




# Sustainable Land Use in Intensively Used Agricultural Regions

Results of the international conference on  
'Sustainable Land Use in  
Intensively Used Agricultural Regions'  
20–23 September 2005  
Leipzig

Edited by  
Burghard Christian Meyer

sponsored by  
Deutsche Bundesstiftung Umwelt (DBU)





This publication is based on the conference of "Sustainable Land Use in Intensively Used Agricultural Regions" from 20–23 September 2005 in Leipzig

Alterra Report No. 1338, ISSN No. 1566-7197  
© LANDSCAPE EUROPE 2006

This publication should be cited as follows:

Meyer, B.C. (Ed.), 2006. Sustainable Land Use in Intensively Used Agricultural Regions. Landscape Europe. Alterra Report No. 1338, Wageningen.

Published by LANDSCAPE EUROPE with contributions from authors of the following institutions:

Cemagref, Unité de Recherche Dynamiques et Fonctions des Espaces Ruraux, France  
Centre for Environmental Research (UFZ), Germany,  
Centre for GeoInformatics (Z\_GIS), Salzburg University, Austria  
Cranfield University, United Kingdom  
Department of Sustainability & Environment, Australia  
Ecological Controlling Research Group, Agroscope FAL, Switzerland  
ENGREF Politiques Publiques et développement des Territoires, France  
European Council of Nature Conservation (ECNC), The Netherlands  
INRA-SAD, Unité de Recherche Transformations des Systèmes d'Elevage, France  
Institute of Agricultural Development in Central and Eastern Europe (IAMO), Germany  
Johann Wolfgang Goethe University Frankfurt, Germany  
Justus Liebig University, Germany  
Leibniz- Centre for Agricultural Landscape Research (ZALF), Germany  
Martin-Luther-University of Halle-Wittenberg, Germany  
Norwegian University of Life Sciences, Norway  
OLANIS Expertensysteme GmbH, Germany  
Polish Academy of Science, Poznan, Poland  
Research Centre for Agriculture and the Environment (ZLU), Georg-August University Göttingen, Germany  
Saxon Academy of Sciences and Humanities, Germany  
Swedish University of Agricultural Sciences, Sweden  
Swiss College of Agriculture, Switzerland  
Technical University of Dresden, Germany  
Technical University of Munich, Germany  
University Karlsruhe, Germany  
University of Granada, Spain  
University of Natural Resources and Applied Life Sciences, Austria  
University of Rostock, Rostock, Germany  
University of Tours, France

Available from LANDSCAPE EUROPE Secretariat:

Marion Bogers,  
Alterra Wageningen UR,  
PO Box 47,  
NL-6700 AA Wageningen (The Netherlands)  
Phone: +31317474610  
Fax: +31317419000  
E-mail: marion.bogers@wur.nl

Cover: From images supplied by Andreas Schiemke, Leipzig and Dirk Wascher, The Netherlands  
Designed by: NatureBureau International, 36 Kingfisher Court, Hambridge Road, Newbury, Berkshire RG14 5SJ, UK  
Printed by: Information Press, Oxford, UK

No part of this publication may be reproduced or published in any form or by any means, or stored in a database or retrieval system, without the written permission of LANDSCAPE EUROPE

<http://www.landscape-europe.net>

## 7. Making the multifunctionality concepts operational for impact assessment

Annette Piorr, Sandra Uthes, Yuca Waarts, Claudia Sattler, Kathrin Happe and Klaus Müller  
(Corresponding author: A. Piorr, email: [apiorr@zalf.de](mailto:apiorr@zalf.de))

### Abstract

Multifunctional land use is related to multiple concepts, policies, rural development objectives, and agricultural land use realities. For the assessment of impacts on multifunctionality, a consistent and operable framework has to be developed that refers to all of these different aspects. It also has to integrate those functions and criteria that are addressed in existing concepts for sustainability and multifunctionality and their assessment.

The EU's 6th Frame Programme (FP 6) research project 'MEA-Scope'<sup>1</sup> develops a tool for the ex-ante assessment of policy impact on the multifunctionality of agriculture. Connected to this task is the challenge to develop an operational framework that consistently integrates theoretical multifunctionality concepts with the practical impact assessment requirements. We describe a multilevel approach that integrates the different conceptions and policy levels of multifunctionality into an indicator framework applicable for impact assessment. Both, the demand side of multifunctionality, from the rural development perspective, as well as the supply side of multifunctionality, from the agricultural production perspective, are considered.

### Key words

Multifunctional agriculture, sustainable rural development, impact assessment, NCOs, multifunctionality indicators, modelling tool

### 7.1 Introduction

The promotion of multifunctional agriculture has been set as an explicit goal of European agricultural policy. Especially the latest reforms of the Common Agricultural Policy (CAP) emphasise the role of multifunctional agriculture as an Instrument to support sustainable rural development. Since rural areas in Europe vary a lot in terms of geo-physical conditions and urban-rural settings, it becomes highly complicated to assess existing policies or potential future policy options regarding their impacts on multifunctionality. To cope with this challenge, special tools are required that reduce complexity and help focusing on the substantial.

