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Improving Measures for Targeting Agri-Environmental Payments: The Case of High Nature Value Farming

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Abstract

The debate on optimization of policies and instruments of the European agriculture has been lasting for several decades and still there is no unified opinion on that aspect. Although there is an unanimity on targets these policies should achieve, there is an ongoing discussion on policy tools and instruments for practical implementation of CAP in connection with agri-environmental payments. The aim of this paper is to contribute to this discussion by looking at the developed approaches to evaluate environmental and economic efficiency simultaneously as well as to examine possibilities for more targeted agricultural support by an implementation of economic-environmental efficiency analysis. In this regard it is especially interesting to consider the case of support for sustainable land use practices such as in HNV farming (high nature value) and the opportunities of implementing such analyses in areas of HNV agriculture: we consider in particular disadvantageous mountain areas in the Romanian Carpathians and the bordering areas in the Ukrainian Carpathians.

Keywords: CAP measures, agri-environmental payments, economic-environmental efficiency, HNV farming.

JEL classification: Q18, Q56, Q57.

1. INTRODUCTION

The debate on optimization of policies and instruments of the European Agriculture Policy (CAP) with regards to environmental aspects has been lasting for several decades and still there is no unified opinion on that aspect. There is certainly an unanimity on targets these policies should achieve such as: (1) they should be formulated as obtaining economic efficiency under the condition of simultaneous production and environmental goals and (2) they should recognize regionally specific aspect and subsidiarity. However, since the early 1990s, when agri-environmental issues first found reflection in the CAP, there is an ongoing discussion on policy tools for practical implementation of CAP targets and on those instruments which should particularly serve as a basis for agri-environmental payments. The range of opinions on suitable policies is quite wide. Generally it seems that the currently existing system of agri-environmental payments and cross-compliance mechanism is only justified and positively evaluated as having no alternatives (Cooper et al., 2009; FAO, 2010). However many researchers have criticized the implementation of the CAP system for inefficiency and inconsistencies, noticeable between policy measures and objectives (Arovuori, 2008; Mann,

2005). Some specifically argue that there is an obvious contradiction in the current CAP policy: on the one hand, there are agri-environmental payment schemes offering support to sustainable land use practices; on the other hand, there are market and income support payments which give incentives to intensify agricultural production (Pacini et al., 2004). At any case there is a constant search for a suitable policy scheme which could replace the existing system of payments and which would consider more targeted distribution of payments.

It is especially interesting to consider the case of support for sustainable land use practices such as in HNV farming (high nature value) which is recognized in parts as the CAP and as a set of farming practices which are successful in providing positive externalities and environmental services. Those member states, who acknowledged the HNV farming concept through commitment to support and maintain HNV agriculture, sustain it mainly through Rural Development Programmes (RDPs) (Beaufoy, 2007).

The aim of this paper is to contribute to the above mentioned discussion on EU agricultural policy schemes by looking at the developed approaches to consider ecological and economic efficiency simultaneously and to examine the question of possibilities to measure economic performance in agriculture with the consideration of environmental efficiency. To do that, we give a review of the existing literature on economic-environmental efficiency and on incorporation of environmental externalities into analysis of production efficiency. Moreover, in the paper, we contemplate on opportunities of implementing such analyses in areas of HNV agriculture: we consider in particular disadvantageous mountain areas in the Romanian Carpathians as target areas. Especially and also, bordering areas in the Ukrainian, Carpathians were taken as a region for comparison because they have generally similar conditions but the efficiency analysis can still be conducted with the exclusion of the influence of the EU agri-environmental payments (which have been already introduced in Romania). This article brings in the discussion on addressing efficient provision of nature if there are possibilities for more targeted agricultural support in case of HNV farming.

The paper is structured as follows: after the introduction the theoretical background on policy intervention, specifically in agriculture, is presented, main policy instruments, their mixes, and possible problems are considered. The third part deals with the CAP itself. First, its development, after that the current state and possible future amendments are described with the special consideration of agri-environmental schemes and then most discussed problems and inconsistencies of the CAP are mentioned. In the fourth part we give an overview on the solution options for some of the mentioned problems: after some approaches for evaluation of the farms' performance which are mentioned in the literature are considered, an alternative approach for performance analysis is discussed which considers economic and environmental efficiency simultaneously; this part shows how this methodology was developed and used in various researches and deals with positive sides as well as limitations of the presented approach. The fifth part considers the special case of HNV farming support and contemplates on implications of the described efficiency evaluation approach for the special HNV farming areas at the research sites in the Romanian and the Ukrainian Carpathians. The conclusion sums up

the discussion on the possible solutions to the more targeted support within the CAP presented in the paper.

2. AGRI-ENVIRONMENTAL POLICY: THEORETICAL BACKGROUND

The aim of this part is to give an overview of the theoretical foundation for agri-environmental policies and discuss most important justifications for policy interventions in agriculture within a market economy. Two dimensions will be mentioned: the environmental and the economic perspectives. The same dimensions will be considered subsequently in other parts to analyse the methods of performance evaluation or the policy mechanisms. The subsection concerning the political perspective deals with main components of policy design: objectives of the agri-environmental policies as well as policy instruments and their mixes.

