DESIGNING MODELS FOR EVALUATION OF FARM PRODUCTIVITY AND EXTERNALITIES

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Integrated assessment tools for agricultural innovations and policy development
Policy development at EU, national and regional scale requires scientific tools that enable ex-ante assessment of alternative policy options and innovation impacts. It will be the role of agronomists to summarize process knowledge in integrated tools that enable assessment of individual agricultural activities and whole-farm systems. For this purpose, the SEAMLESS project (Van Ittersum et al., these proceedings) proposes to develop a set of procedures and tools, among which two models to be used at farm scale: APES and FSSIM.

The Agricultural Production and Externalities Simulator (APES)
Currently, different available models provide for analysis of arable crops/cropping systems, livestock, orchards and agroforestry production activities. However, models are specialised and a comprehensive approach that allows consistent simulation of the wide range of production activities observed on farms is not available (Van Ittersum and Donatelli, 2003). Also, the structure of present models does neither allow their modular use for integrated applications, nor does it support the use of different approaches for the simulation of processes via alternative model components. Here, we propose the development of an agricultural production and externalities simulator (APES) based on the knowledge and experiences gained during development and application of existing models and international frameworks. APES is a modular system of biophysical components that will allow the quantification of management and environmental effects on agricultural systems, by estimating input and output coefficients, including production and externalities of production activities. To capture climate effects APES will comprise a set of deterministic simulation models to be used in a stochastic fashion via weather scenarios. Different combinations of modules in APES will be used to simulate production activities

Fig. 1. The structure and main components of APES
The Farming Systems Simulator (FSSIM)

It is at the farm (micro) level that the main integration takes place between the bio-physical processes and resource allocation decisions. Production activities are no longer seen independently (single activities as in APES) of other farm processes. Instead, their implementation is constrained by farm specific resources, available technologies and policy conditions. FSSIM will model the integration of biophysical and socio-economic aspects of farming, by assessing agricultural activities and policy instruments at the farm scale, given resource endowments and alternatives objectives. We aim at a generic model set-up to simulate farming systems across Europe. The generic model can be parameterised to represent the various types of farms that exist in the European Union. However, independent farm-specific parametrizations the same approach is used to the representation of techniques, i.e. using engineering production and environmental functions, elaborated with the information provided by APES outputs. To enable simulation of both actual and alternative agricultural activities for the major European farm types, we need automated and generic procedures for generating agricultural activities, production technologies and the corresponding technical coefficients (cf. Hengsdijk and Van Ittersum, 2002; Dogliotti et al., 2003).

Fig. 2. The structure and main components of FSSIM

Final Remarks

The development of APES and FSSIM aims at making available simulation tools which can be updated with reasonable ease and with components which can be re-used even outside the project. We believe that it is an important goal to collect and make available knowledge produced by research in the area of modelling within an operational frame which prioritizes transparency and quality verification.

References

Rizzoli et al., 2004. (these Proceedings)
Van Ittersum, M. K., et al., (these Proceedings)