Rewards for ecological goods—requirements and perspectives for agricultural land use

B. Gerowitt, J. Isselstein, R. Marggraf

Abstract

This paper focuses on the possibilities to reward ecological goods and services of agriculture. Ecological goods in agriculture are achieved by various types of agricultural land use either creating resources or buffering resource consumption. From an economic point of view, positive consequences will result from rewarding the agricultural sector for the production of ecological goods according to market principles. A rewarding system can be developed according to market principles when results instead of actions are rewarded, producer and consumer surpluses are created, demand can be expressed and supply can be provided. Ecological goods are public goods, therefore the expression of demand is up to the community. However, the purchasing of such ecological goods is up to the authority administrating public finances. Establishing regional markets is necessary, since regional differences are evident. Principally, the price of an ecological good should be determined by its value to the public, not by the cost of production.

With respect to the various ecological goods achieved by the agricultural sector, the contribution of agricultural land use to biodiversity, and more specifically to plant biodiversity seems to be the most appropriate for a market-orientated rewarding system. A framework for establishing such a market is outlined in this paper. Deviation from standard economic principles regarding prices for ecological goods are considered to be necessary during an introductory period. Finally based on both, ecological and economical considerations, and regarding the intrinsic and extrinsic characteristics of “plant biodiversity connected with agricultural land use”, it seems worth the effort to further examine and develop this concept.

Keywords: Ecological goods and services of agriculture; Market principles; Rewarding concept

1. Introduction

Ecological goods and services produced and undertaken by the agricultural sector result from using the environment in a way which is somehow valued by the society, but not by the market price for the produced food, feed or raw material. These types of goods and services already accompany today’s agricultural land use; however, a continuously ongoing discussion indicates, at least in Germany, a general dissatisfaction about their quality and quantity. In addition principal public objectives such as enhancement of biodiversity, environmental protection, leisure and aesthetic perception of the cultural landscape can profit from specific forms of agriculture. Current agricultural environmental policy is trying to influence agricultural land use within this framework.

The major pillar of the Common Agricultural Policy (CAP) at the moment in the EU are direct subsidies
donated to the producers as payments based on the acreage of subsidised crops ("grandes cultures" within the EU). These payments are accompanied by financial transfers with environmental goals—the second pillar. In 1997 direct subsidies for "grand cultures" formed 40.8% of all EAGGF costs (KOM, 1998; Appendix 8), while the financial engagement of the EU in financing the national agri-environmental programmes only covered 3.7% of this budget (KOM, 1998, Appendix 22c).

Starting with the Agenda 2000, this second pillar has been sequentially strengthened within the European CAP. Additionally, various possibilities for regional adaptation have been offered to realise the desired secondary liability (subsidiarity) of the agricultural policy (KOM, 2000).

Independent of this political process, it is definitely necessary to construct a generally acceptable basis for the transfer of public money into agriculture. The desired ecological goods and services by the agricultural sector, which are not automatically realised by the primary production of food and raw material seem obviously suitable to fulfil this function.

In this paper, the requirements for approaches above and beyond the actual practice in Europe are deduced by applying both ecological considerations and principal economic theories. Based on these prerequisites a perspective is outlined for rewarding suitable ecological goods within a market orientated concept.

2. Ecological goods and services provided by agriculture

Any farming activity is based on the use of abiotic and biotic resources, and thereby, affects the environment. Intensive farming has, in many situations, been shown to exploit and even disturb natural resources and has adverse effects on the environment, i.e. the pollution of ground and surface water, or of the atmosphere, by nitrogenous compounds or pesticides. However, apart from being dependent on natural resources, agriculture also creates resources. Set in a historical perspective agricultural land use has, for example, produced and sustained a major part of the biodiversity found in Central European landscapes. In addition, agricultural land use, rather than forestry or abandoned land facilitates the regeneration of clean ground water resources that are used for society’s drinking water supply.

The positive effects of farming become obvious when agricultural land use is no longer maintained. Many attempts connected with conservation contracts for farmers focus on guaranteeing agricultural land use on marginal land in order to maintain biodiversity.