The central issue of the FP6 project MEA-Scope is to develop an ex-ante multifunctionality impact assessment tool on a microeconomic farm approach. Connected to

this task is the development of an operational framework that is expected to link in a consistent way theoretical multifunctionality concepts to practical policy impact assessment requirements. This paper describes the structural development of such an operational framework and is organised as follows:

In Section 7.2, a conceptual analysis is presented, which compares the relevant multifunctionality theories, considers the relationship between multifunctionality and sustainability, and determines the scope of policies, which affect agricultural land use and the production of commodities (COs) and non-commodities (NCOs).

In Section 7.3, we present the MEA-Scope operational approach, which distinguishes between a demand side of multifunctionality by policy makers and society as a whole and a supply side of multifunctionality represented by the agricultural production of seven case-study regions. Our approach is based on existing impact assessment methods and indicator frameworks adapted according to the project's requirements, workshops with policy makers to identify their needs and expectations concerning impact assessment tools, expert surveys in our case study regions and a modelling part, to investigate agricultural joint production.

Since multifunctionality demand and supply do not necessarily correspond, we discuss in Section 7.4 how a potential gap can be closed by further research.

### 7.2 Conceptual analysis

#### 7.2.1 Theoretical multifunctionality concepts

Existing theoretical multifunctionality concepts show a differentiation between a supply-oriented or positive, and a demand-oriented or normative view to analyse multifunctionality (Casini *et al.*, 2004). The positive view on multifunctionality recognises agricultural activity as a multioutput activity involving the joint production COs and NCOs with some of the NCOs having the characteristics of externalities or public goods. This approach analysing multifunctionality from the joint production view has been widely adopted, e.g. by OECD (2001), Blandford and Boisvert (2002), Boisvert (2001), or Romstad *et al.* (2000). It stresses multifunctionality as an inherent characteristic of rural

1 MEA-Scope: Micro-economic Instruments for impact assessment of multifunctional agriculture to implement the Model of European Agriculture. Project (SSPE-CT-2004-501516) funded by the DG RTD of the European Commission, FP6 Policy oriented research [www.mea-scope.org](http://www.mea-scope.org)

landscapes with an emphasis on the specific production relationships between COs and NCOs.

On the other hand, there is also a normative component to the analysis of multifunctionality in the sense of maximising positive and minimising negative externalities of agriculture. In this particular point of view, agriculture is given the objective to fulfil certain functions that society demands. This approach is put forward mostly by FAO (FAO, 2000a, 2000b) and the European Commission (e.g. COM, 2004). Following this view on multifunctional agriculture, three main functions of agriculture can be distinguished: the economic, the environmental and the social function. The concept is based on the assumption that agricultural systems are intrinsically multifunctional and have always fulfilled more than just their primary aim of producing food, fibre and fuel (Maastricht, Netherlands, 12–17 September 1999).

Multifunctional agriculture refers to the multiple goods and services that are provided by both, the agricultural sector itself and land use related other sectors. The multifunctional role of agriculture is understood as the entire range of associated environmental, economic and social functions of agriculture.

### 7.2.2 Multifunctionality and sustainability

From the conceptual perspective the question comes up how to describe the relationship between multifunctionality and sustainability. The MULTAGRI project e.g. analysed this question by pointing out the dependencies between the need and capital oriented and normative paradigm based sustainability concept and the demand, activity and jointness oriented and analytical concept of multifunctionality (Caron and Lecotty, 2005). '...multifunctionality can make an important contribution to sustainability but does not necessarily have to be sustainable ... EU policy acknowledges that multifunctionality is an important contributor to sustainability' (Cairol, 2005). Hagedorn (2004) even refers to 'multifunctionality as a tool for achieving increased sustainability'.

### 7.2.3 Multifunctional agriculture, CAP und Rural Development objectives

To accompany the further reform of market policy, Agenda 2000 explicitly introduced rural development as the second pillar of the CAP. In this sense, the role of agriculture is redefined within the framework of rural development (van Huylenbroeck and Durand, 2003). In particular, the second pillar recognises farmers as the producers of public and private goods in their environmental and social function in rural areas by providing financial support to engage in non-commodity production (COM, 2004). With the introduction of the Midterm-Review-Reform of the CAP the complementary position of rural development became even more accentuated with the introduction of decoupling, modulation, and cross-compliance.

The latest reform of the CAP is expected to provide EU farmers with a clear policy perspective: to go towards

integrated rural development with the financial framework until 2013 for agricultural expenditure, to make European agriculture more competitive and market oriented, to promote a substantial simplification of the CAP as well as to facilitate the enlargement process and to better defend the CAP in the WTO. Further, it shall allow maximum flexibility in farmers' production decisions while removing or improving environmentally negative incentives of the current policy to provide encouragement for more sustainable farming practices (COM, 2003). This overall policy development underlines the position of farming as being of overriding importance within the scope of an integrated rural sustainability development (COM, 2004). In order to continue and improve this development according to the situation in rural areas the measures under the EU's future rural development policy will be build around three thematic axis, namely competitiveness, environment and land management, quality of life in rural areas and diversification. Additionally, the LEADER axis will be integrated as a cross sectional area.

## 7.3 Operational framework for multifunctionality impact assessment

### 7.3.1 Requirements

Given the objective of developing a tool for impact assessment of multifunctional agriculture, first a suitable analytical framework is required. Such an analytical framework on the one hand should be operable for more or less specified models working at different scales with data sources at different levels of aggregation. On the other hand, the framework has to meet the existing and envisaged demands for ex-ante policy evaluation. It should comply with the international trade negotiation requirements without sacrificing its normative basis in sustainable development and the promotion of rural areas.

