The MEA-Scope Analytical Framework

Preface
Objectives
At the Second Project Meeting held at Frick, Switzerland, the MEA-Scope consortium agreed on the development of an analytical framework to
• illustrate the overall approach
• structure future activities
• clarify the interconnections between the policy context (WP2, WP6) and the tool development (regional data provision and modelling)
• specify the interfaces of regional data survey – model input – model validation by regional data from a WP spanning view.

The analytical framework addresses both the work level and the theoretical background of the MEA-Scope project approach.

Scope of use
Primarily, the MEA-Scope Analytical Framework at hand should serve as
• an internal paper to develop and establish a common understanding of the scientific approach and the interfaces between the work packages
• central part of the conclusions of the Frick meeting
• preparation for the Gödöllő meeting

Additionally it should be externally usable, as a paper for public project presentation, by figuring the thread from the MEA-Scope objectives to the MEA-Scope approach and the respective work organisation.

Project objectives
The EU project MEA-Scope develops a tool to assess the impact of the common agricultural policy on multifunctional agriculture. The tool is model-based, taking account of changes in production schemes as well as changes in farm structure. The project represents a first step towards this objective, and does therefore not to produce results which are generally applicable. Rather, we develop the tool to the conditions and landscapes of seven case study areas across the EU. The tool development is based upon three main pillars:

1. to develop an operable multifunctionality framework to provide the theoretical bases for the analysis and modelling of multifunctional agriculture
2. to bring together and create knowledge on the joint production of commodity and non-commodity outputs. Based on their scientific and methodological background, project partners can contribute to this in three different ways. First, there is region-specific knowledge on the particular conditions for and provision of joint products in the case study regions. Second, because of the various scientific backgrounds of project partners, knowledge creation on joint product is discipline-specific. Third, project partners contribute by adding different methodological approaches to the modelling and understanding of joint production. In this way, the theoretical framework is operationalised through the various expertises of project partners.
3. to develop a quantitative modeling tool to assess and measure the impact of policies.

The MEA-Scope understanding of multifunctionality and joint production (figure 1):

The concept of multifunctional land use adapted in MEA-Scope refers to agriculture as a multi-output activity involving the joint production of commodities (CO) as well as non-commodity outputs (NCO). The view on multifunctionality from the point of view of joint production has been widely adopted in the literature, although it is also feasible to view multifunctionality from the viewpoint of functions.

For the purpose of MEA-Scope, however, the former approach appears to be preferable because of two reasons. First, it allows to apply the theoretical framework of production economics. Second, if it is possible to quantify NCOs based on measurable indicators, it allows to bridge from theory to operation, i.e. into indicator analysis and modelling.

Hence, by focussing the scientific questions within MEA-Scope on multifunctionality output by means of the NCO-production, we allow to bridge from theory to operation. In this way, the identification of a broader spectrum of related NCOs demanded potentially by the public is substantiated in more general landscape functions.

Equally, according to their nature as joint products, NCOs usually outcrop as positive or negative externalities of CO production, depending on the intensity of management practice and on the site specific natural conditions (the realised supply side of NCO production). We use sets of indicators to make the relevant NCOs operable for impact assessment. The definition of the indicator sets are within the tasks of WP2.

The MEA-Scope objectives (figure 2):

In the MEA-Scope approach, according to the general project objectives we move in a stepwise fashion from the multifunctionality concept down from theory to operation:

1. First, an analysis of the diverse multifunctionality interpretations is carried out.
   Based on this analysis, an operable Analytical Multifunctionality Framework
(AMF) is developed. It considers the relevant dimensions of multifunctionality, structures the functions that are addressed in the multifunctionality discussion, and aggregates them for use in the impact analysis of policies. (WP2)

2. The societal demand for potential Non-commodities (NCOs) is identified by EVM (expert valuation method) interviews in four of the six case study areas. (WP6)

3. In a hierarchical approach, the joint production of selected COs-NCOs in relevant beef production systems is modelled at farm and at landscape level by using the three models AgriPoliS, MODAM and FASSET, which are linked for this purpose. At this level, the supply of NCOs is identified by modelling different farm types applying agricultural management practices of different intensity in 7 European case study regions. This assessment tool assesses NCO based on a defined indicator set. (WP3)

4. The validation tool is adapted to 7 different landscapes across the enlarged EU. Socio-economic, technical, and environmental data enter the assessment tool for each of the 7 case study region at different levels of scale (farm and landscape). (WP4, WP5)

5. To make sure that the MEA-Scope tool meets the demand on information and on handling the end-users’ requirements, a continuous exchange on the project progress is fulfilled by series of workshops. (WP6, WP7)

