Multifunctional agriculture : how to provide incentives to farmers ?

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Abstract
In this paper we anlyse the meaning of multifunctionality at farm level. After defining the concept, a number of examples are given to illustrate problems in delivery of non-commodity outputs. Based on a general micro-economic model, it si shown that farmer's behavior will depend on personal characteristics as well as on relative prices. Next, Instruments to give incentives to farmers to engage in the delivery of non-commodity outputs are discussed as well as the possibility of collective action. The paper ends with some conclusions and recommendations for further research and discussion

1. Introduction

According to OECD (2001) (see also Carhill in this issue) multifunctionality is to be interpreted as a characteristic of an economic activity such as agriculture in the sense that an economic activity is producing multiple and interconnected (joint) outputs or effects. These effects or outputs may be positive or negative, intended or unintended, complementary or conflicting, valued in existing markets or not. In general terms one can speak about commodity and non-commodity outputs of an activity. Within a given market and policy setting, the economic activity will result in a certain combination of the joint products. As long as this combination is satisfying the demand toward the different outputs, there is no problem as an equilibrium situation is reached. However, due to shifts either in the supply side (e.g. technological innovation) or in the demand side (e.g. higher demand for recreational goods), there may be under- or overprovision of certain commodities making corrective actions necessary.

In this paper we will concentrate on these corrective actions or in other words how can agricultural producers be stimulated to change the combination of commodity and non-

commodity outputs resulting from their activities and what does this imply at farm level. First the necessity of corrective actions and the difficulties connected to it are analysed on the basis of some concrete examples of market failure in the production of joint non-commodity outputs. Next, a micro-economic model is presented that may serve as a basis for analysing the impact of price or policy changes on the combination of outputs produced and for analysing farmers' reactions on corrective measures. The paper then continues by analysing which instruments may be used to change the output combinations. Finally some conclusions and policy reflections are presented stimulating further discussion and research.

2. Examples of joint non-commodity outputs

Agricultural activities produce a number of other outputs as joint products of the production of intended commodity outputs such as food and fibre. Examples of joint outputs are employment, food security, landscape, biodiversity, soil-, water- and air-quality, cultural heritage and so on. Table 1 in annexe presents some more concrete examples that have been analysed according to a number of criteria set out by OECD to detect the nature of jointness and market failure. They are only examplary cases of a much larger group of existing cases.

A first observation is that the analysed non-commodity outputs do not or only partially depend on the production level of the commodity output. The link with the production level is only clear in case of negative externalities (cf. the example of water quality, but it would also be the case if other negative externalities such as soil quality or air quality were analysed). In most other cases the link with the production level is weaker and has to be interpreted as follows : agriculture or any form of cultivation is in most cases a necessary condition to obtain the non-commodity output, but the yield on itself is not as important. In a few case however, above a certain level of production the non-commodity output decreases or is endangered (e.g. meadow birds are endangered if the farmer wants a first cutting of his grassland earlier than the breeding season, genetic diversity is not compatible with having only high yielding varieties).

More important is that in all cases studied, the non-commodity output is dependent on the applied farm practices, systems or technologies. This confirms the production possibility model of joint production stating that it will depend on economic conditions at what point of output combination farmers will produce. As the required farming systems for having a higher delivery of non-commodity outputs normally result in lower commodity outputs (or higher

costs for the same output level), the problem is to find price mechanisms that shift the equilibrium on the production possibility line towards more non-commodity output. In most cases the non-commodity output is also linked to agricultural structures : specialisation and increased scale of farming have caused larger physical structures which on their turn allow the use of more modern technologies. All these factors together may contribute to the under provision of certain functions. A specific problem is that the level of jointness is in most cases depending on topography, soil quality, climate conditions and so on and thus spatially differentiated, causing problems of competitiveness in case in a particular region measures are taken.

A second aspect is in how far non-agricultural provision of the non-commodity output is possible or in other words in how far delivery of non-commodity outputs can be de-linked from commodity production. In theory, in most case this is possible because the non-commodity output is dependent on certain cultivation practices, but not on the production level itself. In theory it is thus possible to conserve the practices without selling the products (or at least not to be dependent on the selling). In practice, however this is in most cases a very expensive option which may only be possible to conserve old practices with a cultural heritage or other value or in case of a high demand for the provision of the non-commodity output de-linked from agriculture (e.g. water quality in water winning areas). For non-commodity outputs with a high dependence on farming and for which the demand is to have a small quantity per area unit, agricultural provision is often the only way.

