loss in NCOs. None of these outcomes is easy to predict. The nature of farmers' responses is crucial. There are many possible forms of adjustment. Not all of them will lead to a loss in NCOs large enough to provoke market failure. The most efficient farmers who could compete with international prices may increase the size of their farms or may change their farming systems in a way that is actually beneficial to NCO provision. Land abandonment or switching to production of commodities that have no or smaller associated NCOs would, on the other hand, have negative effects, although some land use changes would have positive effects.

On public goods

It cannot be assumed, once again, that all the NCOs exhibiting jointness and market failure are public goods. To the extent that there are use values associated with them, or if their spatial incidence is limited, there may be possibilities of market creation through the development of charging or other exclusion mechanisms⁶⁴ (see Box 13 for a discussion of equity and other issues associated with setting up exclusion mechanisms) or through voluntary provision. Where different NCOs occur simultaneously there may be scope for exploiting complementarities between them in order to minimise intervention and reduce costs. There will also be situations, often where non-use values are strong, in which policy makers are faced with a pure public good. In these cases provision will usually be through direct intervention by some level of government.

How significant are transaction costs?

Transaction costs will be determinant if the difference in transaction costs between policy options is greater than the difference in efficiency between them. From the menu of policy options available, market price support mechanisms or output subsidies cause the largest efficiency losses (except if jointness is widespread and fixed (or direct): to date, no systematic attempt has been made to examine jointness empirically. These efficiency losses relate to distortions in resource allocation in commodity production and consumption. Given what has been found concerning jointness, production-linked measures are also unlikely to deliver NCOs precisely in the required quantity, quality or location. To improve their performance with respect to NCO delivery, it seems inevitable that regulatory, cross-compliance or accompanying measures would be required. Design, implementation and monitoring of such measures would also incur transaction costs. Implementation conditions and the systems for monitoring compliance that are put in place are important in determining the level of transactions costs.⁶⁵ The transactions costs of different policy options will also be affected by factors such as the number and the spatial distribution of farms, the existence or otherwise of measures that already involve making payments to farmers, the scope for technical substitution of inputs (related to monitoring), the efficiency of government or its agencies and certain aspects of the social and cultural environment.

Modern communication and information technology may create potential to reduce transaction costs, both those related to policy and non-policy options⁶⁶ as may increasing public awareness and involvement on the part of both farmers and non-farmers. Transaction costs, although not easy to measure, are much more measurable than some of the other parameters needed to define the optimal policy choice. Transaction costs associated with different measures should therefore be measured early in the sequence. In this way, policy makers have at least an approximate idea of their relative significance and hence of the likelihood that they could be the deciding factor in the choice of policy option⁶⁷ (see also endnote 49).

Incomplete information

It is expected that difficulties will be encountered in assembling the information required to apply the analytical framework. These relate particularly to measurement of demand for NCOs, to predicting farmers' response to policy changes and, in some circumstances, to estimating de-linkage costs. Several possibilities are put forward to overcome these problems. They include, whenever feasible, constructing "market" tests set up to reveal de-linkage costs by getting farmers and non-farmers to bid for NCO provision. Gradualism is recommended as a device to surmount

difficulties in predicting responses to policy change. This recommendation is particularly important when policy-makers are faced with potentially irreversible losses of NCOs. A progressive approach has already been recommended by Ministers (for example, in the 1987 principles) and should be easy to apply as, in reality, the process of policy reform has, with only a few exceptions, been extremely gradual. Careful sequencing is suggested as a way of testing the potential for non-governmental provision. In particular, institutional development and facilitation of voluntary provision should, whenever possible, precede direct intervention so as not to stifle the former. Decentralisation is proposed as a way of avoiding free riding on central government budgets, to exploit complementarities between different kinds of NCOs with local public goods characteristics and more generally to avoid "government failure". Provision of local public goods (*e.g.* local roads, water supply) is already the responsibility of local governments in many countries and sometimes even national public goods (*e.g.* primary education) are managed by local governments.

Finally, incomplete information should not be a pretext for inaction. Even incomplete information will assist governments in choosing the appropriate strategies although reasonable efforts to collect relevant information should be made. Policy changes, in many domains, are made with imperfect information. The recommendation that reform be progressive and carefully monitored should allow many of the information-related difficulties to be overcome.

It should be noted that there is a "hierarchy" in the information requirements in the sense that the answers to one set of questions may preclude the need to answer the others. For example, if there is no or weak jointness, it is illogical to try to answer the remaining questions. In particular, it is not relevant to try to ascertain if market failure will result from agricultural policy reform. Finally, the process of gathering the information is important in itself, creating a greater understanding among policy-makers and stakeholders of the issues and acting as a powerful communication device if undertaken with the appropriate level of transparency.

Dynamic aspects, structural adjustment

On-going economic, social and demographic changes in our societies must be kept in mind if the analytical framework is to be applied successfully. An obvious example concerns international prices. These are generally used as a proxy for the opportunity cost of commodity production. If the country in question is large, reform may lead to an increase (or decrease) in imports (or exports) large enough to cause that international price to increase (or decrease). The economic models that are used to

estimate the effects of policy changes usually automatically estimate such adjustments. It should also be noted that international prices will be affected by the long-run development of global agriculture, including sustainability.

It is important to facilitate beneficial structural adjustment. For example, if there are impediments to farm enlargement or leasing, farmers will not be able to change to extensive farming systems to preserve NCOs or their livelihoods, because they cannot acquire more land. An important prerequisite for application of the analytical framework would, therefore, be to ensure that beneficial structural adjustments can take place following reform.

More generally, changes are occurring in our societies that will influence both the supply and demand for NCOs. Those that are beneficial for NCO provision should be facilitated. Many farm households are no longer exclusively dependent on agriculture. These households engage in other activities, on or off-farm. There are increasing numbers of hobby and retirement farms. Their behaviour may be quite different from households that are totally dependent on farming. In particular, there may be a segment of households, occupying a significant amount of space, that has the resources, and commitment to work towards the preservation of threatened NCOs, and who do not need or wish to farm profitably. The possibilities of this type of structural development could be facilitated and exploited to maximise the potential for voluntary and club provision of certain NCOs. Similarly, society's demand for NCOs is not static and will evolve with income, with education and many other factors, which should be kept under review.

Policy implications

A number of policy implications emerge from the analysis undertaken. Given the nature of the information requirements, actual policy design must necessarily be left to each country or area.