The MEA-Scope project opted for a framework that differentiates between the demands on the supply side of multifunctionality. Hence, our framework consists of two parts: a demand based theoretical approach based on the functions of agriculture to find the demanded NCOs and the representative indicators on the one hand and a supply oriented economic modelling approach on the other hand.

### 7.3.2 The framework structuring concepts, policies and models

Based on the analysis of existing concepts and theories (see Section 7.2), the MEA-Scope project holds the following view. The overall frame for agricultural policy as well as for rural development policy in the EU is formed by the concept of sustainability. The concept of multifunctionality itself is subordinated to it. It is expressed through the policy measures divided into the first and second pillar introduced by the Agenda 2000 reform and the Midterm-Review Reform of the CAP with the main focus on agriculture, increasingly integrated into rural development (Figure 7.1).

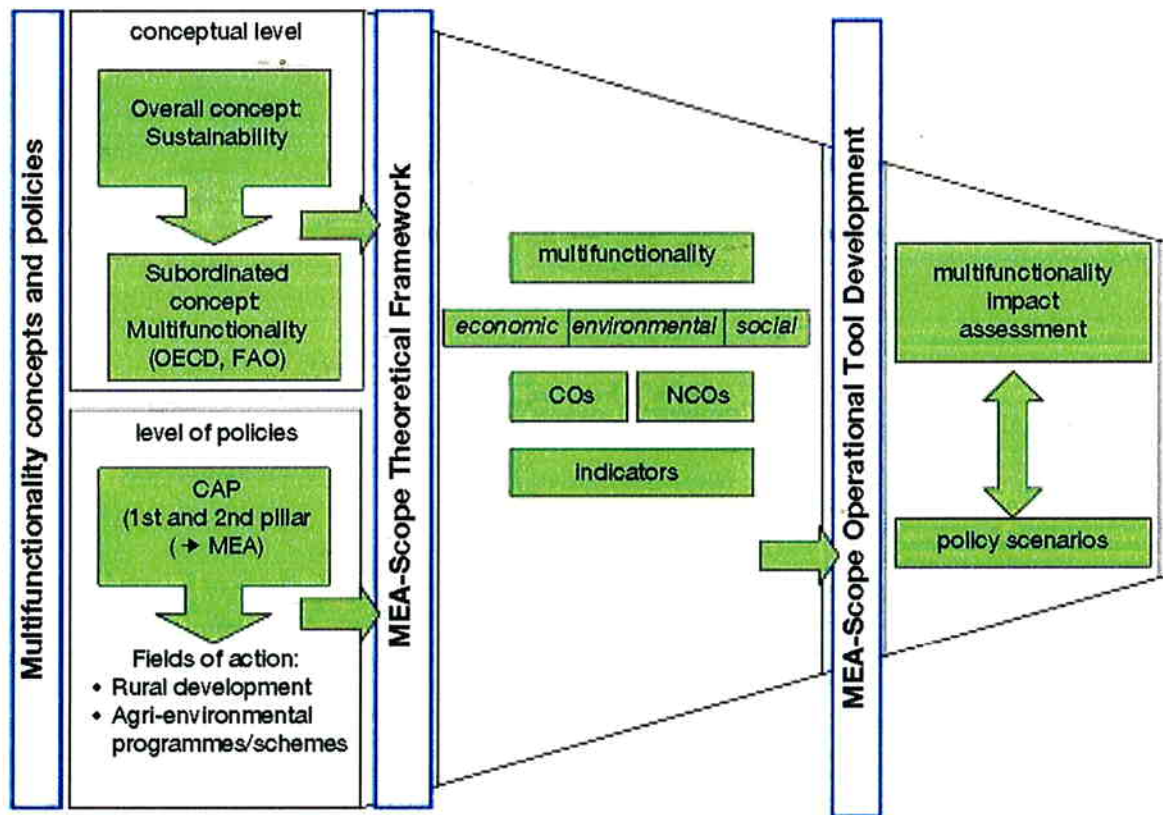
### 7.3.3 The modular features for demand and supply oriented analysis

The demand for ex-ante assessment of future policies is a specific interest of policy makers in the European Commission. Not only because the policy programmes underlie an evaluation process, of which the ex-ante assessment is a key element, but also because a kind of governance is more and more implemented, which intrinsically builds upon the principle of bottom-up driven national, respectively regional implementation. As outlined, the new policy strategies for 2007–2013 give even more emphasis to the integration of agriculture and rural development.

Thus, also the assessment of the societal demand for multifunctionality becomes an increasing field of interest. Specific regional rural development priorities emerge depending on the given land use structures, the involved sectors, and the development objectives by varying groups and regional policies. We refer to this issue as 'societal demand', and differentiate between the 'potential' demand, which stands for development objectives and priorities, e.g. as seen by regional stakeholders, and 'revealed demand' which expresses itself by subsidies, e.g. agri-environmental programmes (AEP) (Figure 7.2).