A third point that needs to be taken into consideration is the mutual influence on other non-commodity outputs. Hereby distinction can be made between social functions (employment and rural viability), food security and environmental and landscape functions. In general there is a conflict between the first and third group because (partial) de-linkage will in general be linked to a reduction of the employment (directly or indirectly because of weakening of the competitiveness) at least if no instruments are found to remunerate the higher costs for or lower production of commodity outputs.

In all studied cases no real effect is expected on food security, in the sense that in most case delivery of the non-commodity functions investigated require that at least the land is minimum cultivated or occupied by a vegetation so that the situation can easily be reversed if necessary. The only case where there is a possible danger for food security is when cultural heritage protection by non-agricultural delivery (e.g. farming buildings) should mean that the land is occupied for industrial or domestic functions which may not be reversed. In some

cases there may be competition among some functions such as e.g. meadow bird conservation and bio-diversity in the meadows as both non-commodity outputs require different farming practices.

Finally it is indicated in how far price decreases of commodity prices are creating a market failure in the provision of non-commodity outputs. This is not as obvious because the effect of price decreases of the commodity outputs is not straight forward. In some cases this has a clear positive effect on the non-commodity provision such as in case of reduction of negative externalities, or in cases where the intensity of the farming system will be reduced without loosing competitiveness: e.g. more extensive beef production because of price reductions can be good for meadow birds or for field flora as long as farmers do not switch to other commodities (e.g. ploughing their land) or do not leave the sector with the danger that the land is occupied by other functions that are less good for the production of the non-commodity outputs. In other cases the effect is negative because price reductions stimulate farmers to cut further on costs and to apply more efficient farming systems (which are less compatible with the delivery of the non-commodity output) An example of this situation are the maintenance of landscape elements or cultural heritage elements that are often disappearing because they are not compatible with lower cost technologies or the negative externalities such as e.g. the use of modern feed containers with negative effects on landscape. In a number of cases the global effect is not clear as it will depend on substitution possibilities, overall competitiveness (and thus the remaining in production). The central question hereby will be in how far the adjustments in farming systems are compensated.

3. A model to analyse multi-functionality at farm level

In order to analyse decision-making of farmers with respect to the combination of commodity and non-commodity outputs that will be produced a micro-economic model can be applied. Based on models developed by Delvaux et al. (1999), Dupraz et al (2000) and Vanslembrouck et al. (2001) for decission making with respect to agri-environmental measures a general formulation of the choice problem can be proposed. The formulation assumes that the farmer is maximising an utility function (U) dependent on both the profit (π) coming from commodity outputs as well as the level of non-commodity outputs (Q_A), for which he may or may not obtain a certain compensation (either from the market or from public funds). This micro-economic model can be expressed as follows:

$$\underset{\pi, Q_A, X_A, X_c}{Max}\ U(\pi, Q_A)$$

$$\pi \le p_c^{'}\,\mathrm{f}(\mathrm{X}_c) + p_A^{'} Q_A - w^{'}(\mathrm{X}_\mathrm{C} + \mathrm{X}_A) \qquad (\lambda)$$

$$Q_A \le g(X_A) \qquad [g(0) = 0] \qquad (\mu)$$

where U, f, and g are increasing concave functions and

with X_c the inputs/efforts for commodity production

X_A the inputs/efforts for non-commodity output

p_c^{1} the price vector for the commodity goods produced at the farm

p_A^{1} the price vector for the non-commodity outputs at the farm

w^{1} the input price vector

The farmer's problem is to choose the input use of X_c and X_A so as to maximise his utility. The optimum is given by the following first-order (Kuhn-Tucker) conditions:

$$\lambda = \frac{\partial U(\pi, Q_A)}{\partial \pi} = U_\pi > 0$$

$$\mu = \frac{\partial U(\pi, Q_A)}{\partial Q_A} + \lambda \cdot p_A = U_{Q_A} + U_\pi \cdot p_A$$

$$\lambda \cdot \left(p_C^{'} \frac{\partial f(X_C)}{\partial X_C} - w \right) = 0$$

$$-\lambda \cdot w + \mu^{'} \frac{\partial g(X_A)}{\partial X_A} = 0 \Rightarrow w = \left(\frac{U_{Q_A}}{U_\pi} + p_A \right) \cdot \frac{\partial g(X_A)}{\partial X_A}$$