- The first step in policy design should always be to try to apply the analytical framework.
- This should be done in as transparent and systematic a way as possible. Attention must be paid to the trade-off between the costs of eliciting the information and the level of precision actually required to make common-sense policy choices. The risk of applying inappropriate policies should also be taken into account when determining the appropriate trade-offs.
- The nature of the negative externalities and NCOs observed in each area should be defined in specific, quantifiable and verifiable terms. Taking all NCOs and negative externalities into account simultaneously is also critically important.

- When there is weak jointness, the intervention should always be targeted to the NCO itself and should not be linked to any production activity because, by definition (weak jointness – no economies of scope), de-linked measures are always more efficient.
- When there is strong jointness, the existence or non-existence of market failure needs to be carefully examined taking into account both NCOs and negative externalities. If there is no market failure, no policy intervention is required.
- Where there is jointness and market failure, the intervention could in principle be aimed at the NCO, or at the source of the jointness, but in all cases should be conditional on delivery of the NCO. This would, at the same time, ensure supply of the NCO and limit efficiency losses through unwanted production, consumption and trade effects. The only possible exception relates to fixed (or direct) jointness. To date, no systematic attempt has been made to examine jointness empirically.
- When intervention is aimed at the source of the NCO, it should target the activity or factor most strongly related to the NCO and, if there is a choice of policy instrument available, should avoid activities or factors directly related to production intensity. If the only available strategy involves targeting a non-allocable input related to intensity, the incentive should not be provided beyond the level at which the direct linkage disappears or becomes negative.
- The intervention should always be spatially/geographically targeted unless the NCO is widespread or national in character, i.e. associated with all or a large proportion of the production or agricultural land in a country.
- Transaction costs have to be taken into account in determining optimal solutions. Careful attention needs to be paid to ensuring that all costs including losses in efficiency associated with different options are included.
- If a planned intervention is “distant” from the NCO itself (e.g. if generalised area payments or production-linked measures are in place) specific regulatory or cross-compliance provisions must be put in place to ensure that the required NCO is actually produced in the quantity and quality required.
- The administrative or political level at which policy decisions are taken should coincide as closely as possible to the geographical occurrence of the demand for NCOs.
- All policy interventions should be carefully monitored to ensure that the desired outcomes are being achieved. All inputs (payments, etc.) and outputs (NCOs) should be quantifiable and quantified.
- If there is significant uncertainty about outcomes a progressive approach to reform is recommended. This would allow timely correction if undesired outcomes emerge.

- More generally, comprehensiveness is important. Negative externalities should be internalised, whenever feasible and necessary, using the “reference level” as the benchmark that defines when a negative externality is occurring (OECD, 2001c). Institutional developments to allow market, voluntary or club provision should (when such are optimal) precede direct government intervention. If it does not, non-governmental provision will be stifled.

Which policy instruments?

It is not the purpose of this report to make specific policy recommendations for specific situations. What is proposed here is a blueprint which, when applied, will lead governments to optimal strategies. Assembling the information necessary to make those decisions is the business of individual governments. Nonetheless, this report and the analytical and empirical work that preceded it, allow some general implications about appropriate policy instruments to be put forward.

The possibilities available range from market creation and voluntary provision on the one hand to output subsidies and traditional market price support maintained through border protection, on the other. Market creation and different mechanisms for voluntary provision are better in the sense that they can correctly capture demand for NCOs and should be exploited as fully as possible before direct government intervention is undertaken.

When the need for government intervention (for example, to avoid market failure caused by loss of jointly produced NCOs following a reform of market price support) has been established, the analytical framework, the empirical work and this report all suggest that targeted payments are likely to be the most desirable option from the point of view of efficiency, equity and international spillovers. Targeting in this context is a multi-layered concept that includes geographical or spatial targeting, but also targeting to the specific non-commodity output that is desired. In some situations targeting to the specific non-commodity output being sought may be relatively easy – hedges, habitat conditions etc but in others it may be more difficult – as in the case of landscape associated with a commodity output. In some situations it will be necessary to target a production factor or activity that is at the source of the NCO. In this situation it is imperative that the measure remain decoupled (de-linked) from the level or intensity of output and that there is strict adherence to geographical targeting. Finally, the more distant the measure is from the non-commodity output, *e.g.* a payment per hectare, the greater the need will be for educational initiatives, strict regulation and monitoring to ensure that the NCO is actually produced in the quantity, quality and location desired.

Market price support and output subsidies, compared to targeted measures, generally create significant inefficiencies on the commodity

production side including resource mis-allocations and negative externalities. Except in the case of jointness that is both widespread, and fixed (or direct) – to date, no systematic attempt has been made to examine jointness empirically – they are also less efficient than more targeted measures in supplying the required NCOs. Both measures score very poorly on international spillovers and market price support is generally inequitable (see endnotes 52 and 54). Moreover, they need to be accompanied by regulatory and monitoring mechanisms to ensure effective provision of NCOs, if that is their objective. There is no theoretical answer as to whether the difference in transaction costs between output coupled measures (market price support, output subsidies including "intermediate" measures such as geographically differentiated output subsidies) and targeted measures are big enough to offset the relative inefficiency of the former. Little, if any, empirical work has been done in this area. It is expected that the on-going work on transactions costs will throw some light on this issue.

The role of governments

To the extent that governments are obliged to interpret society's non-market demands, policies need to be implemented in ways that are transparent so that governments are answerable for their actions. The burden imposed on the economy, on taxpayers and on consumers should be compatible with the willingness of society to pay. For a given outcome, a general objective of government should be to implement policies that minimise the economic burden and that are consistent with society's objectives with respect to redistribution between different groups. In the specific context of multifunctionality these obligations translate into a burden of transparency. Governments should be able to demonstrate to their citizens that the policy choices being made are the correct ones.

Governments also have obligations to other countries with whom they have entered into binding international agreements covering a range of issues such as trade, security or environment.

These principles favour the application of the analytical framework as a prelude to any policy decision. This would allow governments to chose, from various options, the best strategy corresponding to the policy environment they are facing. Applying the analytical framework as recommended in this report would be an important step towards strengthening complementarities between domestic and international goals and minimising the risk of conflict. Further work relevant to multifunctionality, including that on TCs, would also help policy makers to identify the best strategies.

