

Agri-environmental Measures as an Instrument to Enhance Sustainability - Farm Level and Budget Implications from a Case Study Region in Germany

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The EU sees agri-environmental measures as a policy instrument to cope with future challenges caused by e.g. WTO negotiations or new scarcities in the field of resources and environment. The majority of agri-environmental measures are explicitly action-oriented which means in contracts with the executive, farmers abandon the property rights to farm their land differently from what is defined in the contracts. As it is highly complicated to evaluate the effects of action-oriented measures, for example their environmental effects are seldom an observable state of nature, when defining agri-environmental measures, policy makers face a conflict between optimal realization of society's objectives (e.g. optimal ecological output) and available budget to spend for alternative agri-environmental measures.

In order to make the design of agri-environmental measures more transparent and to allocate public expenditures more efficiently, we explain, that it is in fact the action-orientation of agri-environmental measures that provides the key to farm-level impact assessment methods. We suggest a four-step procedure: To fulfill the mentioned requirements with respect to (target) effectiveness and (budget) efficiency, and thus to match society's demand, we introduce in a first step a fuzzy-logic-based impact assessment method which generates goal attainment values that evaluate the suitability of agri-environmental measures with respect to defined objectives. In a second step, average opportunity costs that result to farmers from the agri-environmental contracts have to be calculated. Given the assumption that there is a consensus that the level of compensation has to match average opportunity costs plus a small financial incentive, this second information can serve as orientation for compensatory payments. The combination of both information makes it possible to describe agri-environmental measures as mathematical functions that continuously relate goal attainment values (step 1) to public expenditures (step 2) and thus to interpret budget allocation as a continuous multi-objective linear optimization problem (step 3) which helps to find the optimal budget allocation mix for different agri-environmental measures.

Taking a 250 000 ha case study area in Germany as example, we discuss critically differences between observed and optimal budget allocation. As due to psychological or transaction costs related reasons, the acceptance by farmers to participate in agri-environmental measures can be significantly lower than the optimal budget allocation would suggest, we will in a final step reproduce the 585 farms of that region in a bio-economic agent-based farm model. By modeling scenarios with and without different agri-environmental measures, we can draw conclusions with respect to the "virtual" acceptance of the farms and demonstrate what extent agri-environmental measures influence the land market in the region and the land use of the farms (GIS maps).