2.1 Environmental perspective

A central aspect of agri-environmental policy is the recognition of the various impacts of agricultural practice on material flows of pollutants, nature biodiversity, landscapes, etc. Tillage practices, usage of chemical substances for fertilization, pest control, water consumption, etc. can significantly influence nature and its components. In particular intensified agricultural production can lead to serious environmental problems such as soil erosion, water quality degradation, reduction of wild life habitats, etc. (Bonnieux et al. 2006, p.4). Production systems and practices differ in the impacts they have on the environment which can be positive or negative (for example, the differences between the production approaches in organic and in conventional farming).

To justify policy interventions from the perspective of environmental reasons, it was also very important to realize that changes in farming practices towards nature-friendly techniques can have a strong positive influence and solve some serious environmental problems. Some forms of agricultural management can provide better environment; for instance, such characteristics as agricultural land use, the size and structure of the farm, agricultural infrastructure, etc. can influence to a certain extent types of positive or negative environmental changes (Cooper et al., 2009, p. viii). This aspect increased the importance of the role farm practices play in managing environmental impacts: farmers are not only the food suppliers but also the "conservators of the landscape" and "protectors of natural resources" (Pacini et al. 2004, p.349).

2.2 Economic perspective

Economic perspectives of policy interventions, in this case, deal with two main terms: environmental externalities and public goods. The impacts of agricultural production on the nature influence not only the producer but also other society members causing additional costs (in case of negative external effects) or benefits (positive external effects). The concept of public goods implies that certain goods are characterized by non-rivalry and non-excludability (Schader, 2009, p.9) and these public goods can be provided by farming practices which are environmentally friendly only if governances are cleared.

Both, externalities and public good aspects, are considered as market failures, since external effects create costs which are not compensated or benefits which are not paid and environmental public goods can be undersupplied since the provider has no incentives to provide it without compensation (Cooper et al., 2009, p.7). This justifies policy interventions into the market mechanism and provides an important framework for the agri-environmental policies whose aim is usually to internalise the external effects.

2.3 Policy perspective

Agricultural policy is an example of multi-objective policy. Most of the aims of the current agricultural policy can be accommodated into a sustainability concept (FAO, 2010, p.3) and the particular sustainability of farming also implies multiple objectives (Pacini, 2003, p.82). Although the term itself is quite ambiguous, we can argue that sustainability in agriculture includes two important components: socio-economic and bio-ecologic or environmental dimensions (De Koeijer et al., 2002). The main policy objectives should cover these dimensions and include such aims as securing farmers' incomes, allowing increase in productivity, recognizing structural developments, market stabilization, reasonable consumer prices, availability of suppliers and of course the environmental concerns (Arovuori, 2008, p.4), which are in their turn comprised of further specified targets which will be discussed in part 3 of this paper.

There is a wide variety of policy instruments which can be used to achieve the above mentioned objectives. The overview of these instruments is given in a Table 1. (based on Schader, 2009, p. 19-24).

Table 1: Overview of the instruments in agri-environmental policy.

Instrument	Short description
Standard regulation	Standard regulation bans the use of certain (detrimental) inputs and prescribes the use of precautionary measures
Environmental tax	Input-oriented taxes allow farmers to use the taxed input only in case they still can be profitable with the tax. There may be also output-oriented taxes (e.g. undesired output)
Tradable quotas	Contrary to the environmental tax which deals with price regulation, the quotas regulate the quantity of environmental certificates tradable at the special market
Environmental auctions	An effective solution on a smaller scale
Communicative policies	Communicative policies lead to higher uptake levels of the agri-environmental schemes on the production side and the improved market transparency on the side of the consumer
Agri-environmental schemes and measures	AE schemes represent a voluntary instrument and are a mixture of regulatory instruments with economic incentive; compensate farmers for yield, income loss and higher production costs due to implementation of environmentally-friendly practices
Cross-compliance	Cross-compliance rules are representing obligatory approach. Non-compliance to certain environmental standards makes the farmers ineligible to receive other types of payments, for instance the direct payments
Community-based schemes	The idea behind this instrument is to fund local initiatives aimed at pursuing policy goals at regional or local level

Source: based on Schader, 2009, p. 19-24.

Beside these instruments there is a certain number of other tools connected to the economic dimension directly, which implies the use several instruments in one policy. This diversity of instruments causes major difficulties for the policy design with the task of combining policy tools in the most favourable, i.e. effective way in order to create the needed incentives for farmers for the provision of environmental public goods. There are some rules for the effective policy measures and policy design (OECD, 2007):

- Good understanding of the (environmental) problem which should be addressed;
- "Cost-benefit" criterion – marginal cost of the instrument mix implementation should be less than marginal benefit;
- "Cost-effectiveness" criterion – marginal cost of the instrument mix application should be as low as possible;
- "Environmental effectiveness" criterion – marginal environmental benefit from the implementation should be as high as possible;
- In particular the question of the optimal number of instruments in policy design is usually addressed from the perspective of Tinbergen rule (Tinbergen, 1966, p.55), which implies that each instrument within one policy should address one specific policy objective, i.e. the number of tools used should be equal to the number of policy aims.

Following these rules, we can sum up other important aspects which are crucial for effective agri-environmental policy:

- Thorough analysis of the problem is expected, the focus of the policy is on efficiency;
- Sufficient information on the socio-economic and environmental parameters is needed;
- The developments of economic evaluation techniques to measure the effectiveness of policy measures, to estimate the costs or benefits of certain farming types and to evaluate the performance rates of certain farms with regard to the provision of environmental public goods, are essential. The later has an implication for more accurate targeting of the agri-environmental policy measures that plays an important role and will be partially addressed in the following sections of this paper.