ENDNOTES

1. Empirical work was the basis for the workshop, in which literature from seventeen OECD countries was reviewed in the attempt to gauge if the analytical framework could be applied using existing information. See also the synthesis papers by Abler (2001), Burrell (2001), Meister (2001) and Santos (2001).
2. Governments may need to play an important role in establishing institutional frameworks (*e.g.* defining property rights) as discussed, for example, on pages 47 and 50.
3. The most economically efficient strategies refer to those that could optimise a country's overall welfare taking into account externalities. "Efficiency" as used in this report, therefore, always take into account externalities.
4. Another important message from the empirical work relates to the site specificity of many NCOs. In the situation described here – an NCO linked to a certain minimum level of production – the incidence of the NCO is often site, locality or region specific. This observation also has potentially significant policy implications because the linkage does not exist everywhere that the product in question is produced, only in those areas where the NCO is produced.
5. It could happen, for example, when average production cost decreases until the use of the non-allocable input reaches A.
6. Difficulties associated with demand measurement will also be discussed below in the context of lack of information (see, for example, page 56).
7. Contingent Valuation Method, which is often used to estimate demand for public goods, especially for non-use values.
8. See the next section (*e.g.* Box 7) for detailed discussions on how to explore the possibilities of delinkage.
9. These costs should be converted into the same unit (*e.g.* the total cost in each area).
10. "Large" countries in this context is an economic, not a physical, term (*i.e.* production or consumption in a country is large enough to influence international prices).
11. Difficulties associated with measuring these parameters are discussed later.

12. This is the sufficient condition in the sense that further reduction in production below A could still increase the welfare if the production is controlled only by tariff since consumers' surplus would increase. However, the country's welfare could be optimised when the price goes down to the international price and the production is sustained to point A (*e.g.* by payments equivalent to the marginal value of the externality to farmers). This issue is discussed in the following chapter.
13. It is possible that extensive farming can cause damage, for example on fragile land or by encroaching on natural habitat, especially when land is converted to agricultural use.
14. See Santos (2001).
15. The term "mixed farming" sometimes is used to refer to multiple crop production (*e.g.* wheat and potatoes at the same farm). In this paper, as widely used in agricultural statistics, it refers to the combination of livestock and crop production.
16. Mixed farming is widely observed in OECD countries. For example, "in the group of bigger farms with an acreage of over 50 hectares in Poland, over 38% have plant production only, 17% animal production and 45% of such farms are involved in mixed farming" (Polish Ministry of Agriculture, 2002). For EU member countries, although "the process of specialisation has led to a decline in mixed farming systems as farmers focus on either livestock or arable production in order to rationalise resource use" (EC, 1998), traditional small-scale mixed farms remain widespread (*e.g.* in 1995, mixed farming covered 12 million ha, accounting for more than 12% of the total UAA (EC, 1999). A study conducted by EC, World Bank, and the governments of Denmark, France, Germany, the Netherlands, UK and US shows that "mixed farming systems produce the largest share of total meat (54%) and milk (90%) and that "mixed farming systems of the OECD countries and Asia provide by far the largest share of these products (Hann, Steinfeld and Blackburn (2000).
17. For example in the EU, "in mixed cropping and livestock farming, the gradual abandonment of grasslands in favour of industrial crops has led to an increase in the area used for field crops (EC, 1999).
18. "Non-excludability" is an economic term used widely in the public good literature and should not be interpreted as, in any way, pejorative or discriminating. "A good is non-excludable if it is physically or institutionally impossible or costly to exclude individuals from consuming the good." (OECD, 2001a).
19. Some NCOs, such as habitat for migratory birds, may exhibit the characteristics of global public goods.

20. OECD has carried out various studies focusing on agriculture and its impacts on environment. See, for example, OECD (2001c), OECD (2001d) and OECD (2001e).
21. See, for example, OECD (2001f) for a more general discussion on sustainability.
22. When a reference level, *i.e.* the level of externalities which would result from normal good farming practices, has been established, the benchmark for defining NCOs could be a level of externalities equal to or beyond the reference level. See OECD (2001c) for comprehensive discussions on reference levels.
23. For rice production, extensive farming in some cases could increase production costs per output compared to intensive farming because the cost associated with the use of machinery is the major component in the total production cost and it does not change regardless of the farming intensity. In other words, increases in fixed costs per output may outweigh decreases in variable costs such as fertiliser. Farmers usually change the production level by changing the area cropped.
24. If the policy measures are tax or regulations, the costs associated with reducing negative externalities are considered to be included in the production cost.
25. It should be noted that, as detailed in the analytical work, this categorisation depends on the degree of excludability and rivalry, not on property rights.
26. Strictly speaking, the provision of NCOs through de-linked measures could cost more than the demand for NCOs. In this case, no policy is required.
27. As discussed, farmers have a distinct advantage in providing NCOs when there are support measures in place. For the estimation of economies of scope, real economic or opportunity costs should be used, not the costs prevailing when support is provided.
28. Although these payments are not linked to production intensity *ex ante*, they may have *ex post* impacts. See OECD (2001g) for more details on the concept of *ex post* decoupling.
29. In theory, the payment could be equal to the demand for NCOs. By definition, the demand for non-commodity outputs is greater than the cost of continuing cultivation (*i.e.* the difference between the international price and production cost) in this case. Therefore, a payment based on demand for non-commodity outputs may provide economic rent to relatively efficient farmers. To avoid this, the payment could be equal to the above difference between the international price and the production cost converted into area payments. In this case, precise demand measurement is not absolutely necessary, but it is necessary to confirm that demand is greater than the difference between the international price and the production cost.
30. As described in the following chapter, policy sequencing is generally very important.

