A SYSTEM FOR ENVIRONMENTAL AND AGRICULTURAL MODELLING (SEAMLESS) FOR POLICY EVALUATION

M.K. Van Ittersum1, M. Donatelli2, J. Wery3, A. Rizzoli4, F. Ewert1, E. Rowe1, F. Brouwer5, E. Romstad6, G. Flichman7, T.H. Jetten8

1 Plant Production Systems, Wageningen University, P.O. Box 430, 6700 AK Wageningen, The Netherlands. Email: martin.vanittersum@wur.nl
2 ISCI, Via di Corticella 133, 40128 Bologna, Italy
3 UMR System (Agro.M-Cirad-INRA) Cirad TA 40/01, Avenue Agropolis, 34398 Montpellier Cedex 5, France.
4 IDSIA, Galleria 2, 6834 Manno-Lugano, Switzerland
5 LEI, Wageningen UR, P.O. Box 29703, 2502 LS The Hague, The Netherlands
6 Economics and Resource Management, Agricultural University Norway, PO Box 5033, NO-1432 Ås, Norway
7 IAMM-CIHEAM 3191, route de Mende, 34093 Montpellier Cedex 5, France
8 C.T. de Wit graduate school for Production Ecology and Resource Conservation, Wageningen University, Haarweg 333, 6709 RZ Wageningen, The Netherlands

Why SEAMLESS

European agriculture is going through rapid changes driven by a variety of factors, including markets, institutions, agricultural and environmental policies, technology, public concern and environmental changes. European policies will continue to change as a result of environmental issues, enlargement of the EU and WTO regulations. Targeted policy development and agricultural innovations require tools that enable ex-ante assessment of complex combinations of these factors. Past and ongoing European agricultural research has generally been thematic, issue and/or scale-specific, and characterised by a disparity of methodological and technical approaches, and hence fragmented. Much progress has been made with tools for analysis of agricultural production and cost-effectiveness and cost-benefits of various policies. Several tools and modelling approaches are now available to evaluate specific problems at specific scales (from farm level to global level) and time horizons (from a few years to decades). However, sustainability assessments of European agriculture integrating economic, environmental and social dimensions remain poorly developed. Systems approaches provide one of the few means for analysing and understanding the potential interactions between complex issues at different temporal and spatial scales.

Scaling across different spatial levels and integrative efforts by a range of disciplines (e.g. ecology, agronomy, economics and sociology) are vital for a sufficiently broad perspective on sustainability and multifunctionality of agricultural systems. Micro (farm) – macro (region, EU) linkages, the use of quantitative versus qualitative approaches and the reliance on survey data versus primary research data are amongst the obstacles to come to integration across disciplines and scales. Even within the domain of quantitative modelling at specific scales integration of research and cross-fertilisation of ideas is unsatisfactory, which is due to incompatibility of approaches and formalisms. First, the relevant ontology is rarely explicitly defined, making difficult the full understanding and integration of approaches belonging to different domains. Second, the different formalisms are also reflected in the software tools implementing the research results. Consequently, different research groups develop and implement their research using incompatible software tools. Models and data are often hard-coded into the software and they are rarely re-usable. End users are often not clearly identified, resulting in the development of tools which cannot be used outside the environments for which they were developed. Agricultural systems research faces this problem, especially when systems are analysed at larger scales, where the interactions between social, ecological, and economical systems cannot be ignored. As a consequence, progress in the research domain is sub-optimal and policy makers have had little integrated scientific support for their
policy development and evaluation. The proposed SEAMLESS integrated project (IP) within the EU Framework Programme 6 aims at filling this gap by providing an integrated analytical framework to assess the contribution of agricultural systems to sustainable development and the role of multifunctionality of agriculture.

**What is SEAMLESS**

The main deliverable of SEAMLESS will be an Integrated Framework (SEAMLESS-IF) that enables simulation and analysis of effects of agricultural and rural developments, policies and innovations. SEAMLESS-IF will integrate quantitative, qualitative and participatory tools, and aims at including a software architecture and implementation (SEAMFRAME) for the technical integration of quantitative tools. More specifically:

- The emphasis will be on quantitative tool development for integrated analysis of environmental, ecological, socio-economic aspects of change, policies, sustainability and multifunctionality.
- Complementary qualitative tools will be used in post-model evaluations to assess the effects of factors not captured by quantitative tools (e.g., the influence of institutional or historical context), and enable qualitative judgements to be incorporated in scenario definition and their assessments.
- Participatory methods will be developed and used to (a) distil information from prime end-users (e.g. the European Commission) of SEAMLESS-IF and from stakeholders in rural development, and (b) to ensure utility and dissemination of SEAMLESS-IF.

**SEAMLESS and the European Society for Agronomy (ESA)**

Some of the original ideas of SEAMLESS initiated from the 2nd International symposium on Modelling Cropping Systems (Florence, 2001) organised by ESA. The role of agronomists in the project is essential but only partial – the integration with economic and social disciplines will be crucial. Two major aspects of the SEAMLESS project, with potentially large off-spin to the agronomy science community in Europe are highlighted in two companion contributions: 1. The development of an Agricultural Production and Externalities Simulator (APES) and a generic Farming Systems Simulator (FSSIM) – Donatelli et al.; 2. The development of an open and reusable software platform using a declarative approach to modelling and by the development of separate components – Rizzoli et al.