3. THE CAP AS AN INSTRUMENT MIX FOR AGRI-ENVIRONMENTAL POLICY

3.1 Development, current implementation and future of the CAP

The history of the CAP (European Common Agricultural Policy) starts in 1957 and it has been constantly a subject to new developments. Based on the Treaty of Rome, it introduced various market interventions with the main objectives of increasing agricultural productivity and providing income support to European farmers (Cooper et al., 2009, p. 85). Although certain measures of agri-environmental policy were implemented in some European countries already in the 1980s, the first introduction of environmental concerns into the CAP framework took place in the mid-1990s when McSharry reforms were started (FAO, 2010, p.3). The EU Regulation 2082/92 covered such impacts as water quality, soil quality, biodiversity, and landscapes (European Commission, 1998, p. 38). The relevant measures were classified into 3 groups: environmentally-beneficial in productive farming (including input reduction, organic farming, extensification of livestock, etc.); tools for non-productive land management

(including maintenance of the countryside and landscape features, set-aside, etc.); and socio-economic measures (including training and education) (European Commission, 1998, p. 38).

Next, changes within the CAP were introduced within the period of the Agenda 2000 – the policy developments for the 2000-2006 period – and with the 2003 reform. Within this period such measures as cross-compliance and decoupling of direct payments from production were introduced. This was implemented through the Single Payment Scheme (SPS) which is paid per hectare of land and does not depend on the agricultural output. Cross-compliance implies that SPS is paid as long as the land is kept in Good Agricultural and Environmental Condition (GAEC) (FAO, 2010, p. 3; Brady, 2011, p. 16). There have been many explanations for the choice of policy (Bartolini et al., 2012); a popular explanation is the theory of compromise and doing things at the minimum as well as having a focus on financial flows instead of real concern for the environment.

The same strategy was followed in the CAP framework for the 2007-2013 period, which was formed around two pillars: with Pillar 1 representing traditional commodity orientation including decoupled direct payments as well as cross-compliance, and Pillar 2 containing rural development programmes (RDPs) (FAO, 2010, p. 8). Three Axes of the Pillar 2 are covering all dimensions of sustainability: Axis 1 dealing with economic issues, Axis 2 focusing on environmental and land management issues with agri-environmental measures as a part of it and Axis 3 considering social and rural community issues (FAO, 2010, p. 9).

Concerning an assessment of the policy Cooper et al. (2009, p. 30) put into the focus of their study 10 environmental public goods provided by agriculture which are under the CAP influence. These include agricultural landscapes, farmland biodiversity, water quality, water availability, soil functionality, climate stability with relation to carbon storage and measures to green house gas emissions, air quality, resilience to flooding, resilience to fire. These authors also divide the current CAP measures into three groups (Cooper et al., 2009, p. 86-87): measures which are focused directly on the provision of environmental public goods (like agri-environmental schemes); measures with partial focus on the environmental issues (for example, support of LFA – less favoured areas); measures with no direct focus on environment but with potential to have a positive influence on nature (decoupled direct payments and cross-compliance). These interdependencies determine the complex structure of the CAP instrument mixes where each instrument may be used to reach several objectives.

All measures for the next CAP reform for the period of 2014 – 2020 are still under discussion. However it is already clear that there are some serious challenges for the agricultural policy in Europe:

- The CAP reform is developing in the framework of Europe 2020 Strategy of "smart, sustainable and inclusive growth" which among other issues includes "the promotion of more resource efficient, greener and more competitive economy" (FAO, 2010, p. 10). This implies that the CAP will keep a strong focus on the environmental aspects of agriculture. Moreover the current discussion about percentages of area to be devoted to ecological main structures by farmers, such as 7% of arable land or fallowing, crop rotations, etc., and the intensive discussion what is eligible to be considered as greening

measure show the will and need to proceed in the direction of getting better results out of a new CAP in terms of nature conservation;

- The problem of limited financial resources will put additional challenges for all the actors and will require two important special measures within the policy design:
    - Improved justification of agricultural support as a definite benefit for society and
    - Improved cost-effectiveness of the agri-environmental policies.

The later issue belongs to the most discussed problems of agri-environmental part of the CAP and is discussed among other issues in the next subsections of this paper.

3.2 Problems and trade-offs of the CAP

As we have already mentioned, the effectiveness of CAP can be questioned from the perspective of the Tinbergen Rule implying that one policy instrument is needed for one policy objective to create an efficient policy. In the sub-section 3.1 we have mentioned the complexity of instrument mixes within the CAP which means that it fails to comply with the Tinbergen Rule (Arovouri, 2008, p.1). However this rule was formulated under certain assumptions which should be emphasized: there should be no conflicting goals or co-benefits of policies and there should be no transaction costs (Schader, 2009, p.28). This is hardly applicable to agri-environmental policy in general and to the CAP in particular due to complex system of interdependencies of various tools. For example Schader (2009) shows that multi-objective policy should not be excluded on the basis of the Tinbergen Rule, only. Rather he shows, in his study of organic farming, that it is not the only criteria for the cost-effectiveness of a policy: the effectiveness of organic farming has to be regarded against a single instrument for several objectives. It was proved to be comparable to the option of combined agri-environmental measures (Schader, 2009, p. 271-273).