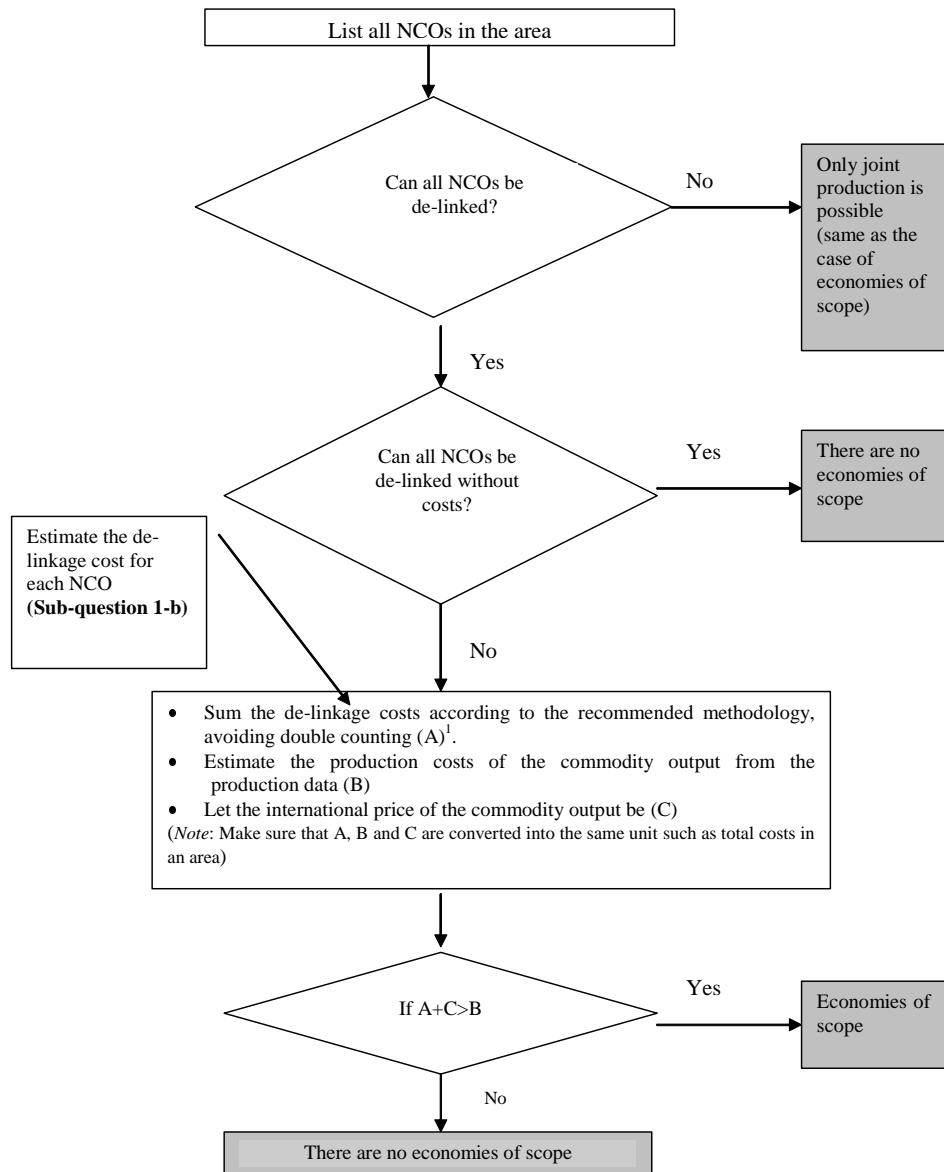
31. It should be stressed that the broad-based payment in this context is not meant as price support or output subsidies.
32. There are equity considerations here that will be discussed in Chapter VI.
33. Borrowing could also be a tool to collect funds for financing the provision of public goods. However, it may not be suited for the provision of NCOs since it would require current spending.
34. Trusts in this context refer to organisations that contribute to preserving environment or rural amenities by raising funds mainly from their members. Trusts are not strictly the same as clubs in economic terms; club goods are congestible and excludable, but the goods or services preserved by trusts show strong non-excludability in many cases. See Hodge (2000) for various types of trusts.
35. See OECD (2002) for various roles of governments for encouraging private sector involvement.
36. Communities in this context should also include a group of organisations.
37. The detailed definition of policy and non-policy related transaction costs is given in "Multifunctionality and transaction costs: main issues" (OECD, 2001*h*).
38. See Challen (2001).
39. The importance of sequencing policies will be discussed later.
40. See OECD (2001*a*) for more details.
41. Farmers transactions costs, gathering information, application formalities etc. may have to be taken into account for some policy options. For example, see Falconer (2000).
42. Differentiated subsidies depending on the level of outputs might in theory be possible for fixed (one-to one) or direct but non-proportional linkages (*e.g.* the linkage changes as the level of the commodity output increases). However, such differentiated subsidies could cause substantial TCs, which also should be taken into account in the overall comparison.
43. See Vatn (2001) for a conceptual discussion of possible tradeoffs between precision and TCs.
44. A special case that may need attention is the combination of a tariff and targeted payments. In this case, the tariff level is set so as to bring the domestic price up to the production cost of the most efficient farmers and the payments are targeted only to eligible areas. The tariff level would unlikely stimulate excess commodity production while the TCs associated with the payments (*e.g.* dead-weight loss) might be reduced.
45. The loss of consumer surplus depends on the price elasticity of demand. The smaller the elasticity, the smaller the loss.

46. The dead-weight loss associated with a tax on a good increases with the price elasticity of the compensated demand curve of the good taxed and with the square of the tax rate (see, for example, Stigliz, 2000).
47. For countries where existing administrative systems are weak (*e.g.* developing countries), this might be difficult.
48. Unless the jointness is widespread and fixed (or direct).
49. The relationships between farmers and consumers may also affect TCs. As Francis Fukuyama (1996) argued in his book *Trust*, social trust may affect TCs in various ways in society by, for example, substituting for law enforcement. Vatn (2001) also stresses the importance of cultivating intrinsic motivation to reduce TCs.
50. They include, in addition to Parliament, decision making at the local government level, and informal discussions between local governments and stakeholders that could influence political processes. For example, "citizens' jury" in which local people and or stakeholders constitute an informal "jury" to discuss policy options.
51. This is because at the central level vested interests to protect domestic production against imports may be well organised and have significant political power while it is unlikely that this would happen at local level. Note that this does not mean that there is no political bias at the local level; the issue here is whether political pressure at local level to favour allocation of the local budget to farmers is stronger than the political pressure favouring other uses. However, it should be noted that in areas where the number of farmers is substantial, this argument may not hold.
52. If NCOs in a region are not threatened (*e.g.* commodity production is competitive), there is no reason for NGOs to become active in the area. However, the formation of NGOs may lag behind once the threat has manifested itself.
53. There could be various reasons for this. For example, high price support may have prevented the development of incentives for voluntary organisations or transaction costs associated with organising people may be prohibitive.
54. Again, it should be stressed that if the NCO in question is rare, a precautionary approach may be required rather than the gradual approach that involves monitoring marginal changes as they actually happen.
55. This principle in fact can be applied to any situation where support is provided to farmers for the provision of NCOs.
56. Equity among farmers is not discussed here because it is not specifically related to the provision of NCOs.

