The Water Framework Directive – Environmentally friendly but economically devastating? A regional assessment of irrigation related restrictions

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Abstract **– The Water Framework Directive has been implemented to protect aquatic ecosystems as well as to contribute to sustainable development. This paper analyses how the implementation of the Water Framework Directive in Lower Saxony affects farming as well as society. Production systems in the case study area in the North-Eastern part of Lower Saxony are based on irrigation. Apparent plans to lower or even ban water withdrawal permits from the groundwater exist. The impact of these measures is analysed by employing the system-dynamics model POMMARD. The results show that although farming is a small regional sector a prohibitive implementation of the WFD can have severe regional consequences.**

INTRODUCTION

The European Union Water Framework Directive (WFD) aims at the protection of the quality of aquatic ecosystems, including the groundwater. Good quantitative conditions of the groundwater bodies have to be certified, so that groundwater levels can be protected and are not influenced by devastating anthropogenic changes (Rumm et al., 2006). If these anthropogenic changes are present, measurement plans have to be adopted. Restriction of the water withdrawal permits and higher water prices could be implemented. Several authors have suggested that the introduction of the WFD will bring major changes for irrigated farming (Bazzani et al., 2002). With this paper we analyse the regional economic effects of measures to restrict the use of groundwater in irrigation farming.

CASE STUDY

The case study area is the region around Luneburg (situated in the northeast of Lower Saxony) and its surroundings to the South in which farming is extremely dependent on irrigation.

Agriculture and the up- as well as downstream related sectors (e.g. food production, agricultural machinery, etc.) are the most important sectors in this area in terms of jobs as well as Gross Domestic Product (GDP). Due to the technological progress in irrigation technologies over the last decades, despite unfavourable local water and soil conditions such water demanding production systems are the dominating systems.

With the introduction of the WFD there is some regional concern that in future the extraction of groundwater will be increasingly restricted, up to a total ban.

METHOD

By employing the system-dynamics model POMMARD (Bergmann and Thomson, 2008) this paper will analyse the effects that a reduction as well as a total ban of extracting ground waters for agricultural purposes has on the case study area. POMMARD consists of four partial modules, agriculture, land use systems, regional economic module and a regional demographic module and is currently under development to include Quality of Life as well as environmental issues (Fig. 1).

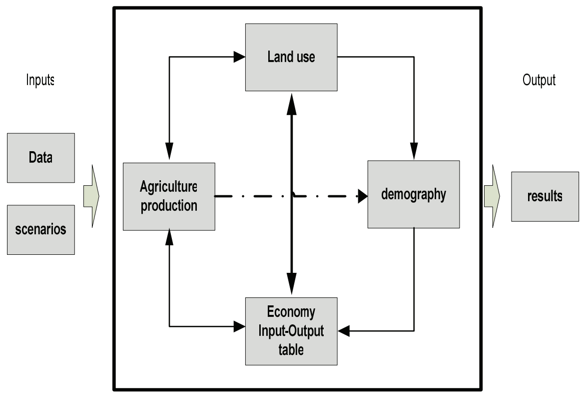

Figure 1: Structure of POMMARD

POMMARD is used to simulate the behaviour of rural regions as a whole concerning demographic, economic and agricultural aspects during one period up to 15 years. It contains altogether 11 modules, including land use, agriculture, economy, capital investments and human resources.

The scientific modelling approach of POMMARD is based on Johnson (1985) and Leontief (1953) in which dynamic regional shifts are included in a localised input output table.

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Three scenarios including the baseline scenario and reduction of available water to 50% and total ban of extraction have been specified and analysed.

Results

The model results show that the change of the water politics has substantial effects on the number of the agricultural enterprises, their employees as well as on the up- and down stream enterprises. Especially the number of farms would decrease in the context of structural change.

Table 1: Number of Farms

Number of farms	2007	2010	2014
Baseline	100,00%	94,23%	87,05%
50% reduction	98,79%	93,08%	86,00%
Total ban of irrigation	85,69%	80,75%	74,60%

Source: own data

Beyond the purely economic effects we also expect major demographic effects leading to a reduction of population by the year 2020 of more than 3,000 people. The WFD should only have ecological consequences, if significant measures (e.g. a ban) are adopted. This could significantly alter the economic as well as social situation in the region and might in the long run hinder further rural development.

Conclusions

The withdrawal from groundwater for field irrigation could lead locally and regionally to a degradation of the quantitative condition of the groundwater bodies (NoRegret 2008). With the measures to re-establish a „good condition" of the groundwater bodies, a reduction of water permissions can be expected. Such measures not only lead to ecological benefits through e.g. higher water tables or improved water quality, they also lead to costs for farmers and rural areas. The largest loser is surely agriculture and indirectly, as the computations show, also the regional economy.

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