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Opportunities and limitations in assessing the multifunctionality of agriculture within the CAPRI model

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Abstract

In recent years the objectives of agricultural policy have shifted from a principal focus on production and income towards agriculture's provision of public goods summarized by the term 'multifunctionality'. Agricultural sector models, which are important tools for policy advice, need to be adjusted in order to maintain their relevance and reliability in accordance with policy changes. This paper investigates the strengths and limitations of incorporating multifunctionality indicators in the agricultural sector model Common Agricultural Policy Regional Impact Analysis (CAPRI) by reviewing the existing literature and incorporating such indicators in the model. Multifunctionality indicators are developed and implemented for four selected aspects of multifunctionality: food security, landscape, environmental concerns and rural viability. By running different policy reform scenarios, it is shown that indicators closely related to the underlying economic variables of the sector model may provide useful to describe the effects of policy reforms on agriculture's multifunctionality. However, these indicators do not completely cover the selected aspects of multifunctionality. In order to yield a broader coverage, this paper proposes to strengthen interdisciplinary research by linking agricultural sector models with other model systems like farm-based economical-ecological models, regional economic models or landscape information systems.

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1. Introduction

The objectives of agricultural policies in Europe have changed somewhat over the past decades. While food production and stable farm incomes were

important goals in the post-war period, current policy reforms aim at promoting the multifunctional aspects of agriculture (Norwegian Ministry of Agriculture, 1999). According to this concept, agriculture does not only produce food and fibre, but has also a significant impact on inter alia food security, landscapes, the viability of rural areas, the environment and animal welfare (OECD, 2001). As agricultural policy

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objectives broaden and diversify, the tools for agricultural policy advice need to follow-up in order to maintain their relevance and reliability for policy-decision makers.

Traditionally, agricultural sector models have proven to be a powerful tool to analyse the economic performance of the farm sector and to study the effects of policy reforms on production, trade and income (van Tongeren et al., 2001). These models are typically built around the animal and plant activities of primary agriculture and maximise an objective function (e.g. farmer's surplus, total welfare level) under a given set of constraints (e.g. farmland, feed requirements, nutrient requirements, policies). Agricultural sector models exist at different regional levels, reaching from the farm level via the regional and national level to world agricultural models.

Indicators can play an important role in quantifying the linkages between human activities and the different aspects of multifunctionality. Yli-Viikari et al. (in press) argue that "relevant and up-to-date information systems are one of the cornerstones in order to succeed in (the task of) balancing between various objectives of agricultural policies". International organisations like the OECD and the EU have devoted much effort to develop indicators for policy analysis that cover the environmental situation, biodiversity and landscape issues (Yli-Viikari et al., in press; Piorr, 2003). However, the economics literature is sparse on the topic of extending agricultural sector models with multifunctionality indicators. Various approaches have been made to incorporate agri-environmental indicators in farm models that cover small regions (Vatn et al., 2006) or in agricultural sector models (Attwood et al., 2000; Lehtonen et al., 2005). Schmid and Sinabell (2004) proposed multifunctionality indicators in an Austrian agricultural sector model and studied how policy reforms change the indicator values. Brunstad et al. (2006) took the analysis a step further and derived the optimal amount of food security and landscape preservation from a Norwegian agricultural sector model by implicitly using multifunctionality indicators. Andersen et al. (2005) explored the development of multifunctionality indicators based on an EU farm database.

In this paper, we aim at improving upon the existing literature by investigating the strengths and limitations

of incorporating indicators covering agriculture's multifunctionality in the European agricultural sector model Common Agricultural Policy Regional Impact Analysis (CAPRI). We aim to identify those aspects of multifunctionality for which the extension of agricultural sector models with multifunctionality indicators may prove useful. The CAPRI model seems to be well suited for several reasons. First, it already covers a wide range of environmental indicators, such as nutrient balances and climate gas emissions. Second, its regional representation at the NUTS-2 level is expected to account for the regional dimension of multifunctional attributes. Third, the CAPRI model has been used for numerous studies regarding agricultural policy reform and has become one of the most used agricultural sector models for policy advice for the European Commission.¹

This paper proceeds in the next section to presenting the CAPRI model and certain potential multifunctionality indicators, considered in the study reported here. Section 3 provides an overview over four scenarios involving different policy reforms that have been developed to cover current challenges relevant to Norwegian agricultural policy. Numerical values for the economic variables and the proposed multifunctionality indicators are reported in Section 4. Finally, the strengths and limitations of the proposed indicators together with a critical review of the existing literature are discussed and areas for future research are addressed.

2. Methods

2.1. The CAPRI model²

The CAPRI model is an agricultural sector model originally developed for the EU-15 and later extended to include Norway. Its principal aim is to analyse the economic impacts of changes in EU (or international) agricultural policies on the performance of European agriculture. Technically, the model is a partial equilibrium model consisting of four interconnected modules: supply, market, young animal market and

¹ See the CAPRI-homepage for references on projects for the European Commission (http://www.agp.uni-bonn.de/agpo/rsrch/capri/capri_e.htm#H4).

² This section is based on Mittenzwei et al. (2006) and Britz (2005a).

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