57. The only exception would be if income is so evenly distributed in an economy that differences in the share of income spent on food are small across the economy.
58. Some governments may have laws to preserve fiscal discipline in which long-term financial commitments are prohibited.
59. It should be noted, however, that long-term commitments could effect farmer investment, which would, in turn, have impacts on production.
60. See also OECD's work on agricultural trade and environment (*e.g.* OECD, 2001*d*, OECD, 2001*e*).
61. See Annex 7 of the analytical paper (OECD, 2001*a*) for a detailed discussion. In this context, it should also be noted that failures to internalise externalities could also have impacts on income distribution (see also Annex 7 of the analytical paper)
62. Input subsidies might be the best strategy in some cases such as positive effects of agricultural employment. However, those subsidies are likely to be the best for limited areas, which therefore have limited impacts on production and trade.
63. Although not always, for example, intensive production can release land for nature areas.
64. See endnote 18.
65. There is also the potential for developing intrinsic motivation and public awareness as a way of reducing TCs.
66. Modern technology may also increase TCs for example by creating the means whereby different views and interests can be expressed. However, society may have to bear these costs to ensure transparent decision-making.
67. Work on transaction costs will be conducted with a view to helping policy makers to identify issues associated with measuring transaction costs of different policy options and how to reduce them.

Annex 1. Flow Charts

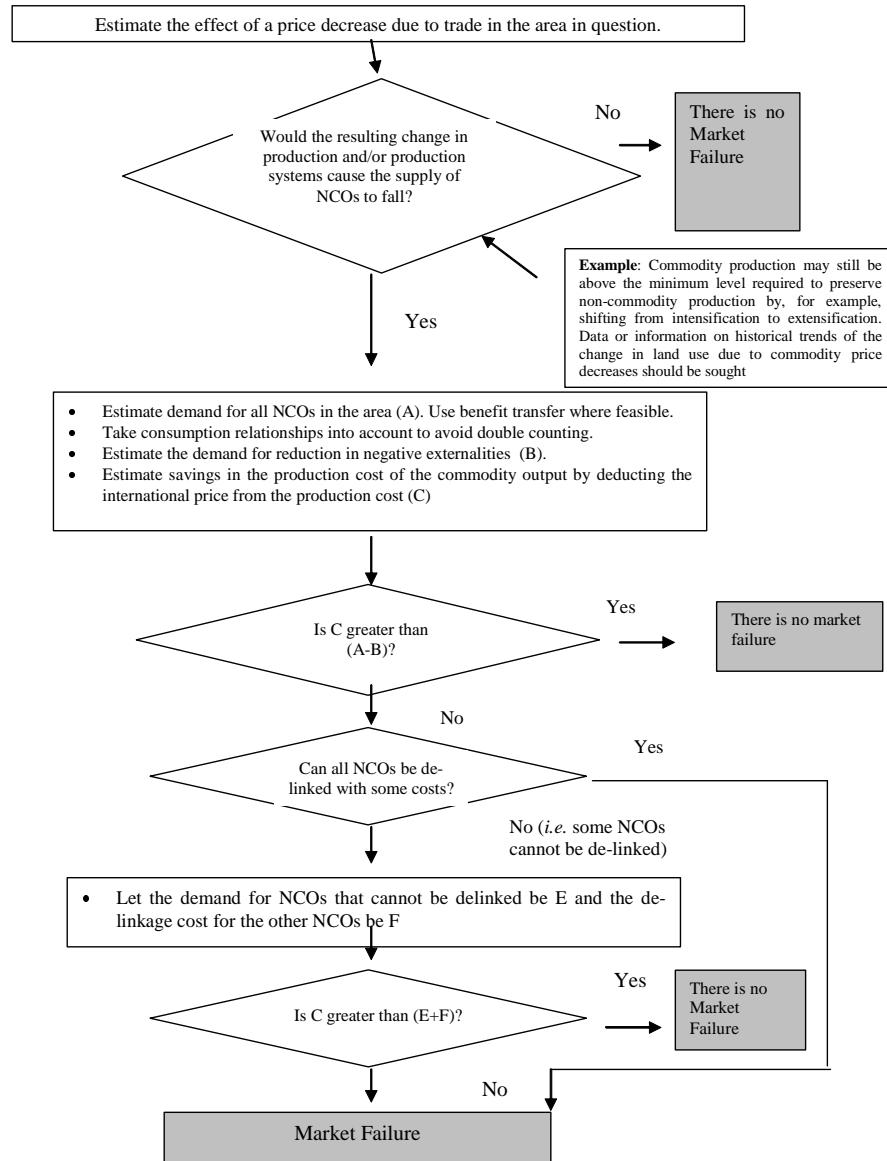
Flow Chart 1. Determining economies of scope (Jointness)



Technical note to Flow Chart 1

1. Strictly speaking, all possible combinations of de-linked measures of providing NCOs should be taken into account instead of only joint and separate provision being compared (*e.g.* economies of scope may occur when a de-linked NCO is jointly provided with another de-linked NCO). In practice, avoiding double-counts of shared "inputs" could provide reasonable proxies to examining economies of scope that may exist in jointly providing de-linked NCOs.

Flow Chart 2. Determining Market Failure



Annex 2.

GUIDELINES FOR INCORPORATING QUALITY DIFFERENCE OF NCOs

NCOs de-linked from commodity production may not always be perfect substitutes for NCOs linked to commodity production. The quality may be different or the substitution incomplete. For example, complex biodiversity based on mixed farming may not be perfectly preserved by spreading manure on crops; *i.e.* not all the original species may remain at the farm.

In this case, policy makers need to compare three cases: (1) where production would continue providing both commodity and NCOs; (2) where imports would provide commodity outputs and de-linked measures would provide NCOs with reduced quality; and (3) where imports provide commodity outputs and the NCOs disappear.

This possibility can be incorporated into the examination of economies of scope or market failures. In the context of economies of scope (as included in Box 7 of the main text), the difference in quality (expressed in monetary value) should be added to the cost of providing NCOs without commodity production (*i.e.* providing non-allocable inputs or pursuing non-agricultural alternatives). The total cost incorporating the quality difference would be used as the cost of de-linkage. A more detailed explanation on this follows in Annex Box 1.

Annex Box 1. Quality difference and economies of scope

The difference in welfare between joint and de-linked provision with reduced quality can be expressed as follows:

If $B_{all} - (C \cdot IP) > B_{de-linked} - CD$, then joint provision is more efficient than separate provision. B_{all} and $B_{de-linked}$ are values of the NCOs in question for the cases of joint provision and de-linked provision respectively; C is the production cost of the commodity output; CD is the cost of providing NCOs with lower quality using de-linked measures; and IP is the international price of the commodity output.

