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A Modelling Framework for the Assessment of the Impacts of Alternative Policy and Management Options on the Sustainability of Finnish Agrifood Systems

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Agrifood systems need to adapt to cope with the risks and opportunities related to global changes in climate, markets and policies. The impacts of these changes on food production, the environment and farmer livelihoods, as well as those of changes to technology and management practices, are not clearly understood. There is a need for improved assessment methods and tools that consider multiple factor and scale interactions. In recent years, European consortia have worked to create flexible and widely applicable frameworks for the integrated assessment and modelling of agrifood systems. This work has been valuable in developing common concepts, methods and more flexible frameworks. However, their generic character reduces their competitiveness when it comes to detailed regional applications. In Finland, there are several individual modelling tools available for the analysis of the environmental and socio-economic impacts of agricultural activities from field to national scales. Recently, a new project focussing on integrated assessment modelling of agrifood systems (IAM-Tools) has been launched at MTT Agrifood Research Finland to gather, evaluate, refine and develop these component models and to link them in an IAM framework for Finnish conditions. The framework was developed for ex-ante assessment of alternative policy and management options in relation to climate change adaptation and mitigation, biodiversity and reducing nutrient emissions from agriculture. A set of alternative scenarios of the main global and national driving factors have been down-scaled to construct regional scenarios of the major factors likely to influence agro-ecosystems. The framework is being built by revising existing and designing new models, interlinking the models or their results at the farm and regional level, and integrating the information in a GIS environment. The component models applied are, for example, a dynamic regional sector model of Finnish agriculture (DERMFIA), a static agent model of agriculture (SAMA), a dynamic crop growth simulation model (WOFOST), models describing the nutrient dynamics in agricultural systems (INCA-N, ICECREAM and COUP) and a hydrological rainfall-runoff model (WSFS-P). This framework represents a novel approach to the integration of data and output from several existing models. The aim is to apply the tool in relation to questions of high importance for Finnish agriculture, especially policy interventions targeting more sustainable agriculture-environment interactions, for example, in terms of water quality, greenhouse gas emissions and adaptation to climate change.