As most non-commodity outputs are joint products with a negative trade-off with commodity production, the model allows also to study the substitution (or competition) effect between commodity and non-commodity production for any input k involved in both productions (e.g. labour) by requiring that the last two conditions are equal:

[1] The vectors p' and w' are the inverse matrices of the vectors p and w respectively

$$w_k = \left(\frac{U_{Q_A}}{U\pi} + p_A \right) \cdot \frac{\partial g(X_k)}{\partial X_k} = p_c^{'} \frac{\partial f(X_k)}{\partial X_k} \Rightarrow \frac{\frac{\partial g(X_k)}{\partial X_k}}{\frac{\partial f(X_k)}{\partial X_k}} = \frac{p_c}{\left(\frac{U_{Q_A}}{U\pi} + p_A \right)}$$

From the above equation it can be derived that the equilibrium between commodity and non-commodity outputs will depend on:

a. the value of non-commodity products (increase of P_A or a relative increase in the utility of non-commodity outputs as compared to income e.g. in case of farmers who themselves have a certain utility of the provision of non-commodity outputs)
b. the form of the production possibility line
c. the required inputs or efforts to produce the non-commodity output (the lower the higher provision) as well as on the costs or efforts for commodity production (the higher the negative effect on income of withdrawing input factors from commodity production, the lower the non-commodity provision

In general, the model indicates that for a particular farm or situation, the obtained farming system (determining the resulting combination of commodity and non-commodity outputs) will depend on the substitution possibility $(\vartheta g(X_k)/\vartheta X_k)/(\vartheta f(X_k)/\vartheta X_k)$ and thus the jointness character, the decision maker characteristics (reflected in the U-factor), the specific situation (reflected in the f- and g-functional forms) depending on farm specific features, location, climate and so on and last but not least the possible price or remuneration that the farmer can obtain from non-commodity provision in comparison with the prices for commodity outputs (the P_A term as compared to the price for commodity production). It is clear that the higher commodity prices (e.g. because of market distortion), the higher the prices of non-commodity outputs has to be to compensate farmers.

Central point is therefore to look at instruments or mechanisms that can be used to create price mechanisms for non-commodity outputs.

4. Delivery instruments for non-commodity outputs

4.1. Market creation

When the equilibrium point on the production possibility curve is not satisfying the demand for one of the non-commodity outputs, mechanisms or instruments have to be found shifting the equilibrium point toward the desired combination. Market creation or in other

words making it possible that the demand is expressed through the price mechanism is of course the best and most efficient way. However, this highly depends on the public good characteristics of the non-commodity output. Most of the analysed non-commodity outputs are pure or local public goods with as characteristics non-rivalry (meaning that use by one consumer is not reducing the possibilities of other consumers) and non-excludability (meaning that it is not possible to avoid consumption). Organising rivalry is in most cases not possible except for some specific cases of genetic diversity or cultural heritage for which a use value exists and property rights can be assigned that limit the use by others (e.g. special breeds or old farm buildings that may have a value for other activities (restaurant and so on). In more cases the non-excludability property can be relaxed (Table 1 in annexe) meaning that excludability can be organised. Distinction can be made between cases where individual access to the good can be limited (like e.g. by limiting the access to the good) or if it is only possible to exclude certain groups (e.g. in the case of soil conservation where distinction can be made between those benefiting or not, but not among those benefiting).

If excludability is possible or when the non-commodity output is or can be linked to a commodity output, a market can be installed. Direct market creation (meaning that the non-commodity output as such can be marketed) is in most cases impossible or very difficult. This is normal as otherwise it would be a commodity output. The only exception are those non-commodity outputs that can have a use value for other persons than farmers such as farm buildings (e.g. for making a restaurant or another use, genetic diversity that can have a value for certain industries). In these cases a private market will exist and there is no problem of delivery. Another example that can be regarded as direct marketing is e.g. the selling of shooting rights on farm land. These cases do normally not pose any problem, although there may be a problem at that moment with the delivery of the associated commodity (food) or other non-commodity outputs, either because it becomes non-agricultural delivery (the example of a restaurant in an ancient farm building may mean that the farming activities can not be continued) or because there is a conflict with other non-commodities such as food security or bio-diversity.