A lot of critics became the decoupling and cross-compliance policies. For instance, it was argued that decoupling would lead to a reduction of agricultural activities and production especially in marginal rural areas (Brady, 2011, p.16). The SPS (Single Payment Scheme) is seriously criticized as an inappropriate measure to provide environmental stewardship for rural landscapes and an inefficient environmental policy at least with regard to landscape values (Brady, 2011, p.231-232). The ability of cross-compliance framework to avoid all the negative environmental consequences of decoupling is also questioned: the argument is that "commercial constraints will necessarily dominate" and environmental public goods will be undersupplied (Beard and Swinbank, 2001, p.142). Payments within this policy measure stay on the same level and are not connected to the levels of nature provision: if some farms show better environmental indicators than another, they still receive the area based payment. Agri-environmental schemes and payments are to be developed to solve this problem, however they face another challenge: since the compensation level is not adapted to real performance of farms, this leads to overcompensation of some producers (Schader, 2009, p. 23). The sensible methods for evaluation of farm performance are needed for more targeted and balanced agricultural support.

These contradictions which underlie the current CAP measures are a problem and matter of conflict between environmental measures and other measures for support of agricultural

production: although the agri-environmental issues are recognized and accommodated into the current policy, the main objective of the CAP is to increase agricultural productivity. Aims may contradict each other. The question is: if there is certain farming system or set of farming practices within a region which is able to reach both aims simultaneously in the most efficient way, how can we incorporate the incentive to follow the best practice example into the policy?

The problem of performance evaluation of farms and ways to the targeting of agri-environmental support will be addressed in the following parts.

4. CONSIDERING ECONOMIC AND ENVIRONMENTAL EFFICIENCY WITHIN THE CAP

4.1 Evaluation approaches to support the CAP: Literature overview

As mentioned above, the agri-environmental policy itself and agri-environmental schemes in particular face a lot of challenges since it is very complicated to measure environmental effects in practice and to evaluate how effective the policy measures are. There are a lot of approaches developed in literature which are supposed to solve the issue of evaluation. In this paper we consider few evaluation approaches which do not cover all the scope of existing methods but give an idea on how this assessment can be performed. These methods contain the following common features:

- These are farm system approaches of evaluation (with the exception of the case presented by Schader (2009) where sector based approach was applied);
- They include modelling of economic and environmental effects;
- The main aim of these methods is to evaluate measures of agri-environmental policy.

For example, Schader (2009) used a cost-effectiveness approach for the evaluation of the Swiss agri-environmental policy, in particular of organic farming support. The approach used linear programming (LP) and modelled farm management and relations between farm internal activities as well as farmers' responses to changes in exogenous conditions in form of direct payments or product prices; it also compared farm groups (organic and non-organic farms) within the sector and took into account policy uptake, environmental effects and public expenditure for agri-environmental policy, notably as determinants for cost-effectiveness (Schader, 2009, pp. 112-113). Although only three environmental effects were considered (fossil energy use, biodiversity and eutrophication with nitrogen and phosphorus), the analysis (with the use of this model) presented interesting results considering cost-effectiveness of organic farming support and showed differences between organic and conventional farms. It proved that generally organic farms perform better with respect to the environmental impact. Moreover it showed that organic farming support as a multi-objective policy provided individual environmental effects at a higher (but comparable cost) than specialised targeted agri-environmental measures.

In their approach Falconer and Hodge (2001) used the "production ecology methodology" to see how different measures of pesticide use control influence the farm performance (Falconer and Hodge, 2001, p. 266). The idea behind this approach is to analyse simultaneously production of agricultural outputs and environmental externalities. It resulted in connecting economic farm modelling with ecological models developed to evaluate environmental

consequences of pesticide use. Economic performance models were developed for two farm groups: commercial crop production and "progressive" farming which included commercial as well as reduced input practices. The environmental model aggregated "hazard indicators for pesticides" which were identified for nine ecological and human-health dimensions scored according to labelled warnings (Falconer and Hodge, 2001, p. 267). The two models were combined into farm resource allocation model including both the economic components and indicators for environmental hazards. Finally a two-dimensional frontier analysis was then used to see the differences between the outcomes of the various policy instruments applied. The approach also uses an LP model.

The model developed by Pacini et al. (2004) aimed at comparing the economic-environmental performance of organic and conventional farms under various policy scenarios and at measuring the superiority of organic system for various amenities. Versions of integrated ecological-economic LP models for organic and conventional farming systems were used to compare various aspects of their performance: technical, environmental and economic. In principle, the model used input-output matrices which were extended to include emissions and various indicators from ecological models such as nitrogen leaching, soil erosion, ground and surface water balances, herbaceous plant biodiversity, and others (Pacini et al., 2004, p.355). The combination of these models allowed the evaluation of production costs of environmental externalities provided by organic method. The modelling framework is described as indicating efficient use of measures for the policy with multiple objectives because "it is based on actual environmental performances, it takes into account site-specific pedo-climatic factors; and it is holistically designed and considers trade-offs between potentially conflicting environmental goals" (Pacini et al., 2004, p.363).