The MEA-Scope objectives
The theoretical background for the identification of NCO demand and supply (figure 3)

The societal demand for NCO production expresses itself by two lines:

- First, the potential demand, that may differ between regions by the site characteristics (which determine the potentials and resources for positive externalities on the one side and the exposures and threats for negative externalities on the other side), but also by the overall rural development objectives, the economic situation etc. Regional stakeholders are the persons in charge for a) providing a regional framework and b) for addressing regional needs and requirements to the national or EU level respectively for further regulatory developments that encourage farmers to consider and implement the NCO production more intensely. Therefore MEA-Scope makes interviews with regional stakeholders and analyses them by EVM (WP6). The potential demand for NCOs does not imply that it is actually revealed and realised. It can equally be a very unrealistic demand.

- The revealed demand can be identified, for example, by the existence of agri-environmental programmes (AEP) respectively the agri-environmental schemes (AES) which are offered / implemented in a specific region. However, the mere presence of these programmes does not directly imply that they are implemented at the intended levels as the programmes are voluntary. Because of this, we therefore identify the realised demand for NCOs which includes the actual participation in specific programmes and the subsequent impact on production schemes. Thus, the realised societal demand can be analysed by matching the AEPs/ AESs with the herewith produced NCOs, e.g. the area under respective agreements or the amount of payments (WP6). As well the revealed societal demand is analysed by setting the relevant AEPs/ AESs as the low intensity levels of the production schemes, which are modelled by MODAM and FASSET in order to quantify the corresponding NCOs.

The supply on NCOs can be defined as a function of the production of COs and NCOs. The relation between CO and NCOs depends on the degree of jointness in production and on the production schemes applied. In the MEA-Scope assessment tool (trade off-)function determine the degree of jointness and the related social, economic and environmental impacts of the CO and NCO production in typical farms and production schemes of different intensity. Because of the models’ focus primarily on quantifiable and measurable variables, the scope of NCOs addressed is quite “conservative”. In particular questions relating to social impacts are difficult, if not impossible to assess, within this setting (compare the Commission’s handbook for impact assessment). At the same time, a number of questions raised in the Handbook are not approachable by models (e.g. the effect on occupational health and safety arrangements). Regarding the more qualitative NCOs, model results need to be augmented by qualitative analyses.

The MEA-Scope project focuses on the identification of supply on the one hand and of demand on the other. It is expected that depending on the region (case study area) and the kinds of NCOs, a gap opens up between supply and demand. The study of institutions to close this gap are not at the centre of MEA-Scope but only treated marginally. Nevertheless certain aspects of governance will be covered (by WP6). Overall, this gap nevertheless is not a point of weakness of our approach, but a relevant result, as it indicates the agenda for future research necessities.
The selection of NCOs, models and data (figure 4)
The societal demand for NCOs is identified at different levels and by different groups: At the EU level, the analysis of governance structures for multifunctionality is carried out in form of a literature review (within WP2 and WP6); the NCOs to be addressed by the MEA-Scope tool are reassured with end-users at the EU integrating further policy development options; on the regional level stakeholders are interviewed in four of the six case study areas (WP6). The survey on the societal demand side is expected to deliver a broad spectrum of NCOs.

For the MEA-Scope modelling approach a selection of relevant NCOs has been made (WP4). A compilation of general potential NCOs to be produced by agriculture was set up and classified by functions. It constitutes a part of the theoretical MEA-Scope multifunctionality concept: the analytical multifunctionality framework (AFM) (WP2). From this compilation a selection of NCOs was made by the MEA-Scope researchers in the case study regions, considering i) the regional natural conditions (based on GIS data and others) (WP5) and ii) the regional production schemes and priorities (based on expert knowledge/ scientific interests) (WP4, WP5, regional partners).

For the selected NCOs, suitable indicators are identified, which fit to the models’ capabilities. In the next step the NCOs and indicators are allocated to the different models. Based on the results of the data demand inventory for the three models (conducted by WP3) the data requirements are defined.
The data supply for the MEA-Scope tool development (figure 5)
After the definition of data requirements according to the demands of each of the three models (by WP3) specific queries on available data have to be organised: different kinds of data have to be surveyed by the regional partners and are collected by different researchers in charge for different working steps, milestones or deliverables in different work packages.

- The query on data (e.g. GIS) and descriptions on the natural site conditions is started by WP5 (Anne - Kristine, DIAS). The regional partners submit the data and maps to WP5 (DIAS), who will carry out a specific classification in order to structure the thematical maps and will create a synthetic landscape map, as an input to the modelling by AgriPoliS.