More frequent in practice are forms of indirect marketing, meaning that farmers will provide non-commodity outputs because this creates higher possibilities and remuneration for associated commodity products. Indirect market creation is possible in those case where excludability can be realised either by limitation of access to certain non-commodity outputs that have a recreational or tourist value (access limitations e.g. for bird observation or to

specific cultural heritage elements) or because the jointness with a non-commodity output gives a higher value to certain commodity outputs (either the food and fibre product, either another commodity output that be delivered by farmers such as rooms for farm tourism)

In the case of agricultural commodities it means that the value of the non-commodity output is reflected in the commodity prices because trough labels or other market separation mechanisms a higher price may be obtained for food products produced according to farming systems delivering a certain amount of non-commodity outputs (e.g. organic farming products, integrates pest management products and so on). In the other case, the production of non-commodity outputs makes it possible to create more added value because farm tourism will become more attractive. Theoretically hereby distinction can be made between pluri-activity and diversification whereby pluri-activity refers to the level of the labour (farmer having different activities in or outside agriculture) and diversification to the farm level meaning that the resources at the farm are used for alternative activities either for agricultural production (e.g. new crops or applying another farming system) or for non-agricultural activities (such as transformation and commercialisation of food commodities or renting rooms of the farm to tourists).

4.2. Government intervention

However, for many functions markets are not functioning because it concerns pure public goods. For functions where market failure exists, government intervention is necessary, either to translate the societal demand into regulations, standards or norms or by providing incentives paid by the tax payer in order to create a demand market. Collet et al (2001) hereby distinguish, based on Salais and Storper (1994), three action models for intervention: either the authorities act as prescriptor (meaning that they tell what and how to produce), as regulator (meaning that they only tell what to produce, but leave it to the sector on deciding how to reach it) or as actor (meaning that the authorities is searching and developing together with the farmers and/or other actors delivery mechanisms by stimulating innovation but without ex-ante defining a certain amount or objective). Which action model is the best highly depends on existing knowledge on the relation between farm practices and the delivered outputs and the possibility of control. If a certain level of non-commodity output can be reached through different practices and the authorities are able to monitor the result, regulation through norms and standards, this is the easiest way. If however, one or a few practices are able to deliver the required level of non-commodity outputs and the practice is

easier to be controlled than the final result, the state has to enforce the practices. In the third case, when the exact delivery mechanisms are not yet (fully) explored, the authorities may better act as stimulator of innovation, than as prescriptor or regulator. In a lot of cases of course intervention will be based on a combination of prescription, regulation and stimulation. Situation may also change in time. In the beginning, the State may stimulate the search for alternative production practices and when these have proved their possibilities regulating and/or prescribing their application. A good example is the development of integrated pest management systems where first the innovation has been stimulated and later regulated (through reconnaissance of the system) and even prescribed for certain applications.

The above models of action can be translated in four forms of intervention: 1) direct provision; 2) mandatory instruments obliging farmers to provide other functions; 3) the public pricing of the function and 4) compensatory payments providing economic incentives.

4.2.1. Direct provision

The first possibility is the direct provision by the authorities of the function. This is of course only possible for a small quantity of public goods that are highly valued such as e.g. cultural heritage elements, highly valued ecological systems, etc. This instrument means that a public authority obtains the property rights on the land and pays for the maintenance or provision of the function that needs to be protected or delivered. In some cases the state may even pay farmers for it (e.g. to maintain a certain farming system or cultivating the land according to certain practices necessary for the maintenance or delivery of the function). The main difference with other instruments is that the state (or a designed body) obtains full property rights making the negotiating position totally different compared with other instruments where farmers keep property rights. Therefore this instrument is only suitable for very specific cases and functions, in particular those which can hardly combined with a competitive form of farming. A prerequisite here is of course that the state has full knowledge on how the non-commodity output can be obtained.

4.2.2 Command-and-control instruments

A second instrument is mandatory provision through so called command-and-control measures. This means that farmers are by law or regulation obliged to deliver certain functions mostly by limiting the property rights of farmers concerning land use choices (e.g. forbidding the ploughing of grassland) or concerning application of certain farm practices

(e.g. limitation of cattle stock per hectare or on the use of manure). In most cases this seems feasible, but the question is if it is in all cases the best solution. Following elements need to be taken in the discussion: 1) the amplitude of the measure and effect on internal competition (all farmers within a country or only part of them) as well as on the international competitive position and 2) the possibility of enforcement of the measure.