Negative effects of agricultural land use have received considerable attention since the 1970s in agricultural scientific research and its related disciplines, and the reference scientific literature is vast. In Germany extensive reviews on that topic have been repeatedly updated (SRU, 1985, 1994, 2000). According to SRU (1985) the negative effects of farming activities can be clustered as follows (ranked according to importance):

- Loss of species and habitat diversity, removal and disturbance of non-agriculturally used margins within agro-ecosystems, e.g. hedgerows, ditches, grassy margins, etc.
- Pollution of groundwater with nitrates, pesticides and their metabolites leached from farmed land.
- Deterioration of soils and soil function through compaction, erosion and accumulation of pollutants.
- Pollution of surface water with nitrate, phosphorus and pesticides due to farming procedures.
- Pollution of the atmosphere through the gaseous emissions from farming procedures.

Legislation accompanying agricultural land use should prevent any unacceptable environmental effects of farming. However, in specific areas further actions are undertaken to reduce an area-specific unwanted pollution arising from farming activities. For example, in water protection areas in Germany farmers get paid if they employ measures that decrease the nitrate leaching into the groundwater, such as reduced fertiliser use, expanded crop rotation, etc.

Biodiversity plays a major role in both types of the ecological effects caused by agricultural land use, whether synthesising or threatening.

Total biodiversity consists of not only those parts belonging in a wider sense to the cultural landscape but also to the undisturbed natural landscape. The conservation of natural biotopes, i.e. the flora and fauna of areas that have never been managed or used by man, is a widely accepted ecological goal and in Germany,
as in many European countries, a certain amount of the tax revenue is spent to maintain such virgin nature. This component of environmental policy and nature conservation is not considered in the present paper.

3. Economic requirements for rewarding the production of ecological goods

Agri-environmental policy can influence agricultural land use directly or indirectly. Direct control results through sanctions which have proven to be effective such as restrictions and regulations. Indirect influence results through information, appeals or financial incentives.

Methods influencing actions indirectly (e.g. duties and taxes) have more advantages than the methods controlling actions directly (with the help of restrictions and regulations) (OECD, 1994). They are not based on constraints, therefore they guarantee the power of decision to the individuals. The possibility for making individual decisions can be utilised to make nature conservancy measures as inexpensive as possible and to search for new resource-preserving uses of nature. The direct control does not offer any incentive for reducing costs. Restrictions and regulations usually affect the actions only at a specific threshold level. In contrast, the indirect methods influence resource use from the beginning, emphasising that these reasons are scarce and should not be wasted. Therefore, opportunities for implementing indirect methods for influencing behaviour should be preferred for guiding farmers’ decisions on environmental effects.

From the economic point of view the most important criterion for assessing a policy is whether it contributes to better satisfying the needs of members of a society. As far as providing society with private goods is concerned, the decentralised, error-absorbing, and receptacle market system has clearly proved superior to central planning. According to the majority of economists, it is also desirable to profit from the advantages of a market economy when supplying the population with agri-environmental goods. Markets for these collective goods are not as easy to establish as markets for private goods; governmental intervention must be stronger. However, market instruments should be given priority. In this context it is recommended to reward ecological goods by farmers as a strategy of agri-environmental programmes (Latacz-Lohmann and van der Hamsvoort, 1998; Heißenhuber and Lippert, 2000). This strategy can only lead to the desired benefits (provision of goods for members of society at lowest cost) when certain requirements are fulfilled and essential constitutive criteria are considered. The success of a rewarding system for ecological goods is determined by the principles of a market system.

Scarcity of goods: Not all goods of individuals that are appreciated by other individuals have to be allocated by the market. The free market allocation mechanism has only to be applied when demand exceeds supply and an expansion of supply is possible and resource binding.

Price as indicator of scarcity: Consumers, by their willingness to pay, signal potential producers as to which goods shall be produced. The price of goods is determined by the costs of production and their valuation by the consumer.

