Editorial

Quantitative land use analysis in Costa Rica

Since the late eighties, different Departments of Wageningen Agricultural University have cooperated with research and extension organizations in Costa Rica on land-use studies in the Atlantic Zone of Costa Rica, with a focus on defining sustainable land use systems. Major research partners in Costa Rica are CATIE (Centre for Research and Education of Tropical Agriculture) and MAG (Ministry of Agriculture and Livestock). Funding has been provided by the Wageningen Agricultural University as part of its international program.

The Dutch researchers are staff members of the Departments of Soil Science and Geology, Agronomy, Theoretical Production Ecology, Marketing and Development Economics. After an initial phase with mostly disciplinary research, an interdisciplinary phase followed which focused on the formulation of options for sustainable forms of land management at farm and regional level and agricultural policy options to reach them.

Interaction between the various disciplines when facing this interdisciplinary challenge, forms the basis for the papers in this special issue of the Netherlands Journal of Agricultural Science. This interaction was facilitated by modern information technology, applied in the context of: (i) simulation modelling of crop growth, with special attention for uncertainties originating from using different input – output coefficients (the paper of Bessembinder); (ii) geographical information systems for data storage, manipulation and display. Linkage of models with GIS has received special emphasis (the paper of Stoorvogel); (iii) air photo and satellite image interpretation for land use zoning and characterization, and (iv) use of interactive linear programming techniques to derive different options for land use by balancing agroecological and economic criteria for agricultural production on the one hand and environmental criteria on the other, as is illustrated in the papers of Jansen *et al.* and Schipper *et al.*). In addition, econometric techniques of farm household modelling were applied for the analysis of land use adjustments induced by different agrarian policy instruments (the paper of Kruseman *et al.*).

The research has indicated the importance of modern information technology to improve interactions between disciplines. The central theme of the papers being presented in this special issue is therefore the USTED methodology ('Uso Sostenible de Tierras En el Desarrollo' or 'Sustainable Land Use in Development') which integrates the four elements mentioned above (the paper of Stoorvogel *et al.*).

Information technology has the primary objective to facilitate data manipulation and interaction among different disciplines. Technology can never be a substitute, of course, for scientific creativity. It can, however, inspire creativity by allowing rapid exchange and manipulation of information and by showing the effects of certain measures on land use patterns. Thus, potentially important aspects can be selected in an early phase of the work, allowing a cut-off of less relevant ideas. Geographic information systems play an important role as they allow georeferenced visualizations of possible land use patterns as a function of different socio-economic conditions.

Users can identify themselves much better with such visualizations than with text, graphs and tables. The combination of techniques is used to explore options for alternative forms of land use at either field, farm or (sub) regional level. Subsequently, policy instruments can be identified to influence decisions by farmers in a such a way that alternative land use options become feasible. The papers do not cover the important interaction process with the users during the final land-use planning process. Still, the system was designed with a focus on its future use and contacts have been initiated and maintained with stakeholders, such as planners and extension services, when developing the system.

The papers that follow illustrate one major effect of truly interactive, interdisciplinary research: the disciplines themselves will never be the same again. Rather than be fed by their own internal disciplinary procedures, rules and customs, new inter- and multidisciplinary approaches have to be found which often use only part of what used to be considered as crucial disciplinary tools and methods, while new tools emerge at the same time.

In fact, we may be witnessing the birth of a new scientific field here that seems to be evolving on the fault lines of the older disciplinary sciences. The classicial units of analysis have become insufficient to deal with some of the new and pressing questions that society places in front of science, in particular those dealing with the sustainability of land resources. More specific definitions of units of analysis are emerging, such as the LUST (Land Use System and Technology), that allow a better integration of the complex processes affecting the land and its use (see the paper of Jansen & Schipper). The papers of this special issue are intended to illustrate therefore exemples of a new type of interdisciplinary, process-oriented research which builds on data gathered by the various disciplines while these disciplines are fed new impulses in return. Other examples of this approach and discussions of the underlying concepts have been presented by Fresco *et al.* (1994).

The work in the Atlantic Zone of Costa Rica illustrates the potential, but certainly also some of the difficulties of such a combined approach. After all, the establishment of a joint scientific frame of reference is very time consuming and the current approach has been highly data-intensive; a drawback shared by many land use planning exercises. The question is: what can we learn from the experiences in the Atlantic Zone and where do we go from here? With respect to Costa Rica, and to a lesser extent also in the Sahel programme of the Agricultural University, work is currently undertaken to test the USTED approach in the Guanacaste region of Costa Rica. In the course of this work, several aspects will be addressed: the development of a minimum data set to describe land use, a methodology for a rapid appraisal of current land use and the driving forces affecting land use change, the introduction of a feedback loop to assess the effects of land use over time, as well as the scaling up of farm to regional and national levels. We hope that these experiences may be inspiring for scientists also in other regions of the world.

Reference

Fresco, L.O., L. Stroosnijder, J. Bouma & H. van Keulen (Eds.), 1994. The future of the land: mobilising and integrating knowledge for land use options. Wiley and Sons, Chichester, 409 pp.

J. Bouma, L.O. Freso and S.B. Kroonenberg