With respect to the first point, the effect of the measure on internal and external competition, it is clear that as long as an obligation concerns all farmers within a country (or a group of countries), there is no high problem of internal competition (although it may be that certain farmers can better adapt to the new regulation than others and that indirectly competitiveness among farmers is influenced), but that there may be a problem of international competitiveness of a sector (e.g. more stringent regulations in one or some (group of) countries may influence the international position of that sector). Therefore a balance will always to be found between demand for the non-commodity function versus the economic consequences for the delivery of the commodities produced. Hence, in the long run it may be that if competitiveness of a sector is not guaranteed, also the non-commodity function that was aimed to be protected, is endangered (if there is a close link with the existence of the farming system). This is the main reason for the EU to defend a certain general support for farmers to compensate the reduction in competitiveness due to a number of other functions EU farmers are obliged to fulfil. One of the problem is of course the lack of a benchmark situation for comparing competitiveness.

If a measure is more targeted (what for a number of functions may be necessary as delivery is or has not to be uniform over all farms), mandatory measures may also influence internal competition. Important may be in how far certain constraints will be reflected in the price of resources (mainly land). If mandatory measures cause a reduction in land prices because taken this land in production becomes less attractive, in the long run this may compensate the loss of productivity. A problem is of course that this only compensates future generations of farmers, but not the actual one who may even loose two times (once because of reduced productivity in the commodity production and once because they may not be able to recuperate the high land prices they have paid). This may be overcome by buying out the loss of property rights of present farmers (by preference trough a one time payment or if not possible temporary compensations for a given period).

A major problem in the application of mandatory instruments is of course the enforcement. In theory it is possible to work out a regulation for the provision of non-

commodity outputs, but in practice they can hardly be controlled or only enforced at a high cost (e.g. the non-use of certain inputs to protect the bio-diversity function or the application of certain farming practices such as late mowing). Therefore another element in the discussion are the transaction costs in enforcing the delivery trough different mechanisms. In general, this makes that mandatory instruments are restricted to situations in which they only prevent extreme under provision of certain functions (mainly causing negative externalities) or in situations where the reduction of property rights is not as big and easily controllable (e.g. exploitation permits, permissions to change cultural heritage elements, …)

4.2.3. Pricing of non-commodity outputs

Another way of influencing the delivery of non-commodity outputs through government intervention is pricing the non-commodity output. This can be the case for functions for which there is clear societal demand, but not a distinctive private demand. If government (or an other collective organisation) can bundle this demand through a pricing system for the non-commodity output (e.g. clean water, produced flowers or number of meadow birds' breeding pairs). If private market creation is not possible, this seems of course a very appealing alternative, that may, however, in practice very hard to realise because in a lot of cases the link between the action of the farmer and the output of the non-commodity is not straightforward but influenced by e.g. actions of neighbour farmers (e.g. water quality in the water courses surrounding the fields), external factors (e.g. weather conditions) and so on, creating a high uncertainty for the farmer on the results. Another problem is the control and monitoring costs as of course such a system would require to count or to measure the individual contribution of each farmer. Besides some attempts in the Netherlands with breeding pairs of meadow birds, to my knowledge no real other examples of direct pricing of non-commodity outputs exist (except if to this category we also account for tax systems on e.g. negative externalities such as nitrogen surplus), mainly because what need to be achieved is often a shift in farming practice and not a real measurable output.

4.2.4. Economic incentives

Therefore the fourth and, probably most applied instrument for achieving a shift on the production possibility line, apart from mandatory regulations, are economic incentives to producers for applying on voluntary basis certain production practices (or preventing that they shift to less a less desirable combination of commodity and non-commodity outputs). In most

cases the mechanism used is to give subsidies or compensatory payments to cover the cost or price difference with farming systems that do not provide a sufficient level of non-commodity output. As long as the remuneration is sufficient to cover the higher cost they have not to affect the competitive position of farmers. However, the stability of such measures in the long run is debatable as in most cases the situation will be reversed when the remuneration is ceased. A problem may also be that long run effects are under-estimated if only actual losses are compensated. This might e.g. be the case when due to the contractual arrangements farmers have less possibilities to innovate or to apply new technologies what may affect their future competitive position. A lot of the measures in the framework of regulation 2078/92 and agenda2000 take the form of such voluntary provision in turn for compensatory payments. Because the success of such instruments is highly dependent on the reaction of farmers, the next paragraph is analysing some aspects of this participation.