The supply of multifunctionality by agriculture can be defined as a function of the joint production of COs, which are typical market products (e.g. cereals ...) and NCOs, which are products and functions of the landscape jointly generated by agricultural production which fulfil public or private needs (e.g. biodiversity, fertile soils...) (Barkmann *et al.*, 2004; Piore *et al.*, 2005; Wiggering *et al.*, 2003). Depending on the diversity and intensity of production structures (e.g. mixed farm, crop production farm), production systems (e.g. conventional, organic) and/or production schemes (e.g. soil tillage system, amount of fertiliser) the ratio between CO and NCO production and the degree of jointness varies (Sattler *et al.*, 2006; Piore *et al.*, 2006). Thus, in intensively used agricultural areas due to farm economic reasons the CO/ NCO production ratio is clearly weighted on the production of CO. Contrary, NCO production is rather prevailing in extensively used areas. Regarding the amount of payments for agri-environmental measures (AEM) as a proxy for NCO production, the example of Brandenburg country shows, that given a ratio of arable land/ grassland of 80/20 the related payments for AEM per ha are 13% of total for arable land respectively 65% for grassland, whereas round 50% of payments for AEM on arable land refer to organic farming (Matzdorf *et al.*, 2005). Organic farms again are usually located at sites with a lower fertility

FIGURE 7.1. The MEA-Scope theoretical framework integrating multifunctionality concepts and policies and the operational task of tool development.



index, have a higher share of grassland, and a lower yield per hectare (MLUV, 2005).

Also the supply side view differentiates between the 'potential' supply, which refers to the general capabilities and potentials of a specific region, and the 'actual' supply that reflects the real situation, regarding the currently applied agricultural management practices as well as the present environmental conditions.

### 7.3.4 Hierarchically structured NCOs

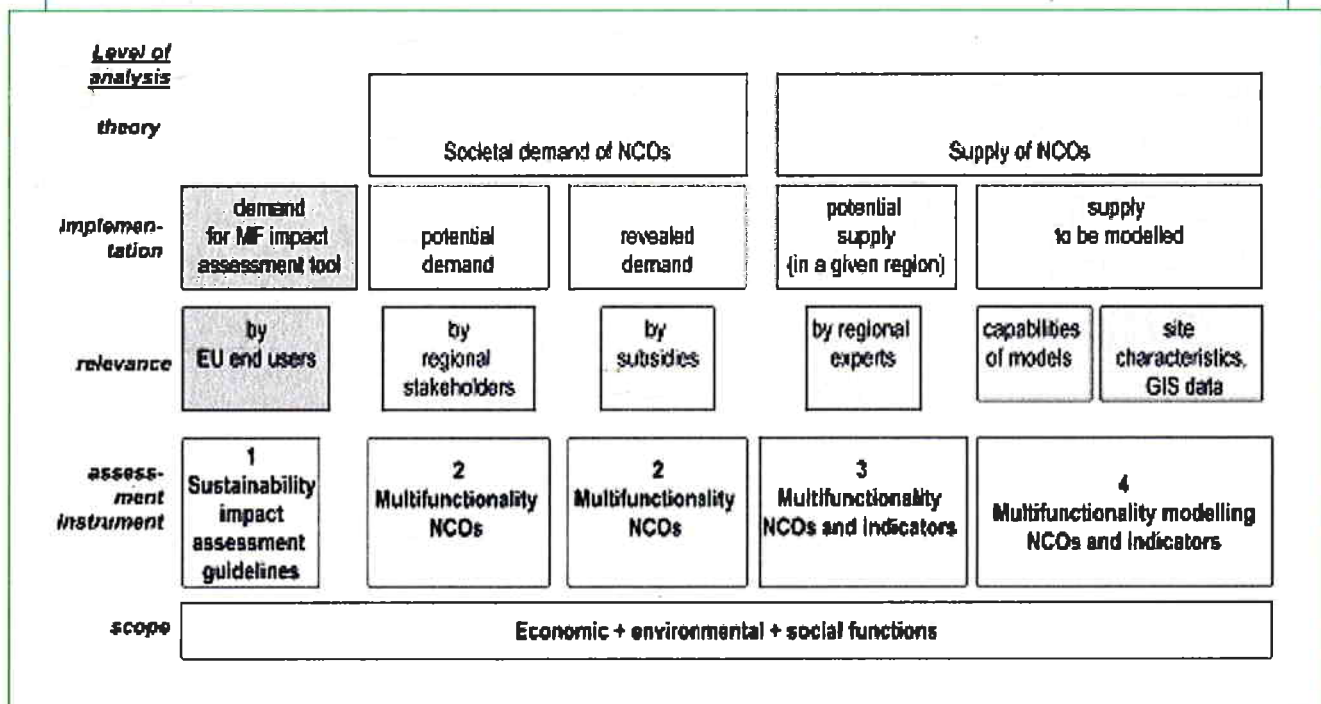
In a stepwise procedure a framework for the assessment of multifunctionality impacts was developed on the basis of established impact assessment and indicator systems. For the selection of the NCOs and indicators, the structure of the MEA-Scope theoretical framework according to Figure 7.1 was taken up.

For the initial framework an assessment system was chosen that allowed for an analogous understanding of the concept of multifunctionality as integrated within the concept of sustainability: The Impact Assessment Guidelines (COM, 2005), a handbook which sets procedural rules for the impact assessment in the Commission, developed to identify whether an issue is related to the EU's sustainable development strategy. The guidelines provide a list of possible economic, environmental and social impacts and name relevant key questions on these issues. Thus, it expresses the policy demand. This list is already in practical use by the potential end-users of the MEA-Scope tool.