Then, this equation is transformed into the following:

$$(B_{all} - B_{de-linked}) + CD > (C \cdot IP)$$

The left side corresponds to the newly defined de-linkage cost, so that the equation compares the de-linkage cost and the opportunity cost of domestic production. This structure is exactly the same as the standard one for examining economies of scope described in the flow chart in Annex 1.

Although this approach does not affect the procedure to estimate market failure, it does require demand measurement at the point when economies of scope are examined. Considering the already considerable difficulties associated with demand measurement, another procedure could be to compare the three possible options in the context of the sub-questions on market failure. More specifically, a demand measurement survey could be designed to ask people which option they prefer. In this approach, problems associated with demand measurement would not affect the choice of the best option.

Annex 3.

Sub-questions/ guidelines for NCOs not covered in the main text

Regulating water supply to downstream areas

This function arises from the fact that water is temporally retained on the surface of farmlands or in soil. It contributes to a constant supply of water to the downstream areas, water, which might otherwise run into rivers or to the sea without being used. Although rice cultivation is a major supplier of this function, since irrigation water continuously runs through paddy fields¹ and turns into groundwater or go back to rivers, other types of farming also serve this function by retaining rainfall.

The use of irrigation water can have negative impacts in addition to the potentially positive impacts that are discussed in this section. Taking water from rivers or pumping up ground water may have strong impacts on hydrological systems. Salinity or water-logging has been observed in many countries as a result of excessive pumping or improper management of water. Excessive withdraw of water from river could result in damage to natural environment. Irrigation water can transport chemical inputs to downstream areas. These negative impacts should be systematically incorporated into decision making by following the proposed guidelines for negative externalities set out in section III-3 of this report.

Sub-questions on jointness

Identify the source of jointness

- Make sure that negative externalities affecting water quality have been internalised. Otherwise, there are no downstream for whom this function is a positive externality of farming.
- Quantify the impacts of irrigation systems (or farmlands) on regulating the flow to downstream areas; *e.g.* compare the flows with and without irrigation systems. If the impact is negative or no substantial difference is observed, there is no linkage.

1. In paddy irrigation, more irrigation water is put into fields than rice plants require biologically.

- Identify non-allocable inputs that are linked to preserving this function (*e.g.* use of irrigation water).

Explore possibilities of de-linkage and estimate the cost

- Explore possibilities of de-linkage (*i.e.* maintaining the water supply to downstream users without producing the commodity output). Could the water supply function be preserved, without any agricultural production. Could the function be achieved with more extensive production systems involving lower production overall?
- Estimate the costs associated with these options, in the first case by estimating the labour and machinery costs of maintaining the agricultural lands with the minimum cover to ensure water supply and in the second case by the increased costs associated with the more extensive production methods.
- Compare the above costs with the cost of providing the same regulating capacity as the paddy fields (non-agricultural alternative such as wetlands, forests, regulating reservoirs, etc.).
- Let the smallest cost be the cost of de-linkage.
- Judge whether there are economies of scope by following the procedure detailed in Chart 1, Annex 1.

Identify spatial factors associated with the supply side

- Sum areas where economies of scope exist between the commodity production and NCO(s) including the constant water supply capacity.
- Compare the summed area with the total farmland used for the commodity output in question in a country. If the area with economies of scope covers a large proportion of the total area, then the scale factor is "wide-spread". If it is a small proportion, the scale factor would be described as "limited".

Sub-questions on market failure

Estimate demand

- Identify the downstream users (both actual and potential) of the recharged water. Note the type of use (*e.g.* municipal water, industrial use, irrigation, environmental use, etc.). If there are no downstream users there is clearly no demand for this service and no danger of market failure.
- Where there are actual or potential users estimate demand. The water price which downstream users are paying could be a good proxy for demand.

- Identify the impacts of irrigation systems on the original hydrological environment. If they are negative, for example, by causing salinity or degradation of river environments, they should be subtracted from the demand estimated in the above. More specifically, analyse what would happen if irrigation ceased, to the rivers or upstream groundwater that irrigation systems depend on. Historical analysis may be useful when irrigation systems have been functioning long time (*e.g.* mature irrigation systems may have created valued, new, natural environments).

Judge market failure

- Judge whether there is market failure by following the procedure detailed in Chart 2, Annex 1.

Sub-questions on public good characteristics

Identify public good characteristics

- If downstream users can be identified and are not too numerous, this function could be classified as a common property resource. If there are many actual or potential users, *e.g.* if a large number of farmers are pumping the water downstream, it could be an open access resource.

b. Examine institutional arrangements

- Examine whether it is possible to establish exclusion mechanisms, mainly for the case of open access resources, such as taxing downstream users (*i.e.* failure to comply with the tax should result in the termination of the use of groundwater) or directly regulating them. Also examine whether institutional arrangements that exist between downstream users and farmers in other areas (*e.g.* payment to farmers by water supply enterprises downstream, etc.) could be applied to the area.

Biodiversity and natural habitat

Sub-questions on jointness

Identify the source of jointness

- Make sure that negative externalities affecting habitat conditions are fully internalised.
- Identify species that depend on agricultural lands in the area.
- Identify the nature and degree to which agricultural activities are linked to each identified species, for example, by applying the "habitat matrix" approach (see Box 7 and, for more details, *Environmental*

Indicators for Agriculture: Volume 3, Methods and Results, OECD 2001j).

- Examine, based on the matrix, areas where important habitats could be threatened by changes in agricultural land use due to reform. Careful attention should be paid to examining whether a natural environment could be a substitute for habitat conditions currently provided by agriculture.

Annex Box 2. Habitat matrix

The habitat matrix identifies the ways in which various wild species use agricultural habitat types. It contains information on which agricultural habitat type (*e.g.* cropland (cereals, oil crops, fruits and vegetables, etc.), forage, seeded pasture, natural pasture, etc.) is best suited for each species, how each species use an agricultural habitat (*i.e.* primary use or secondary use), and for what purpose each species use the habitat (*e.g.* breeding, nesting, feeding, resting, etc.).

Source: OECD (2001j)

Explore possibilities of de-linkage and estimate the cost

- Explore possibilities of de-linkage (*i.e.* maintaining biodiversity and natural habitat without maintaining the current level or any commodity production) for each species with special attention to different types of jointness. Could this function be preserved without any commodity production. Could this function be achieved with more extensive production systems involving lower production overall? There may not be any linkage above some level of production. For species dependent on pasture, careful attention should be paid to how intensive compared to extensive farming practices affect habitat conditions.
- Estimate the costs associated with implementing these options.
- Compare the above costs with the cost of implementing non-agricultural measures to preserve relevant biodiversity and natural habitat. (*e.g.* natural park)
- Let the smallest cost be the cost of de-linkage
- Judge whether there are economies of scope by following the procedure detailed in Chart 1, Annex 1.