- In WP4, namely at the Gödöllő workshop (organised by Katalin, SUI-IEM), typical farms are identified in the case study regions, which are important inputs for AgriPoliS and MODAM. For these, the production technologies are specified according to the regional characteristics and intensity levels, together by the regional scientists and the model developers, especially the MODAM team. The results perform a relevant input both to the modelling by AgriPoliS, MODAM and by FASSET.

- The compilation of data (e.g. FADN) is task of WP4 (Gyorgyi, SUI-IEM). There is a narrow connection to the modellers’ data requirements. In order to avoid double work a high degree of integration between the partners has to be realized (e.g. integration of FADN data from WP3). Thus the data supply comes from different sources: surveys by the regional partners (mainly for WP4, M4.1) and direct support by the EC (WP3, WP5). The farm typology data are structured jointly by regional partners and the model developers.
Definition of typical farms and structuring of production intensities (figure 6)

Definition of farm typologies:
After having got an overview on kind and quality of the available agricultural structural and farm typology data, for each MEA-Scope case study region a number of “typical farms” are identified/defined together by the regional partners and the AgriPoliS model developers (at the Gödöllő meeting). The next question is related to the production intensities on the respective typical farms.

Structuring of production intensities:
In order to achieve a comprehensible structure of farm management practises, a classification of intensities of production schemes has to be set up. According to the model’s requirements the MODAM developers produce a list of variables to classify the production intensities (e.g. kg milk per cow and year). The classification is adjusted by considering the regional characteristics/distribution, that means, the setting of borderlines will be specifically regional and based on the regional experts valuation.

To do at Gödöllő:
For each region a cross-classified table (matrix) on both criteria (farm type and intensity level) will be prepared. It will give an overview on the regional characteristics and the on the modelling design derived from these. For validation the online available Eurostat datasets may be used in the case that the regional structures do not diverge too much from the respective national average.
The spatial aspect of the MEA-Scope approach (figure 7)
Data and thematic GIS maps on natural side conditions (e.g. topography, soil quality, biotope types, demography) are compiled by the regional partners and submitted to WP5. For each case study region a “synthetic landscape” is created by definition of a typology of natural conditions which provides a classification of a number of different site characteristics to one regional map. (WP5)
After the data required for the modelling are made available and the specifications on regional characteristics are performed by regional partners and model developers, the hierarchical modelling approach is conducted. (WP3, WP3)

Defined policy scenarios (Agenda 2000 will be the reference scenario) are modelled by AgriPolis. The result is a distribution of different farm types \((A_1-n, B_1-n \ldots D_1-n)\), that are located in a synthetic landscape.

The next modelling step is down-scaled to farm level. For each farm type \((A_x, B_x \ldots D_x)\) a site type related (e.g. I, II) simulation of for the three intensity levels (e.g. \(I_{a,c}, II_{a,c}\)) of the typical regional production schemes is run by MODAM. Economic and environmental trade offs are calculated. The following simulation by FASSET will be conducted on the same level, but with a dynamic approach. The calculation of matter flows allows to identify the sources for undesired (environmental) impacts.

The following up-scaling step will transfer the results to the landscape level. The modelling results of the impact assessment of the defined policy scenarios are disaggregated by relating them to the real distribution of the relevant farm types in the real spatial context. (WP5).

For validation as well research results (environmental data) delivered by the regional partners as possibly the national Eurostat data can be used.

The practical utilisation of the MEA-Scope results
The Mea-Scope project will deliver a tool and data for decision support at two levels for two groups of users, who have a vital interest in implementation of multifunctional use of agricultural landscapes:

• Administration (policy makers at EU level and regional stakeholders): Their decision making will be facilitated by
  o knowledge support for prioritising multifunctionality objectives
  o identification of target areas for specific measures (delivery of site characteristics data on user friendly surfaces)
  o definition and adaptation of policy measures for achievement of multifunctionality objectives
  o an online accessible tool for ex-post (and ex-ante) impact assessment.

• Farmers, as entrepreneurs (businessmen), who have to decide whether to introduce farm structural changes or to strengthen their NCO production activities, are supported by
  o knowledge support for NCO production potentials (“NCO market information”)
  o DSS for economic impact assessment of structural adjustments and changes in production schemes
  o improvement of/ guidance for management practises for the achievement of multifunctionality objectives
  o an online accessible tool for impact assessment

The MEA-Scope tool is primarily designed for the impact assessment of agricultural policy options aiming at implementation of multifunctionality on regional scale (target
group policy makers). But due to the innovative approach of carrying out the policy impact assessment on landscape and on farm level, the MEA-Scope project actually will generate perceptions demanded in a broader perspective of multifunctionality implementation.