5. Reaction and participation of farmers

In all options of section 4, the final result will highly depend on the reactions of farmers. Even when mandatory instruments are used, the overall result may depend on the reaction of farmers as there may be a decrease in number of farms or agricultural land or farmers may switch to activities not falling under the regulation and so on. This reaction is of course even more important in case of market creation through government intervention or in case of voluntary measures giving incentives to switch.

Based on the micro-economic model presented in section 3, the further derivation of the first order or Kuhn-Tucker conditions may also be used to analyse under what conditions farmers will participate or react positively on created possibilities as shown by following derivation of the equilibrium conditions:

$$w \geq \left(\frac{U_{Q_A}}{U_\pi} + p_A \right) \cdot \frac{\partial g(X_A)}{\partial X_A} \quad and \quad X_A \cdot \left[w - \left(\frac{U_{Q_A}}{U_\pi} + p_A \right) \cdot \frac{\partial g(X_A)}{\partial X_A} \right] = 0$$

$$X_A > 0 \Rightarrow w = \left(\frac{U_{Q_A}}{U_\pi} + p_A \right) \cdot \frac{\partial g(X_A)}{\partial X_A} \ (participat\ ion)$$

$$w > \left(\frac{U_{Q_A}}{U_\pi} + p_A \right) \cdot \frac{\partial g(X_A)}{\partial X_A} \Leftrightarrow p_A < \frac{w - \cdot \frac{U_{Q_A}}{U_\pi} \frac{\partial g(X_A)}{\partial X_A}}{\frac{\partial g(X_A)}{\partial X_A}} \Rightarrow X_A = 0 \quad (non\ \ participat\ ion)$$

In words, these conditions show that if the price for non-commodity outputs (p_A) is lower than the marginal cost of any input dedicated to non-commodity production minus the marginal utility the non-commodity production may have for the farmer, the farmer will not participate in such a programme. If, however, it is higher for some $X_A > 0$, the farmer will participate and increase the input dedicated to non-commodity production until its marginal cost equals the marginal revenue plus the marginal utility of non-commodity outputs.

In practice this means that to have an other allocation of certain resources (such as land and labour) the price and/or satisfaction farmers can get for the non-commodity output (either through higher prices for the joint commodity product or through compensatory payments) must be enough to compensate the marginal costs of allocating this resources toward non-commodity production. The fact that there is also a term in the equation indicating personal utility or satisfaction allows to explain that there may be a difference in required compensation depending on the individual farmer. This may explain why e.g. pleasure of direct contact with consumers or tourists or of working with nature may be an higher incentive for certain farmers to change to quality production, farm tourism or environmental protection than for others.

With respect to the cost and benefit side of the above model, two other caveats need to be made. One has to do with the cost term w : this reflects total cost of delivery including private transaction costs. Private transaction costs include costs farmers need to make to find information about delivery possibilities, negotiating delivery contracts (either with consumers or authorities) and enforcement costs (e.g. cost for controlling production under a label or costs to prove adherence to contractual arrangements (often mainly administrative costs). As explained by Falconer (2000), underestimation of these costs in the price may hamper

delivery. Hereby must be added that farmers do estimate administrative costs often higher than their actual price because of some resistance of farmers toward administration (Vernimmen et al, 1999).

Another remark has to do with the risk element. The above model should be interpreted as an expected utility model, meaning that expected costs are compared with expected benefits. That means that also possible variations in costs and benefits should be analysed. This means that shifts to new production practices resulting in (real or perceived) higher uncertainty, are less accepted. If income support through compensatory payments results in a reduction of uncertainty about farmers' income, because they become less dependent on the market, this may have a positive influence. However, in most cases shifting to other production practices increases uncertainty. This is e.g. the case for prices in innovative joint commodity markets or for long term perspectives on compensatory payment arrangements. If there is e.g. the danger that contracts are not renewed or that voluntary measures are becoming compulsory afterwards, farmers will hesitate to change practices. Another related problem is the financial risk. Engaging in new markets often requires important investments. Because the investments are often not directly related to agricultural production, other than the traditional agricultural investment channels need to be used and no governmental support or backing is given. Another problem because of the non-agricultural character of these investments can be that farmers diversifying their activities fall under other legislation such as e.g. the HACCP-regulation in case of transformation of agricultural products, fire protection in case of renting rooms, other VAT- or fiscal system and so on. Also these may be constraints limiting the shift to multi-functionality.