Identify scale factors associated with the supply side

- Sum the areas that have been identified in the above process as providing biodiversity and natural habitats in association with agricultural production, with economies of scope.
- Compare the summed area with the total farmland used for the commodity production in question in a country. If the area with economies of scope covers a large proportion of the total area, then the scale factor is "wide-spread". If it is a small proportion the scale factor would be described as "limited". In the case of particular bio-diversity and habitat values it could also be site-specific.

Sub-questions on market failure

Estimate demand

- **Demand by local residents:** Estimate demand for the preservation of biodiversity and natural habitats by applying standard methodologies such as CVM, conjoint analysis and travel cost method and where appropriate also use benefit transfer. Bequest values may have to be taken into account when species are in danger of irreversible loss. As discussed in the main text, the difference between current values and those that would result from policy-induced changes in commodity production should be measured.
- Since demand measurement for these NCOs is likely to be problematic, all relevant supporting information should be collected. For example, financial support from local governments or NGOs to preserve the species in question might provide confirmation of the results of CVM studies. If agri-environmental measures are implemented locally² to improve the conditions for biodiversity and habitats, the payment to farmers could be supplemental information.³ If some use values are observed (e.g. entrance fees for fishing, etc.), the resulting information could supplement demand measurement.
- **Demand by the general population:** Examine whether there is a more generalised demand for preservation of bio-diversity and habitats, and to what extent non-use values dominate, taking into account the difficulty in estimating the latter.
- Since marginal values of non-use values are difficult if not impossible to obtain, a proxy should be sought, for example, by simply dividing the total value to be obtained by CVM with the total area inhabited by

2. The importance of decision making at local level is discussed in the main text.

3. Strictly speaking, the payment to farmers could be a proxy only for the demand for improved quality.

those species. It should be noted that this method is likely to overestimate the marginal value.

- Examine whether there is demand from the general population to preserve site-specific species, for example, by reviewing the results of CVM studies focusing on the impacts of distance from actual sites on demand.
- If local demand (*i.e.* use and non-use values by the local residents) is substantially greater than non-use value by the general population the latter may be ignored.

b. Judge market failure

- Judge whether there is market failure by following the procedure detailed in Chart 2, Annex 1.

Sub-questions on public good characteristics

Identify public good characteristics

- **Non-use values:** Examine whether the demand by the general population for non-use values of the species and habitats concerned is substantial/dominant. In this case, we are dealing with a pure public good.
- If not we may be dealing with non-use values of a local public good nature. The following sub-questions on institutional arrangements could be used to judge whether club arrangements is possible.
- **Use values:** Examine whether it is possible to establish exclusion mechanisms for use values. In this case, use values are club or private goods.

Examine institutional arrangements

- Collect information on institutional arrangements that exist to preserve the above identified species and natural habitats including those organised by local governments, environmental trusts, and markets. Examine all possibilities of creating market mechanisms for use values. Special attention should be paid to how these arrangements have tried to avoid free rider problems. Examine whether these arrangements could be applied to the area in question.

Food security

Sub-questions on jointness

There is jointness between agricultural production and food security if the risks associated with the former are lower than those associated with imports and/or stockholding.

Examine jointness

- Examine the level of risk associated with both imports and domestic production.⁴ Compare trends and variability, note if and how often there have been supply failures in domestic and foreign production. Estimate whether or not domestic production depends on imported inputs and if the answer is yes, estimate the risks associated with those imports, using the same type of information concerning incidence and frequency of supply failures and the possibility of replacing them with alternate domestically supplied inputs.
- Specify clearly the nature of the risk to food security that is being considered and the probability of its occurrence. This could vary from a price increase in the case of a shortfall in foreign supplies, to domestic supply failures or to catastrophic events that would cut the imports, each carrying different probabilities. Long-run sustainability of both domestic production and imports should also be taken into account.
- In countries with explicit food security concerns and strategies this information should be readily available. In this context, examine current strategies on how food supplies would be secured under different risk scenarios with special attention to regulations on land use (e.g. restrictions on conversion from agriculture to other uses). Specify the roles of imports, stockholdings, and domestic production in each scenario.
- Attention should be paid to the possible reduction in risk that would be achieved by diversifying the sources of supply through imports.
- In a situation where food security is associated to some degree with domestic production, identify whether food security is attached to non-allocable inputs or to the actual level of production. For example, is food security attached to the maintenance of a certain production

4. Different risks for domestic production and imports are the source of jointness between food security and domestic production (see OECD, 2000b for a detailed discussion on this).

potential (by keeping factors such as lands, human resources and capital available for use) or is it attached to actual production intensity (e.g. crop yields, etc.). For example, does a hectare of intensively farmed land generate greater food security than a hectare of extensively farmed land?

Explore possibilities of de-linkage and estimate the cost

- Explore possibilities of de-linkage if jointness is confirmed in the above questions. At least two possibilities could be examined: (1) maintaining farmlands and other non-allocable inputs related to food security but without any production on those lands; (2) converting to more extensive farming systems, in which existing farmlands and non-allocable inputs would be used but total production would fall. Stockholding may be required in many cases to cope with short-run emergencies, regardless of whether a country depends on imports or domestic production. The costs of maintaining stocks, therefore, need not be included unless there is a difference in the stocks required in a situation where domestic production is the dominant source of supply compared to one where imports are important.
- Estimate the costs associated with implementing these options.
- Estimate the cost of non-agricultural provision (if any) that could accommodate the envisaged risk scenario and compare these costs with the above de-linkage costs. The depreciated cost should be used to compare this option with the de-linked option below.
- Let the smallest cost be the cost of de-linkage.
- Judge whether there are economies of scope by following the procedure detailed in Chart 1, Annex 1.

Identify scale factors associated with the supply side

Even if it has been established that there are economies of scope associated with domestic production and food security it should not be assumed that the scale of this relationship is national or widespread. As the guideline shows, this will depend on various factors, including production cost reflecting the quality of the land. Economies of scope are more likely to be associated with fertile, accessible lands while fragile (less fertile, erodible or inaccessible) lands are less likely to be associated with economies of scope.