To sum up it is necessary to mention that the considered approaches were developed to evaluate and compare the performance of various farming systems with respect to economic output and environmental impacts. However the main aim of these methods is to evaluate various agri-environmental policies. Another limitation is that most of them consider only few environmental effects. Within the scope of this paper we are more interested in how to distinguish farmers according to their economic-environmental performance within a certain farming system. In order to make the agri-environmental support more targeted, we think that it is necessary to consider farm performance. Admittedly the described approaches can be applied to this kind of assessment; however the next subsection will deal with a further method for evaluation which offers new perspectives to policy analysis and design.

4.2 Opportunities for efficiency evaluation

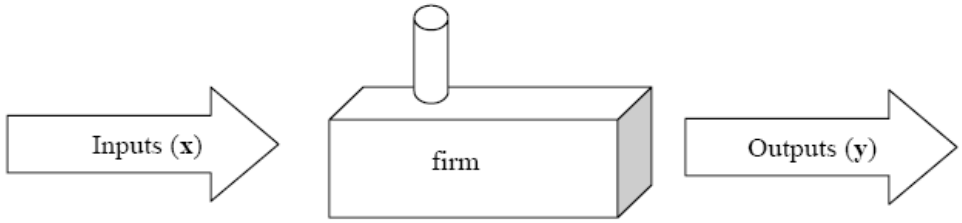
With regard to the trade-off between the two most significant objectives of the CAP which are often contradicting one another (those are the increase of productivity and the provision of environmental goods) it is important to take into consideration evaluation methods which would be able to provide an analysis combining both aims. Efficiency evaluation which would consider economic and environmental performance seems to be a suitable solution. This subsection gives an overview of the methodological developments in this area and discusses the implication possibilities within the CAP.

The measurement of production efficiency is usually based on physical and monetary inputs and outputs. The traditional setting of production economics (see Figure 1) implies that "a firm consumes inputs (e.g., labor capital, materials, energy) to produce economic outputs (i.e., goods and services)" (Kuosmanen and Kortelainen, 2004, p.3). Technical efficiency of this firm implies that its input-output combination lies on the boundary of the set of all possible inputs and outputs which represents technology (Kuosmanen and Kortelainen, 2004, p.4). A commonly used measure of efficiency is a ratio in form of:

[illegible]=[illegible]

Although many other measures (such as, for instance, relative efficiency) are used (Cooper et al., 2002, p.1, p.5, Bousofiane et al., 1991, p.1), it lies at the core.

Figure 1. The traditional setting of production analysis



Source: Kuosmanen and Kortelainen, 2004, p.3

It is important to point out that an incorporation of environmental externalities into efficiency analysis requests a more complete representation of production technology. At the same time the omission of environmental effects may create biases in evaluation of production techniques and to underestimate the environmentally friendly technologies (Sipiläinen et al., 2008, p.2). The methodological challenge of this approach is the consideration on how these externalities can be incorporated into the efficiency model: as an input or as an output.

There is a certain number of research papers which elaborate on the consideration of environmental impacts of production in the efficiency analysis. The majority of these sources is dealing with negative externalities. Some authors assume that negative environmental impacts are technically outputs and therefore argue that environmental externalities should be modelled as an undesirable output (Färe and Grosskopf, 2004). Another group of researchers sees it as a conventional input; they justify this, for instance, by the fact that undesirable environmental effects as well as inputs incur costs to the firm (Kuosmanen and Kortelainen, 2004, p.14, Lauwers and Van Huylenbroeck, 2003, Reinhard et al., 1999, De Koeijer et al., 2002). However there are also attempts to model positive externalities as well which were considered as non-marketed output or as desirable by-product (Sipiläinen et al., 2008).

The notion of environmental efficiency provides many possibilities for economic evaluation of environmental impacts. However modelling approaches differ. Usually environmental efficiency is defined either as "the ratio of minimum feasible to observed use of an environmentally detrimental input" (Reinhard et al., 1999, p.48) or as the ratio of economic value added to environmental pressures (Kuosmanen and Kortelainen, 2004, p.18).

Also methods of evaluation in case of environmental efficiency vary. For instance, Reinhard et al. (1999) use econometric approach to estimate the environmental efficiency of nitrogen surplus in agriculture. The same group of authors used the SFA approach (Stochastic Frontier Analysis) to assess the same parameter with consideration of multiple environmentally detrimental inputs (Reinhard et al., 2000). But the method, which we would like to consider in this paper and which is also often used for this type of analysis, is the DEA method (Data Envelopment Analysis).

DEA is an approach to compare efficiency of various organizational units (farms) with multi-input and multi-output production options (Sipliläinen, 2008, p.9). Efficiency is calculated for relatively homogenous set of decision making units (DMUs). DEA constructs the efficiency frontier (the most efficient combinations of inputs and outputs performed by some of the DMUs in the set) and calculates the distance to this frontier for the DMUs which are not situated at the frontier and therefore are less efficient (De Koeijer et al., 2002, p.12). "DEA does not require the user to prescribe weights to be attached to each input and output... and it also does not require prescribing the functional forms" (Cooper et al., 2002, p.1). So minimal prior assumptions are made and the approach lets the data "speak for themselves" (Kuosmanen and Kortelainen, 2004, p.7). This is especially beneficial for the case of environmental evaluation since subjective assessment of weights for the aggregate level of environmental impacts is quite a challenging procedure (Kuosmanen and Kortelainen, 2005, p.64). Moreover DEA is using LP models which are solved for every DMU.