Conforming to the rules: In principle it is clear that suppliers must be compensated for their goods. It is also considered acceptable that demanders must pay money to receive goods.

Transparency of supply and demand relationships: The supplier must be able to calculate his production risk. The demander must be able to recognise which suppliers offer which goods and what the quality is.

The first principle states that ecological goods of agriculture be in short supply. This requirement is undoubtedly fulfilled. Farmers do not ‘automatically’ use natural resources in such a way that satisfies society; they could use resources, albeit at the expense of the production of agricultural goods, in another way.

The second principle stresses the role of demand in a market economy. It is of particular importance for the establishment of a rewarding system. The demanders of ecological goods from agriculture are interested in the ecological goods provided and not in the activities that led to the provision of them. Therefore, effects on the environment have to be remunerated, not the activities that lead to the desired environmental effects. A rewarding system only has cost-minimising and innovation-stimulating effects when the amount of rewards is determined by the value of ecological activities to society. This requires the integration of (monetary) demand for ecological goods of agriculture in the rewarding system.
Establishment of markets, on which the demand for ecological goods can be directly realised, is restricted as most ecological goods are collective in character. However, the society indirectly pays for ecological goods, whenever arguments like diversity via land-use and the benefit of a cultural landscape are used to justify agricultural subsidies. In the long term it is necessary to determine the population’s willingness to pay for ecological goods. For an overview on these methods see Garrod and Willis (1999).

Natural conditions and land use differ widely among regions. The willingness to pay for ecological goods will, therefore, differ between specific regions. When considering the funding for agri-environmental remuneration, it must be realised that when farmers are the sole recipients, no surplus remains for the demanders creating a suppliers monopoly with discriminatory pricing. Even when the allocation aspects make this irrelevant, distribution aspects argue for establishing producers’ and consumers’ surpluses on markets for ecological goods. Producer surpluses are essential to induce farmers to treat the land on which they produce agri-environmental goods as a value worth preserving.

According to the principle of conforming to the rules, it must be determined whether all ecological activities in agriculture shall be rewarded by society, or whether farmers should provide certain ecological goods without compensation. Literature frequently suggests to carry out this examination with the help of negative and positive external effects (Heißenhuber, 1995; Hofmann, 1995). It is argued that remunerable ecological activities are positive external effects. Costs connected with a reduction of negative external effects are charged to farmers. From the economic point of view, the concepts of negative and positive external effects are unsuitable for defining remunerable ecological activities. Costs are unsuitable for defining remunerable ecological activities. Economically, benefits and damages are equal effects, but with reversed premises; a benefit is averted damage, damage is a missed benefit. Thus all asked to changes in the agricultural use of the environment can be interpreted as reduction of a negative external effect or an increase in positive external effects. That is, when society wants farmers to reduce ground water pollution, this can be interpreted as a desired reduction of a negative external effect, or as an increase of positive external effects, i.e. as a contribution toward securing the quality of the water supply.

There is no economic criterion for determining exactly which ecological activities of agriculture are to be rewarded. This becomes clear when interpreting the question of rewarding according to the property right theory (Hampicke, 1996). The individual that sells goods for money acts deliberately since he could also retain them. When an ecological activity of agriculture is rewarded, it simulates that farmers have the natural resources needed for the activity at their disposal. When defining remunerable ecological goods the fundamental issue is the allocation of property rights to natural resources. The determination of property rights is based on value judgements and evolve, thus, they may change. There is no social fundamental principle that defines how to proceed; only suggestions can be made about what must be considered. For example, it should be realised that increasing legal uncertainty leads to negative allocation effects. As a consequence, property rights may not be altered due to political opportunity or even arbitrariness. Another important aspect is the distribution effect of the property right system. When farmers are denied property rights to natural resources, they must provide ecological goods without remuneration. If, as a consequence, economic disadvantages increase to such an extent that farming no longer pays, a small segment of the farming population would be charged with very high costs to the advantage of the majority. Even the favoured majority would consider such a situation as unjust and therefore unacceptable. Additionally the decision as to which ecological goods are remunerable and which are not should always be made by binding and understandable regulation with broad public acceptance. Many forms of extensive land use, which provide agri-environmental goods usually cover only a small portion of fixed costs (Hampicke, 1999). Without a reward, farmers would not permanently provide these activities.