In a first step such impacts and key questions which are related to multifunctional agriculture have been selected from the impact assessment guidelines list (COM, 2005) and paraphrased into NCOs. In a second step, this list was narrowed down to adapt it to the assessment needs from the regional demand side. It refers to potential NCOs which can be delivered by the agricultural sector respectively by activities of farmers or by other sectors respectively by activities of other participants than farmers. In the MEA-Scope project the list was used in face to face interviews with stakeholders (representatives from institutions, organisations, and societal groups) in case study regions in Denmark, Italy, Germany and Poland. The stakeholders were surveyed about the regional rural development priorities, the ranking of various NCOs, and about the role which agricultural sector or farmers play in this context. In parallel, step three was carried out for the assessment of the supply side. At this level the NCO list was joint with a compilation of indicators which have been selected from the most relevant (mainly environmental) indicator systems in use. Details on this procedure are described in Waarts (2005). In the MEA-Scope project this list was used for a selection of the NCOs from the scientific experts' view to the specific problems and potentials of seven European case study regions (in Denmark, France, Italy, Germany, Poland, Hungary and Slovakia).

In step four, the multifunctionality NCO and indicator list was linked to the capabilities of existing models, specifically to the modelling approach applied for the development of the MEA-Scope tool. With this modelling

FIGURE 7.2. The MEA-Scope operational approach for NCO identification and assessment.



approach we refer to the actual supply side. The tool is built on three existing micro-economic models, AgriPolIS (Happe *et al.*, 2004), MODAM (Zander, 2003) and FASSET (Hutchings and Gordon, 2001). AgriPolIS is a multi agent model for the calculation of structural change, working at regional scale, using FADN data and considering interactions between different farm types. MODAM is a linear programming model for the calculation of economic-environmental trade-offs for a high variety of management practises at farm level. Trade-offs between farm economics and the achievement of environmental goals are determined in order to assess the degree of jointness of COs and NCOs. FASSET is a dynamic model for matter flow calculations on farm level. First results on the application of the linked tool for a case study region in Brandenburg (Germany) have been published (Happe *et al.*, 2006).

All three models were developed for the agricultural sector and from a CO production oriented view, which has been enlarged first to environmental issues and subsequently to the wider range of NCOs. Oriented towards joint production, the modelling approach refers to the supply side. For the selection of feasible NCOs and indicators it was differentiated between the given situation of models capabilities and the NCOs and indicators that can be or will be integrated in further development of the models. As a result, a framework was set up that provides different levels of specification for NCOs and indicators related to economic, environmental and social functions. Examples are presented in Table 7.1.

### 7.3.5 The indicators for multifunctionality

For the basic structure of the multifunctionality assessment framework, we set up categories for economic, environmental and social functions in analogy to the sustainability concept and the multifunctionality concept by the FAO. By selecting suitable indicators for these three functional categories, the interface for the analysis of the practical meaning of the multifunctionality approach was created. A compilation of indicators from

the most relevant indicator frameworks and of those used in relevant projects was set up. As well scientifically oriented policy evaluation frameworks were analysed (Table 7.2).

The indicators were first classified into functional groups (considering the FAO concept) and in a second step to NCOs (considering the OECD concept). In a well structured reduction procedure the basic indicator list was adapted to the different levels of use on the demand and supply side analysis of the project. Due to the comprehensive compilation, Table 7.2 only lists the level of NCOs and the related subcategory. For the assigned lists of indicators with units of measurement we refer to Waarts (2005).

## 7.4 Conclusions

In spite of several efforts in defining the scope of 'multifunctionality' and 'sustainability' of 'agriculture' or with a broader perspective 'land use', an explicit classification has not yet been agreed on. Generally, the term 'multifunctional agriculture' is mainly used from the suppliers' perspective (the agricultural sectors' view), whereas 'sustainable land use' is referred to from the demand perspective (the broader rural development view). Overlaps are unavoidable as multi'functional' agriculture is related to landscape functions that form a central part of the sustainability concept. *Vice versa*, non or non-exclusively agricultural land use options (e.g. traffic, energy production) that support sustainability of rural regions are more and more supplied by suppliers from different sectors. Cairol *et al.* (2006) confirm in this context that 'multifunctionality is considered as a consequence of the changing needs and demands of consumers and society at large towards agriculture and rural areas...parallel to the evolution of demand, many farmers have engaged in new activities, through new strategies such as diversification, pluriactivity'.

In the MEA-Scope project we considered the difference between the 'potential' and 'revealed/actual' side of

TABLE 7.1. Hierarchically structured Impact assessment framework related to economic, environmental and social functions.