DEA has been used also for agricultural policy evaluations. For example, De Koeijer et al. (2002) applied DEA to estimate technical and environmental efficiency of Dutch sugar beet growers. The environmental efficiency in this analysis is based on the environmental impacts of polluting inputs (pesticides and nitrogen application). Reinhard et al. (2000) considered the use of multiple environmentally detrimental inputs (excess nitrogen and excess phosphate use and total energy use) within the DEA approach to evaluate the environmental efficiency of Dutch dairy farms. In contrast to the mentioned approaches Sipiläinen et al. (2008) used the DEA method for efficiency evaluation with positive externalities: they compared the performance of organic and conventional farms modelling the existence of two outputs – conventional output (crop yield) and environmental by-product (biodiversity). The later research shows that the method can be used to evaluate the performance of a holistic farming system such as in this case organic farming.

Considering these attempts to evaluate the performance at the farm level, we can argue that DEA is a suitable method to measure the efficiency of farms' performances with consideration of environmental impacts. On the one hand it allows consideration of multiple environmental effects (Reinhard et al., 2000) and on the other hand it also gives an opportunity to model positive as well as negative externalities (in the form of outputs and inputs respectively). In addition DEA results can be practically used in many other ways, for instance, to ascertain how the DMUs can become more efficient, to form peer groups, to identify efficient operating practices and strategies, to allocate resources, etc. (Bousofiane et al., 1991, p. 4). The aim is now to use DEA for evaluation of farm performance.

Despite all the positive features it is obvious that the approach also has some limitations. DEA is based on certain assumptions such as resource disposability, convexity and absence of statistical errors in the data set. In fact "the extensive data requirement" is usually mentioned as the main limitation of this method (Kuosmanen and Kortelainen, 2005, p.70). Since the efficiency frontier is built simultaneously and no prior assumptions are made, the data should be accurate and reliable. It is also important to point out that data availability, especially for the analysis with consideration of environmental impacts of policy (payments), is a major problem for all the evaluation methods including those described in subsection 4.1. At the same time the information requirement is very important for policy design: "The omission of information on many environmental aspects may lead to misjudgements in the objective policy-making process and conflicts between different government programmes or regulations" (Pacini, 2003, p.83). Another problem within DEA, which should be mentioned, is connected to the simultaneous evaluation of multiple positive and negative environmental impacts. First, a clear framework should be elaborated which accommodates the environmental effects and groups them into two groups according to their positive or negative impact. It should be also decided how these impacts are defined – as inputs or as outputs. Secondly, the interdependencies between these environmental effects should be also considered (Kuosmanen and Kortelainen, 2005, p.60).

The next part of this paper considers the special case of HNV (High Nature Value) farming and the possibilities of implication of the described efficiency evaluation approach for HNV areas.

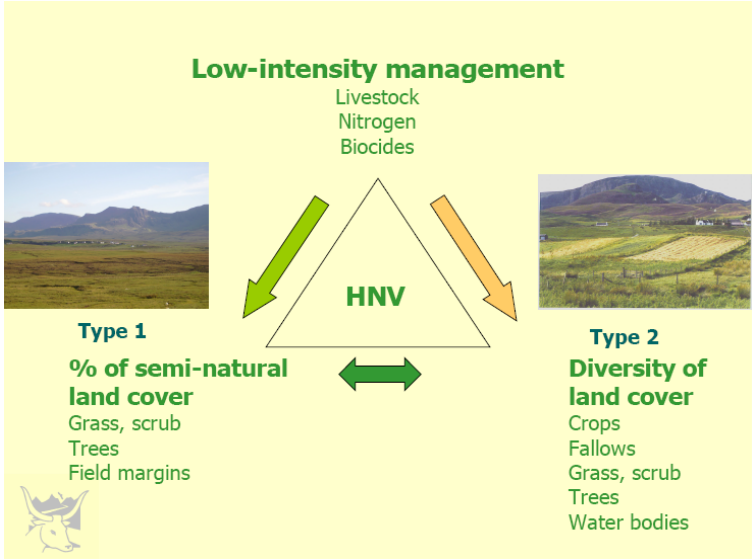
5. EFFICIENCY EVALUATION IN CASE OF HNV FARMING

5.1 HNV farming within the CAP

The concept of HNV farming is rather new (Beaufoy et al., 1994; Beaufoy, 2007, Andersen et al., 2003); though it covers well-established conceptual approaches in farming system and landscape analysis (such as extensive farming, farming with nature provision). The concept was developed for different landscapes, within which one still finds an intact nature and ecological values are ranked high (Figure 2). HNV farming applies to situations in which nature co-exists and coincides with the farming activities as well as in situations where farming is supportive for higher biodiversity in untouched nature. Actually in Europe there are almost no areas that can be considered pure wilderness, and farming and surrounding land use types almost always impact on nature, but HNV areas exist. The purpose of this concept is to contrast intensive farming systems to farming systems that do not care for nature or even degrade nature. The aim is to link the three components, ecology, farming, and public policies, in such a way that they get "equal" recognition and management concepts, which promote HNV, can be developed. Since most of the payments within the CAP framework were intended for Europe's most productive and competitive farmers, HNV farming is an attempt to identify and define alternative types of farming that also need public support; but, at the other hand, deliver increasingly scarce ecosystem services at both local and EU levels. The central objective is to

shift the public support in favour of low intensity farming across extensive areas of landscape (Beaufoy, 2007).