Implications of the last principle, the transparency of supply and demand, are discussed in Section 4.

4. Which ecological goods of agriculture should be rewarded?

As stated from an economic point, the ecological goods of agriculture can be rewarded by honouring the results or by honouring the actions. Action-oriented
B. Gerowitt et al. / Agriculture, Ecosystems and Environment 98 (2003) 541–547

545

In the result-oriented approach a result is rewarded. Consequently this result can be called a produced ecological good. In order to initiate market allocation mechanisms ecological goods of agriculture are needed, which can be described as independent goods. With respect to the economic principles, the result of the goods should be scarce, not to achieve with an agricultural practice conforming to the rules and have characteristics which guarantee as much transparency for supply and demand as possible. In order to transfer a market-concept the defined goods must further have some intrinsic characteristics: the producer of the good must be clearly identifiable and the good must be measurable. Production risks are inherent, however, they should be calculable to some degree by the supplier. Thus, for the transparency in the supply and demand, the profiles of the ecological goods to be honoured are crucial.

With respect to the ecological goods of agriculture, various contributions are scarce, however their scarcity is differently ranked by experts (e.g. SRU, 1985) or in interrogations (e.g. Müller and Schmitz, 1999).

Environmental goods like clean water and air provide no transparency for a market-orientated system of rewarding ecological goods, since their status is difficult to relate to individual actions of farmers. Therefore, attempts to regulate these effects are action-orientated. However, these attempts are essential to reduce environmental threats of agriculture, they are not favourable for any market-orientated system. The desired actions can be used for defining standards, being either obligate for any production (conforming to the rules) or facultative for e.g. marketing labels, focussing on skimming off a specialised demand for the way of production.

Contracts to reduce farming intensities in water protection areas have an area-specific focus and are therefore also unsuitable for a market-oriented concept with individual and unconstrained production decisions. These consequences from the nature of possible goods are also supported by the rules for agricultural land use in Germany: activities with a more environmental impact, like the use of fertilisers and pesticides are at least touched by various legislations (e.g. German Fertilisation Decree, German Plant Protection Act, German Federal Soil Protection Act), while handling wildlife is far less affected. As long as the concrete area or the landscape element has no special protection status, and agri-chemicals are used due to the registered rules, wildlife components can be treated without restrictions.

Thus, goods belonging to the comprised cluster called “biodiversity” are most suitable for any market orientated concept of rewarding ecological goods of agriculture, since they are scarce and require individual, unconstrained production decisions, which are not identical with production conforming to the rules. From a practical point of view, the total accomplishment “biodiversity” must be subdivided due to the suitability of the components for a market-orientated remuneration system: mobile animals seems inappropriate, because it is almost impossible to relate their appearance (the result) to individual field scaled farming actions. More immobile parts of the fauna seems also unsuitable, since results, which can be detected and valued only by few experts provide no transparency for any concept relying on supply and demand. Therefore, plants seem to be most suitable for a market approach of ecological goods. Many plants of our cultural landscape are connected with the almost innumerable management options of agricultural land use in productive areas by arable farming, grass-land farming or orchards of varying intensities and by “unproductive” structuring elements like tractor paths, ditches, hedgerows, copes and puddles.

5. A proposal for rewarding ecological goods in a market approach

The outlined considerations form the conceptional background, which is essential for any new approach in agri-environmental policies. In order to further proceed with the concept, considerations about an implementation are required. At least four crucial aspects
are connected with the outlined ideas.

- Catalogue of ecological goods.
- Demand for ecological goods.
- Supply of ecological goods.
- Adjusting and administrating supply and demand.

**Catalogue of ecological goods:** In the catalogue ecological goods are described. They can be grouped into four types:

- vegetation accompanying grassland use;
- vegetation accompanying arable use;
- vegetation accompanying other forms of land use (e.g. orchards);
- vegetation of boundaries or patches on the property without direct production (e.g. hedgerows, copses, puddles).