Level	Impact assessment framework	Economic functions	Examples for environmental functions	Social functions
1	Sustainability Impact Assessment Guidelines	'Change the level of employment?'	'affect emission of harmful air pollutants?'	'Impact on animal health and welfare?'
2	Multifunctionality NCOs	Employment in the region	Abiotic resources (water, soil, air quality)	Animal welfare
3	Multifunctionality NCOs and Indicators	Employment/ labour (DK, D, F, I, PL, SV)	Air quality - ammonium emissions (DK) - greenhouse gas emissions (DK, D, PL)	Agricultural farming practices: Animal welfare (F, D, HU)
4	Multifunctionality modelling NCOs and Indicators	salaried/unsalaried labour - farm labour - field labour - livestock farming labour	- ammonium emissions - greenhouse gas emissions	Animal welfare

demand and supply, depending on the more or less focused role of the agricultural sector, or in terms of participants, the farmers, in the rural development context. From the 'potential' perspective agriculture offers its activities towards multifunctional outputs competitively to other sectors/ participants, e.g. forestry, nature conservation groups or tourism. Competition does not only mean others might reach the same impact with higher effectiveness or efficiency, but also that others might be better integrated in networks competing for the same funds. From the 'actual' perspective the agricultural activities are focused because the current NCO oriented policies, as the agri-environmental programmes (AEP) of the Agenda 2000 only refer to

agricultural farms. This situation will change in the period 2007–2013. The funds for AEP, now located in the second axis of the European Agricultural Fund for Rural Development (EAFRD), are forecasted to decrease about 30%. Environmentally sound forestry systems are supposed to receive payments from this axis, too. In parallel, the third axis aiming at promoting life quality and diversification, in terms of starting trans-sectoral activities, opens the range to participants from beyond traditional agriculture. Finally, the budgetary integration of the LEADER axis points out that only network oriented activities with a strong linkage to local action groups hold a promising position for receiving future payments.

TABLE 7.2. Categorisation of selected NCO by functions (Waarts, 2005).

Functional category	Selected NCO	NCO subcategory
Economic	Generation of income Employment Rural entrepreneurial activities	- water quality
		- water availability
		- soil quality
		- air quality
		- pesticide use
Environmental	abiotic resources	- energy use
		- biodiversity
	biotic resources	- habitats
		- landscape management
		- landscape pattern
		- landscape amenities
		- abandonment of farmland
		- farming systems (in protected areas)
		- grassland management
		- management practices
Social	Cultural heritage	- maintaining cultural landscape
		- maintaining buildings
		- traditional (farming) practices
	Non-farming activities	- nature conservation
		- educational services
		- care activities
		- population characteristics
	Social infrastructure	- labour use
	Recreation in rural areas	- health
	Healthy food/food safety	
Animal welfare		

The MEA-Scope indicator list is based on the analysis of the following indicator frameworks/references: The Baltic Environmental Forum, 2000; The BIOGUM project, 2004; Bösch, P. and E. Söderbäck, 1997; The Commission of the European Communities, 2000, 2001; EEA (European Environmental Agency), 2001a, 2001b, 2004; The ELISA project, 2000; The ELPEN project, 1999; The ENRISK project, 2004; European Commission and Eurostat, 2001; EU, 2003; Eurostat, 2001; FASSET, 2004; The IRENA project, 2003; McRae, T. and Smith, C.A.S. (eds), 2000; OECD (Organisation for Economic Co-operation and Development), 2001a, 2001b, 2004, 2004; The PAIS project, 2004; Prescott-Allen, R., Moiseev, A. and MacPherson, N. 2000; Reid, W.V., McNeely, J.A., Tunstall, D.B., Bryant, D.A. and Wirograd, M. 1993; The SAFE project, 2004; UNDP/ UNEP/World Bank/WRI (World Resources Institute), 2000; UNEP (United Nations Environmental Programme), 1999, 2001; Wascher, D.M. (ed.), 2000; WHO (World Health Organization) Europe, 2004.

The models of the MEA-Scope modelling approach do not allow to simulate the processes between demand and supply of NCOs, as well as they do not integrate trans-sectoral activities of farm households. The first analyses of surveys on the societal demanded NCOs show distinct differences between the kinds of NCOs demanded in different regions (case study areas) located in different European countries and the NCOs which are supplied by the current agricultural practice. NCOs related to environmental and landscape functions, for example are more demanded in extensively used areas, whereas NCOs providing for economic and social functions, e.g. the prevention from migration of young people, are rated extremely important in intensively used areas. The specification of the gap between both sides – demand and supply – is expected to be one important result of the framework in use (Figure 7.3).

In this context the issue of scales of the tool becomes an interesting question. While the administration often demands a multifunctionality impact assessment at a regional scale (districts, landscapes), the production side asks for an assessment at single farm level. Therefore, the requirements of a multiscale approach in the development of impact assessment tools can be deduced. The MEA-Scope tool works at this multiscale level. Resuming the considerations about complexity of transactions and properties (e.g. 'resource and actors characteristics, that often have no clear boundaries, and positive (intended) effects and negative (non-intended) side effects materialise in different environmental media and different geographical areas' (Hagedorn, 2006) new challenges for adaptations arise.

From our view also methodological and monitoring related tasks should be taken into account. For a full implementation of multifunctionality assessment frameworks as the presented one, some effort remained unsatisfactory. This is especially due to the insufficient availability of data on the social NCOs and indicators. Thus, currently both research and policy advice have to cope not only with the lack of social impact assessment

criteria, indicators and data. Even the discussion on the definition and assessment of social externalities of multifunctional agriculture is ongoing (Mann and Wüstemann, 2005). There is definitely a need for monitoring systems that better integrate social NCOs or indicators in the existing European agricultural databases or vice versa specifically refer to agricultural activities respectively to farmers in rural development related databases.