Figure 2. Characteristics of HNV farming



Source: Beaufoy, 2007, p.5.

As we can, see the concept of HNV farming is based, first of all, on the idea of low-intensity farming and more importantly on the concept of a holistic system of extensive land use practices which includes the notion of connectivity between farming and nature. Therefore HNV agriculture provides the public good of biodiversity conservation as well as other environmental amenities and facilitates increased ecosystem provision, eventually at lower costs than single measures. In contrast to other farming systems, in this case the main policy task is not to encourage the farmers to produce more environmentally friendly since the basic assumption of HNV is that nature provision is already a part of this agricultural system. This type of farming is based on the traditional knowledge and local culture. However there are other important challenges for such policy: intensification or abandonment should be necessarily addressed and agri-environmental schemes should be adopted. Since these farming systems dominate marginal and remote (usually mountainous) areas (Baldock et al., 1996), abandonment, which is connected to inability to adapt the land management to social and economic pressures (MacDonald et al., 2000), is a significant threat. Main impacts of this trend on the environment are usually straight connected to biodiversity losses, changes in landscape mosaic and soil depletion (MacDonald et al., 2000, p.56). An assumption is that HNV farming, as a holistic sustainable agricultural system, can provide a solution for these challenges; therefore all kinds of support measures can be regarded as environmental measures.

Currently HNV farming is supported through Pillar 2 of the CAP and RDPs (Beaufoy, 2007). The main measures within the CAP which have an impact on this type of farms are for instance: i) natural handicap payments or aid to farmers in less favourable areas (measures 211 and 212), ii) Natura 2000 programme for special conservation zones (measure 213), iii) agri-

environmental schemes (measure 214), and iv) partially also payments for conservation and upgrading of the rural heritage (measure 323) (Cooper et al., 2009).

To sum it up, we should emphasize that HNV farming can be regarded as a holistic system which comprises extensive farming practices which are conducive for environment. In contrast to organic agriculture which can also be distinguished through its special approach to production techniques, this system is additionally incorporated into the way of life of local people and strongly connected to the local culture and traditional knowledge. However we argue that even within the homogenous group of HNV farms there can be differences in performance and in environmental provision which are important to identify and to analyse. Therefore, as it has been shown in the subsection 4.2, DEA is a suitable approach to explore these issues due to several reasons: 1) it is suitable to evaluate the efficiency of multi-input multi-output production; 2) DEA has been already used for evaluation of holistic farming systems such as organic farming (Sipiläinen et al., 2008); 3) this method can consider negative as well as positive environmental impacts in the efficiency evaluation; 4) it allows incorporation of several environmental impacts simultaneously (Reinhard et al., 2000).

5.2 The Case of the sustainable farming in the Romanian and the Ukrainian Carpathians

The Romanian and Ukrainian parts of the Carpathians are still characterised to a large extent by traditional farming as well as still exhibit high biodiversity (hot spots of biodiversity in Europe) and they have partly intact landscapes; so they can be considered as HNV farming areas. However often they have undergone and still undergo pronounced land use changes that negatively affect the resilience of sound ecosystems and provision of ecosystem services and public goods (Nuppenau et al., 2011). It is remarkable that even after periods of intensive land use during the communist era (and the times of state farms which dominated in both, Ukrainian and Romanian parts of the Carpathians) the areas under study managed to maintain a system where a rather high degree of connectivity between local farming activities and biodiversity exists. This might be the consequence of the mixture of natural, social and economic conditions as well as a strong cultural identity which is present in both regions.

Those areas in the Romanian and Ukrainian Carpathians, which we consider in this paper, possess various common features as well as differences (Solovyeva et al., 2011). The regions are famous for their unique hot-spots of biodiversity and marvellous heterogeneous landscapes. Although the regions under comparison are far away from each other, their natural and climatic conditions are quite comparable and have a strong influence on the way of life as well as on the regional development paths chosen. The areas belong to the group of disadvantageous areas and natural conditions limit possible farming practices to a certain range of agricultural activities which are almost the same for both regions (like livestock breeding, limited use of arable land, hay mowing, etc.). Beside other features such as low income, which are also common for both countries, there is a strong cultural identity prevailing in these mountainous areas: both in the Romanian and in the Ukrainian Carpathians people are identifying themselves with the local culture, traditions (including traditional ways of farming), and history. The study area in Romania is associated with the Hungarian minority of Székely and Csángós and the research

sites in Ukraine are linked to Hutsuls – one of the three ethnographic groups typical for the Ukrainian highlands. So far this cultural identification may be regarded as a very important integrating force for these regions which could not be weakened even by the collectivization period.

The main differences between the regions under study are new events like availability of EU CAP instruments (payments) for Romania, flight from the land, and different pathways for land distribution (Solovyeva et al., 2011). Since Romania entered the EU, farmers received agricultural support based on the CAP (similar to farmers in other member states). As a survey which had been carried out in two villages in the Romanian Carpathians showed, every farmer in this region of the Romanian Carpathians is eligible for at least one type of payment (Biro et al., 2011). The overview of the measures applied together with the policy uptake is presented in the Table 2. 'Land based' subsidy is the Single Area Payment Scheme (SAPS), 'After animals' subsidy is the payment farmers receive per animal, the agri-environment subsidy is available for High Nature Value Grasslands and has two packages: 1) basic HNV grasslands and in addition 2) the traditional farming package (manual scything of the fields) for (Biro et al., 2011).