These groups must be further sub-clustered to direct applicable goods (e.g. area units with special grassland or arable vegetation types, units of unproductive area with special vegetation), the sub-cluster are to be defined regionally. The catalogue is public. The ecological goods are described up to a detail that allows to evaluate their existence by producer, people and supervisor.

**Demand for ecological goods:** The decision as to which ecological goods are scarce and thus should be stimulated by a market economy shall be transferred to a decentralised and region-specific public committee comprised of representatives from various interest groups: representatives of the regional community (being e.g. a county in Germany), of nature conservation groups and of farmers groups. Responsible administrative representatives (again representing “nature conservation” and “agriculture”) should belong to the board. They decide about their regional demand on ecological goods in quantity terms (m², ha). In order to act rationally, the board needs to have an idea about the regionally possibilities for and costs of producing the various ecological goods. For an examination of perspectives of the supply of ecological goods, real transfer payments within the framework of agricultural policy can be used as society’s willingness to pay for ecological goods. Therefore, for a starting and establishing period of a market system, both funds available in the budget and production costs for the ecological goods are determinants for their prices.

**Supply of ecological goods:** The production of demanded goods is up to the producers, who want to serve the market. They are free in the way to produce it, as long as they act conforming to the rules. Since the concept is completely new for all actors, it is worthwhile to offer information about principal production methods and their on-farm costs. If such a concept is established this will be offered by advising institutions, like they offer advice for producing food or primary raw material today. Dogmatically argued in a market system demand is independent from production costs, however, this seems to strict for establishing a new system. The representatives of the demand will also profit from information about the range of production costs for the various goods. Despite of the value of the information, all actors should be aware, that prices for ecological goods are no compensation payments, and can therefore vary dependent on over- or under-performance of the demand. This risk add to the primary production risk i.e. can the good be produced at all. These risks are generally accepted in a market orientated economy, however, farmers will only go into the production of a good, if the two risks are comprehensible.

**Adjusting and administrating supply and demand:** The market for public goods needs to be organised and supervised, since taxes are used for demanding them. The regional board comes to decision according to a charter. The implementation of the decisions has to be in the response of an administration, who publishes the catalogue of ecological goods and a range for the final price. Producers will announce their possible supply in advance. They receive a feedback before they start the production. Within a determined period they serve the administration with a valid description of the ecological good they have produced, which then can be supervised by the public authorities in spot-checks. As long as the administration is acting within a fixed budget, prices for the ecological goods are used to stimulate some ecological goods while to limit the production of others.

6. Conclusions

As a result of a vital interdisciplinary dialog, we have in this paper outlined ideas, which demand further discussion and attempts for practical implications.
However, the scents of a basic policy change can be widely caught, serving many demands, e.g. of the public, of an expanding EU and its intrinsic interests and extrinsic international integration.

Therefore, characteristics of the outlined proposal are to find to some extend in already realised attempts and programmes. For example, the “biodiversity yardstick” (Oosterveld and Guldemond, 1999) is proposed for farmers to investigate the status of their farm in terms of being habitat for wildlife. The actual agri-environmental programme of the German state Baden-Württemberg accounts for the occurrence of specific wildflower species in grassland (Briemle, 2000).

A market-conform rewarding of ecological goods produced by agriculture is the application of the market idea to a completely new field. Theoretical consideration cannot foresee implementation problems, for an overview of possible implementation mechanisms see Gatto and Merlo (1999). Therefore, such a system must be carefully applied, initially in large-scale trials to gain experience. The advantages of a functioning, market-conforming rewarding system should be worth such trials.

With support of the Federal German Ministry for Education and Science (BMBF) we have actually started an interdisciplinary project to further evaluate and concretise the perspectives and limitations of the concept.

References


KOM (Commission of the European Union), 1998. 27, Finanzbericht der Europäischen Kommission über die Abteilung “Garantie” des EAGFL.