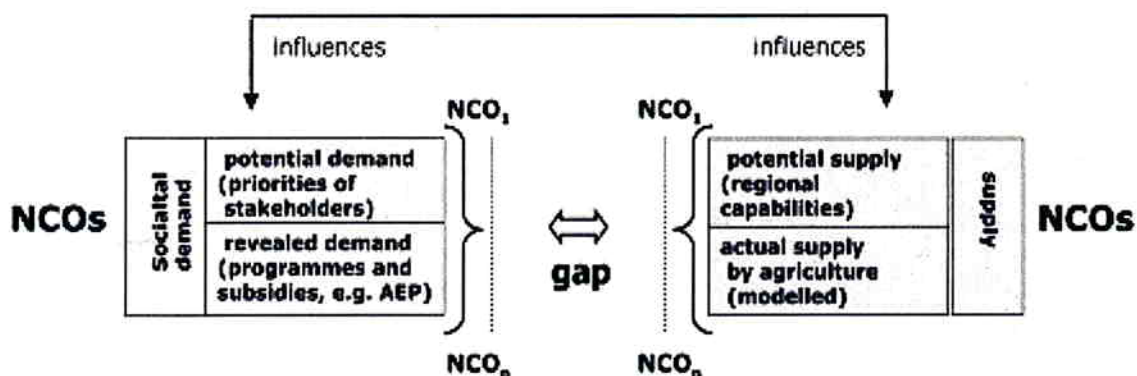
### Acknowledgement

Contracted by the European Commission, DG Research: SSPE - CT-2004-501516-MEASCOPE.

### References

- Barkmann, J., Helming, K., Müller, K. and Wiggering, H. 2004. MultiLand - Multifunctional Landscapes: towards an analytical framework for sustainability assessment of agriculture and forestry in Europe. Fifth Framework Programme 1998–2002. Thematic Programme: Environment and Sustainable Development, Final Report, EVK2-CT-2002-80023, Leibniz Centre for Agricultural Landscape and Land Use Research e.V. (ZALF), Müncheberg, 95 p.
- Blandford, R. and Bolsvert, R.N. 2002. Multifunctional agriculture and domestic/international trade commitments. *European Review of Agricultural Economics* 26, 409–424.
- Bolsvert, R.N. 2001. A note on the concept of jointness in production. In: *Multifunctionality: Toward an Analytical Framework*, OECD, Paris.
- Cairol, D. 2005. Europe's countryside – more than a food conveyor belt. Available at: [http://europa.eu.int/comm/research/environment/newsanddoc/article\\_3184\\_en.htm](http://europa.eu.int/comm/research/environment/newsanddoc/article_3184_en.htm)
- Cairol, D., Cloudel, E., Barthelemy, E., Caron, P., Cudlinova, E., Zander, P., Renting, H., Sumelius, J. and Knickel, K. 2006. Multifunctionality of agriculture and rural areas: From trade negotiations to

FIGURE 7.3. Conceptual background for NCO demand/supply identification.