Table 2: Absorption of subsidies (figure in brackets = number of households taking up the subsidy or grant)

Type of subsidy	Delne (n=24)	Hidegség (n=36)
Land based	66.7% (16)	97.2% (35)
After animals	37.5% (9)	77.8% (28)
Agri-environment	12.5% (3)	16.7% (6)

Source: Biro et al., 2011.

Although the results show that land based and animal based subsidies are relatively well absorbed, the type of measures is not quite suitable for HNV farming systems in the Carpathian areas. Whereas farms in Romanian regions (as well as in Ukraine if this kind of payment were available) obviously meet the cross-compliance criteria, the amount of the support within this measure cannot be comparable with other types of farming systems. Since the land sizes are very small in both countries and animal numbers are also small and keep on decreasing (Solovyeva et al., 2011), payments are minimal. Although most farms which took part in the survey in Romania are eligible to agri-environmental payments, the policy intake of this category of measure was quite low (Biro et al., 2011). The explanation might be that the respondents are not familiar with the available schemes; they don't understand the reason for receiving these payments and simply accept the recommendation of officers from Local Councils.

Beside the described difficulties of agri-environmental schemes in application another point should be mentioned: if we assume that there is a certain variation in farming intensity and in agricultural practices (even within this homogenous group of low-intensity farmers) their environmental performance might also vary (Kleijn et al., 2009) which leads to already mentioned problem of the overcompensation (see subsection 3.2 of this paper and Schader, 2009, p. 23). Moreover it is worth mentioning that the results of the same survey carried out in the Ukrainian Carpathians showed that the situations in both countries are very similar (with

exception of the CAP support) and the similar land management patterns were observed (Solovyeva et al., 2011). This proves that even without policy support farmers in the conditions of the Carpathian Mountains follow management patterns which existed there for centuries and which are based on the cultural traditions. Normally this phenomenon would create an argument against payments since they can cause deadweight effect (Schader, 2009, p.98) and may also lead to overcompensation. However, as we have mentioned above, the measures within HNV farming systems should be more directed towards abandonment prevention and creation of the conditions which would assure the preservation of these farming practices. Therefore any kinds of support directed to income improvement may be regarded as suitable solution.

Taking into consideration the described peculiarities of HNV farming in general and in particular with respect to the regions in the Romanian and Ukrainian Carpathians, the application of the environmental and economic efficiency evaluation method can contribute to the agri-environment policy in few ways:

- It gives possibilities for farmers' performance evaluation which might be used for policy decisions, justification and design of the suitable support measures;
- It can contribute to the targeting of the policy support: in case of HNV farming this method would allow to identify the farmers which are more efficient with respect to economic and environmental performance;
- If the payments are distributed to the most efficient farmers (and efficiency in this case is identified as economic and environmental efficiency), this policy would give the farmers an incentive to keep the management patterns which are conducive with nature provision, on the one hand, and to optimize their economic performance, on the other (for instance, to develop mid-size technology locally which would not have negative impact on the environment).

Despite some positive features of the DEA efficiency evaluation method which were described in subsection 4.2 of this paper, all the negative sides of this approach should be carefully considered. We would like to mention two of the most important challenges with respect to this kind of evaluation:

- Many of environmental characteristics are connected to site-specific natural conditions of the area; therefore it is very important to exclude the influence of this kind of site characteristics from the evaluation. This is necessary in order to assure that the difference in environmental efficiency between the farms is conditioned by different agricultural practices and not the natural characteristics which cannot be influenced by farmers. This is a big challenge for all types of environmental evaluation but there were many attempts to consider this challenge in the evaluation methodology (for example, see Pacini et al., 2004);
- This method as well as other evaluation approaches has very high requirements to the data availability: the data should be especially accurate and reliable. This challenge gives a large scope for the search of improvement and optimization possibilities with respect to the information availability: approaches towards development of various indicators can be a solution.

6. CONCLUDING REMARKS

This paper contributed to the debate on optimization of policies and instruments of the European agriculture, which has been lasting for several decades, by suggesting an efficiency approach of policy based on heterogeneity of farms. Rules crucial for effective agri-environmental policy were described and the degree of the CAP's compliance to these rules was discussed. Some important limitations of the CAP with respect to agri-environmental policy were mentioned. These limitations as well as discussed changes in the European policy for the 2014-2020 period such as shift of the financial resources from Pillar 1 to Pillar 2 and general reduction of the overall CAP budget (FAO, 2010) pose a lot of challenges to the developments in the field of policy design. These aspects also force policy makers and researchers to look for sustainable farming systems in which the connectivity between farming practices and nature is already built in. At the same time the search for suitable methods for farms' performance evaluation, which would allow the differentiation of the efficiency of environmental and economic performance, takes place. Then the paper discussed options for further modes of evaluating policy by efficiency analysis. The literature analysis pointed on the DEA-efficiency evaluation was described as a suitable approach for policy evaluation and its main positive features as well as drawbacks were emphasized. Although its implication would definitely contribute to the policy design especially in the areas with HNV agriculture, it creates various additional challenges which require further development of the approach and the techniques for the environmental and economic performance assessment.

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