6. Collective action

So far, we have concentrated on individual provision of functions by individual farmers through market-led or government instruments, which finally also create an individual market (either through the influence on resource prices or by creating a market for voluntary provision in turn for compensatory payments). An other possibility is a more institutional approach in which collective action is stimulated. This may take two forms depending if it is the demand side for non-commodity outputs that is organised or the supply side (or a combination of both). At the demand side, the problem is that it is often impossible to organise transactions between individual consumers and individual suppliers (and thus payment) of the non-commodity output. If however, mechanisms can be find to bundle

individual “willingness-to-pay” and thus organise the collective demand, it may be possible to organise the transaction with suppliers. This may be a good alternative for local public goods (such as e.g. local landscapes, soil conservation or avoidance of erosion) or rather scarce public goods for which people wants to contribute. In these cases trust or local organisations may be formed either to negotiate the provision of the non-commodity output, or to collect money of individual consumers or citizens to pay for its provision. This mechanism is then the same as the state-pays-instrument of section 5, but in this case the money (or the resources such as e.g. the labour for maintaining the non-commodity output) is collected and organised through a private fund or trust. Again it is often a problem of transaction cost to get such systems work because this involves a lot of organisational costs that also have to be paid from the collected money. In some cases, however, this may work as e.g. to protect cultural heritage or natural value elements (e.g. local action or nature conservation groups). Maybe, this kind of mechanism through which individuals may express their willingness-to-pay for certain functions should be further developed (possible in co-operation with authorities, cf. tax reduction systems for money allocated to certain objectives, etc.). Maybe here there may be possibilities to use or develop new collective financing possibilities (e.g. ethic investment funds or other innovative financing mechanisms).

Also at the supply side, organisation of the offer may be a way to increase supply of certain non-commodity functions. As stated above, one of the problems for individual market or compensatory payment schemes are the often high individual transaction costs. Through bundling the supply side, often important economies on transaction cost can be realised. For an individual producer e.g. it is a very high cost to set up a private label to make it possible to market the jointness with a non-commodity output. In that case organisation of farmers allows to divide the costs and in particular to reduce the private transaction costs to search information on production practices required, legislation, market opportunities, to negotiate a premium price with large distribution channels or to monitor the jointness between the commodity and non-commodity output. In Verhaegen and Van Huylenbroeck (2001) it is indicated for a number of innovative marketing channels how transaction costs can be reduced through collective action.

Collective action at suppliers side may also be a solution if supply of the non-commodity output or function depends on the joint action of different actors. A good example of this are environmental co-operatives delivering landscape goods and services or farmer groups organising local water conservation. By organising farmers, a global plan of action can be

developed in which the role of individual producers is defined. The global plan is then approved and paid for by the authorities or the trust demanding the provision of the non-commodity output while the collective organises the payments of individual contributions. This makes not only use of possible synergies of collective action (the global organised provision may be better than the sum of individual provision) but also avoids under- or oversupply that may result from individual reaction on incentives and may also result in economies on transaction costs linked to individual agreement negotiations. This is certainly also a mechanism that needs further to be explored and developed. In the past organisation of farmers has resulted in remarkable achievements with respect to market power for purchasing inputs or selling commodity outputs. It is my impression that possibilities of co-operative organisation to supply non-commodity outputs (either directly or indirectly through the jointness with the characteristics of the commodity outputs) have not yet been fully exploited. A major problem may be the monitoring of individual contributions and avoiding free rider problems. But investment in effective cost monitoring and control systems may overcome these problems.

Collective action may overcome some of the problems mentioned at the end of section 5 in case of individual delivery, but also collective action is sometimes hampered by problems at the juridical, legislative, financial, fiscal and so on level. Stimulating the delivery of non-commodity functions may therefore also require action at the institutional level for creating more adapted institutional forms. Hereby the property right issue may be crucial as for a number of public goods it is necessary that one or another form of collective ownership is installed in order to create a club good.