- Sum the areas where economies of scope exist between commodity production and NCO(s) including food security.
- Compare the summed area with the total farmland used for the commodity production in question in a country. If the area with

economies of scope covers a large proportion of the total area, then the scale factor is "wide-spread". If it is a small proportion, the scale factor would be described as "limited".

Sub-questions on market failure

Estimate demand

- Even if the level of risk differs between domestic production and imports, demand for food security associated with domestic production needs to be compared with the cost (*i.e.* the difference between the production costs and international prices.) using the Flow Chart 2 in Annex 1.
- Food security is such a potentially emotional issue that valuing demand in a credible fashion is extremely difficult. Demand for food security associated with domestic production could vary substantially depending on various factors such as the difference in the probability of occurrence of shortfalls between domestic production and imports which consumers' envisage. It would also be difficult to incorporate this factor into estimating "annual" demand. Extreme care must be taken to avoid bias in the way questions are put and, in particular, to provide accurate information on the likelihood of a food security problem occurring. Available techniques do not perform well in these conditions. It is advisable therefore to assemble as much information as possible from different sources and using different techniques.
- Understanding that demand for food security will vary significantly with the level of total production is an important starting point. Demand will be much greater when the total production is below the minimum required for the survival of the population. Demand will fall gradually as the production level increases. Demand for food security in association with domestic production is likely to be close to zero if the level of production is above the level at which termination of imports could be offset by increasing domestic productivity.
- Examine any evidence or information concerning the population's attitude to domestic production and imports respectively (*e.g.* CVM estimate). This could supplement the above information.
- Try to obtain data to supplement the other information. For example, are there any individuals or groups that have taken initiatives to secure their own food supply?
- Judge whether there is market failure or not by following the procedure detailed in Chart 2, Annex 1.

Sub-questions on public good characteristics

Identify public good characteristics

- This is non-excludable and rival.

Examine institutional arrangement

- Examine existing arrangements for securing food by non-governmental approaches. For example, are there any arrangements whereby consumers and producers enter into contacts obliging producers to supply food to consumers in return for long-term commitment from consumers. Is there any evidence that farmers continue unprofitable farming with a view to preserving food security for themselves?

Positive effects of agricultural employment on rural viability

Sub-questions on jointness

- In the development of the analytical framework it was established that employment is simply an input to the agricultural production system and cannot, in itself, ever be considered as a positive externality of agricultural production. It was, however, agreed that the impact of agricultural employment in reducing per capita costs of public service provision and in reducing urban congestion could, in certain circumstances, be considered as positive externalities of the agricultural production process.

Identify the source of jointness

- Examine the share of agriculture in total employment in an area. If that share is small, there is no jointness in practice.
- Examine whether farm households in the area depend mainly on agricultural income. If not and agricultural income is not the main reason why farmers stay in an area, once again, jointness could be considered as weak or not to exist.
- Examine trends in agricultural employment and productivity. If the usual pattern of falling agricultural employment and increasing labour productivity has been observed and is expected in a region this could be further evidence of weak jointness.
- Compare the agriculture-dependent population with existing urban populations with a view to gauging the potential impact on urban congestion of further labour shedding from agriculture. If the potential exodus to cities is insignificant, jointness with reducing urban congestion can also be considered to be weak.

Explore possibilities of de-linkage and estimate the cost

- In areas where it has been established that agricultural employment is sufficiently important to suggest that there is jointness between agricultural production and rural viability, what are the possibilities of introducing new industries?

- The costs associated with generating incentives for alternative industries – infrastructure investment grants, retraining assistance, could be considered as proxies for the cost of de-linkage.
- Judge whether there are economies of scope by following the procedure detailed in Chart 1, Annex 1.

c. Identify spatial factors associated with the supply side

- How many regions depends mainly on agricultural employment. If such regions are numerous, the spatial factor is widespread, if few the spatial factor is limited.

Sub-questions on market failure

Estimate demand

- Examine the impact of a fall in the population in the area on the efficiency of providing social services, for example, by comparing the unit cost of providing those services with the national average. The difference in these costs could be a proxy for demand for the positive effects of employment.
- Judge whether there is market failure or not by following the procedure detailed in Chart 2, Annex 1.

Sub-questions on public good characteristics

Identify public good characteristics

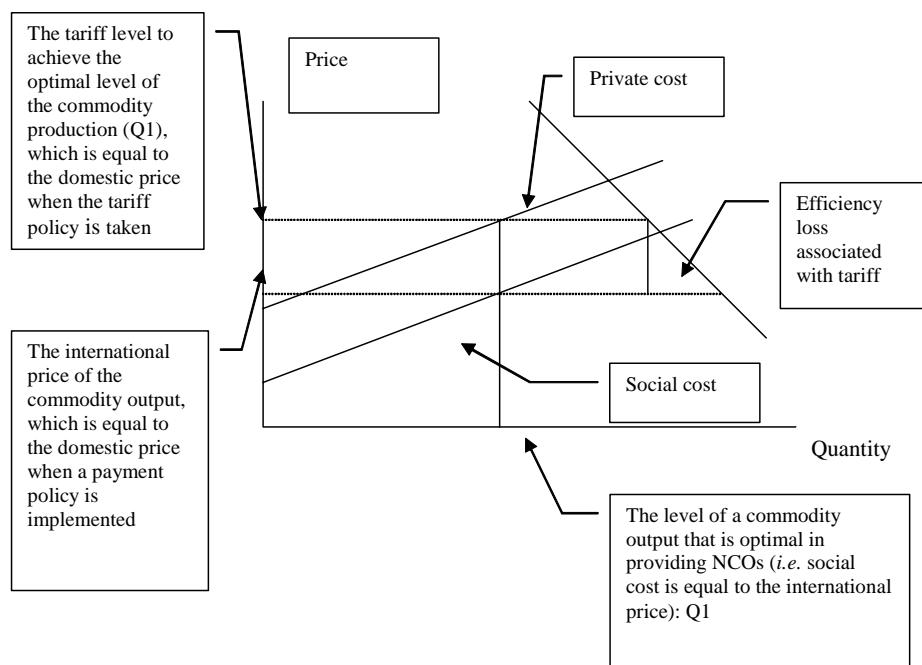
- Benefits associated with efficient provision of public services in a region are local public goods.
- Preserving agricultural employment in order to reduce urban congestion may have pure public good characteristics.

Examine institutional arrangements

- Have local governments implemented
- incentive measures such as property tax exemptions, or housing assistance for new entrants into farming.

Annex 4.

Efficiency Loss Associated with Tariff



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