- contributing to sustainable rural development. Multagri Project Main results. (In preparation).
- Caron, P. and Lecotty, T. 2005. Multifunctionality as a concept for solving problems? Multagri final seminar, Sept 01, 2005. Available at: [http://www.multagri.net/section/deliverable/exec\\_file.php?doc\\_id=363](http://www.multagri.net/section/deliverable/exec_file.php?doc_id=363)
- Casini, L., Ferrari, S., Lombardi, G., Rambonllaza, M., Sattler, C. and Waarts, Y. 2004. Research Report on the Analytic Multifunctionality Framework. MEA-Scope publications Vol. 1. Available at: [http://www.zalf.de/home\\_meascope/website/publications/mea-scope\\_vol1\\_analytic\\_multifunctionality\\_framework.pdf](http://www.zalf.de/home_meascope/website/publications/mea-scope_vol1_analytic_multifunctionality_framework.pdf)
- COM, 2002. *A Handbook for Impact Assessment in the Commission – How to do an impact assessment*. European Commission. Technical Annexes. Available at: [http://europa.eu.int/comm/secretariat\\_general/Impact/docs/imp\\_ass\\_tech\\_anx\\_en.pdf](http://europa.eu.int/comm/secretariat_general/Impact/docs/imp_ass_tech_anx_en.pdf)
- COM, 2003. 'CAP reform – a long term perspective for sustainable agriculture' – Questions and Answers. MEMO/03/10. Available at: <http://europa.eu.int/rapid/pressReleasesAction.do?reference=MEMO/03/10&format=HTML&aged=0&language=EN&guiLanguage=en>
- COM, 2004. Proposal for a Council Regulation on support for rural development by the European Agricultural Fund for Rural Development (EAFRD).
- COM, 2005. *Impact assessment guidelines*. European Commission. SEC(2005) 791. Available at: [http://europa.eu.int/comm/secretariat\\_general/Impact/docs/SEC2005\\_791\\_IA%20guidelines\\_annexes.pdf](http://europa.eu.int/comm/secretariat_general/Impact/docs/SEC2005_791_IA%20guidelines_annexes.pdf)
- FAO, 2000a. Issues Paper: The Multifunctional Character of Agriculture and Land. Cultivating Our Futures. Paper prepared for FAO/Netherlands Conference on 'The Multifunctional Character of Agriculture and Land', 12–17 September 1999, Maastricht, The Netherlands. Available at: <http://www.fao.org/docrep/X2777E/X2777E00.htm>
- FAO, 2000b. Multifunctional Character of Agriculture and Land. Agenda Item 9. Twenty Second FAO Regional Conference For Europe. Porto, Portugal, 24–28 July 2000. Available at: <http://www.fao.org/docrep/meeting/X7073E.htm>
- Hagedorn, K. 2004. Multifunctional Agriculture – an Institutional Interpretation. 90th EAAE Seminar: Multifunctional agriculture, policies and markets: understanding the critical linkage. (28–29 October, 2004), 1–17. Available at: [http://merlin.lusignan.inra.fr:8080/eaae/website/pdf/12\\_Hagedorn](http://merlin.lusignan.inra.fr:8080/eaae/website/pdf/12_Hagedorn)
- Happe, K., Balmann, A. and Kellermann, K. 2004. The agricultural policy simulator (AgriPo-IIS) – an agent-based model to study structural change in agriculture (version 1.0). IAMO Discussion paper, No. 71, IAMO Halle (Saale). Available at: <http://www.iamo.de/dok/dp71.pdf>
- Happe, K., Damgaard, M., Osuch, A., Sattler, C., Zander, P., Uthes, S., Schuler, J. and Piorr, A. 2006. *CAP-Reform and the provision of Non-Commodity outputs in Brandenburg*. Agrarwirtschaft, SH 8-2005. (in print).
- Hutchings, N.J. and Gordon, I.J. 2001. A dynamic model of herbivore-plant interactions on grassland. *Ecological Modelling* 136, 209–222.
- Matzdorf, B., Becker, N., Reutter, M. and Tlemann, S. 2005. Aktualisierung der Halbzeltbewertung des Plans zur Entwicklung des ländlichen Raums gemäß VO (EG) Nr. 1257/99 des Landes Brandenburg. Available at: [http://lis1.zalf.de/fp\\_upload/2290\\_30012006164557x\\_Aktualisierung\\_HZB\\_Berlin\\_05ges.pdf](http://lis1.zalf.de/fp_upload/2290_30012006164557x_Aktualisierung_HZB_Berlin_05ges.pdf)
- MLUV (Hrsg.), 2005. *Auswertung der Buchführungsergebnisse ökologisch wirtschaftender Betriebe in den ostdeutsche Bundesländern 2003/2004*. Available at: [http://www.brandenburg.de/cms/medla.php/2320/oeko2\\_05.pdf](http://www.brandenburg.de/cms/medla.php/2320/oeko2_05.pdf)
- OECD, 2001. *Multifunctionality – Towards an Analytical Framework*. OECD, Paris.
- Piorr, A., Uthes, S., Mueller, K., Sattler, C. and Happe, K. 2005. Design of a MEA compatible multifunctionality concept. MEA-Scope publications Vol.3. Available at: [http://www.zalf.de/home\\_meascope/website/publications/mea-scope\\_vol3\\_mea\\_multifunctionality\\_concept.pdf](http://www.zalf.de/home_meascope/website/publications/mea-scope_vol3_mea_multifunctionality_concept.pdf)
- Piorr, A., Müller, K., Happe, K., Uthes, S. and Sattler, C. 2006. Agricultural management issues of implementing multifunctionality: commodity and non-commodity production in the approach of the MEA-Scope project. In: Mander et al. (eds). *Multifunctional land use meeting future demands for landscape goods and services*. Springer. (in press).
- Romstad, E., Vatn, A., Rorstad, P.K. and Soyland, V. 2000. Multifunctional Agriculture: Implications for Policy Design, Report 21, Agricultural University of Norway, Department of Economics and Social Sciences.
- Sattler, C., Schuler, J. and Zander, P. 2006. Determination of Trade-off-functions to analyse the provision of agricultural Non-commodities. *International Journal of Agricultural Resources, Governance and Ecology*. (in press).
- van Huylenbroek, G. and Durand, G. (eds). 2003. *Multifunctional Agriculture – A New Paradigm for European Agriculture and Rural Development*. Ashgate, Aldershot.
- Mann, S. and Wuestemann, H. 2005. Multifunktionalität als Erklärungsansatz. Agrarwirtschaft 54, 8, 329–330.
- Waarts, Y. 2005. Indicators for the quantification of multifunctionality Impacts. MEA-Scope publications Vol. 4. Available at: [http://www.zalf.de/home\\_meascope/website/publications/meascope\\_vol4\\_Indicators\\_for\\_multifunctionality.pdf](http://www.zalf.de/home_meascope/website/publications/meascope_vol4_Indicators_for_multifunctionality.pdf)
- Wiggering, H., Müller, K., Werner, A. and Helming, K. 2003. The concept of multifunctionality in sustainable land development. In: Helming, K. and Wiggering, H. (eds). *Sustainable development of multifunctional landscapes*. Springer Verlag Berlin, New York, 3–18.
- Zander, P. 2003. Agricultural land use and conservation options: a modelling approach. Dissertation, Wageningen University, 222 p. Available at: <http://library.wur.nl/wda/dissertations/dis3372.pdf>