7. Conclusions

Agriculture has always provided different functions to society. They can be regrouped in three main categories: commodity outputs (food, but also non-food commodities), socio-cultural functions (employment, rural viability, cultural heritage) and environmental functions. Prevailing combinations of these functions are the result of reactions of farmers on commodity prices on the one hand and incentives for non-commodity outputs on the other hand. If there is market distortion or in other words if there is a demand for more multi-functionality, the “price”-ratio between commodity and non-commodity outputs have to be changed so that the equilibrium point on the production possibility line is shifted. This can be done by using different instruments.

In theory non-agricultural provision is possible, but this is in most cases more expensive then agricultural provision. Therefore, market or non-market incentives are necessary to convince farmers to adjust their resource combination toward the desired equilibrium. The level of incentives necessary to convince farmers will of course also depend on commodity prices. One of the reasons for underprovision of certain functions may be the distorted prices for commodity products. However, one must be careful in his analysis as a global price decrease for commodity outputs does not necessarily mean that the provision of non-commodity outputs would increase because this will *inter alias* depend on the competitiveness of farm production systems. It may be that with lower commodity prices only large scale and intensive farming systems with lower levels of non-commodity outputs may survive or that land is taken out of production and thus also the non-commodity output. This give some argument to provide a general (non-coupled income) support to farmers, although a more differentiated system of stimulation of farming systems that provide a higher level of non-commodity output but that are therefore disadvantaged and not competitive in the commodity markets, would be more corrective.

Although directly or indirectly markets may be created for a number of non commodity outputs, because of their public good character, government intervention seems inevitable in a lot of cases. Such intervention may take different forms. Often the role of the State can be limited to the provision of a legislative framework so that market creation is possible or even institutionalised (e.g. allowing private labels, collective property rights). Sometimes, a more prescriptive form of intervention may be necessary, certainly to avoid negative externalities. However, in most cases a combination of both configurations has to be searched and the State has to stimulate private and collective action. In such configuration, the state tries to stimulate innovation through legislation, regulation, subsidies and other instruments in order to achieve the required shift toward farming systems providing the requested mix of commodity and non-commodity outputs without imposing it. It is up to the individual farmer or to groups of producers to make use of the created possibilities.

Rather than to impose delivery, the creation of markets is then stimulated. This requires the creation of new institutions to make transactions and their financing possible. Such policy may also require a paradigm shift for the EU agricultural policy. Rather then a support based on the amount of commodity outputs as is still mainly the case, this would require a support to farming systems and/or production practices which are temporally or permanently disadvantaged in the market. This would stimulate innovation and entrepreneurship as it

would leave farmers with different options: either extensive production at low cost for the market without support or with a basic form of support, or shifting to new markets through the help of a transition support (cf. the actual 5 year support scheme for organic farming), or getting part of the income from permanent funds for the delivery of pure public goods. Hereby new organisational forms can be developed to reduce transaction cost both for the state as for the farmer. If the non-commodity outputs are spatially differentiated and where the place of production can be located, using the land market is certainly a long term option. Also here transitory compensations could be used to by out property rights.

Such a policy would have to put the farmers' role central, but will also require from farmers (and their organisations) a new mentality. Rather than to remain in the protected cocoon of subsidised production, innovation, risk taking and entrepreneurship need to become the central focus. Based on an analysis of strengths, weaknesses, opportunities and threats each farmer (but also other actor in the marker channel) would have to decide how to combine the available resources.

One of the problems to install such policy is the lack of benchmarks to measure competitiveness of different farming systems. Another problem is of course the fear of the agro-industry to loose some of its markets (internal and external). Therefore also agro-industry need to be convinced of the possibilities of a more diversified production and willing to invest in new market niches and leaving the sole path of standardised cost minimised production lines.

Although the rural development policy of Agenda2000 foresees some possibilities in the above mentioned direction, in practice the paradigm shift is not yet realised. Too much of the support even for rural development is still production based (e.g. per hectare or per animal) and not accentuated on a global re-allocation of resources at the farm or production system level. Maybe the recent crises in agriculture can be the driving force to arrive at a more profound review of the EU agricultural support policy. Only then multi-functionality will become more than window dressing to defend the present EU-policy on the international forum.