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USING THE LEITBILD APPROACH AND ECONOMIC MODELLING TO FACILITATE LANDSCAPE PLANNING IN THE PRE-ALPINE LAKE DISTRICT OF SALZBURG

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INTRODUCTION

Today the rates, kind, scales, and combinations of changes are taking place fundamentally different from those at any other given time in the past. Moreover, the complexity of social and political interaction becomes increasingly over-whelming, causing the world to change faster and faster. But, we do not yet understand the synergistic consequences resulting from the numerous environmental risks to which mankind contributes. Hence, the local and regional consequences of human activity on landscape are not something that we have face in the future - they are with us at this moment!

Understanding the complexity of landscapes is an essential prerequisite in finding strategies for landscape development in the mid-term future to predict long-term effects of landscape change to meet future demands to landscape resources. In order to steer today's landscapes to an ideal future state (German: Leitbild), it becomes clear that landscape planning has to include considerations of socio-cultural, economic and political components in addition to ecological aspects of the ecosystem. Leitbilder – originally developed in the German speaking countries – represent an achievable state of spatial utilisation of a landscape and thus illustrate the future and provide a set of guidelines that shape action (Klug, 2008). Considering diverse regional, national and international requirements across political hierarchies and values from social, economical and environmental disciplines, it is argued, that transparent and pursuable landscape planning is of increasing importance for a wide range

of landscape ecological applications. This is done by a systematic and transparent deduction across scales and is transferred into a GIS and remote sensing environment to support semi-operational scenario analyses and the evaluation of current and manageable futures (Potschin, Klug and Haines-Young, 2008).

In response to these challenges, this paper addresses the Leitbild approach using scenario technique for describing, classifying and preparing landscape visions based on present problems encountered in the lake Mondsee catchment. International, national and regional agrarian subsidies from the overall EU budget will be decreasing from 38% to 32% until 2013 (*Auswärtiges Amt…, 2005*) and it is argued that the shrinking funding budget has an impact on state and quality of the landscape affecting the scenic and open landscape with e.g. bush encroachment and afforestation. Furthermore, the work situation is seen at risk without baseline funding for agricultural practices. Thus it is argued that the changing agricultural structure has a complex cause-and-consequence relationship afflicting e.g. the tourism industry due to scenery and social change. Economic-political guidance and control of financial resources is therefore strongly recommended if we want to handle the limited resources that are available for society and environment to our best knowledge. This requires spatial explicit modelling of subsidies based on farm and parcel level. It reveals spatially explicit regional disparities based on changed funding structures to the farm advisory service, national agencies and the European Commission. This decision support tool based on new concepts and methodologies should therefore predict the likely consequences of future regulation and political decisions on the landscape of the Mondsee catchment. The two primary objectives of this study therefore are:

- conceptualising a methodology that is able to capture scenarios of likely consequences from political interventions to the agrarian funding system and
- investigation of the subsidies employed by farmers and their contribution to the farmer's annual balance.

CASE STUDY AREA

The catchment area of lake Mondsee is about 30 km northeast of Salzburg and has an area of 248 km² (fig. 1). The majority of the study area lies in the Alpine foreland and it is politically divided by the Austrian states 'Upper Austria' in the East and 'Salzburg' in the West. The area is characterized by its hilly appearance; only the south of the study area is dominated by the northern edge of the limestone Alps (Klug, 2007). The catchment is small structured by meadows and pastures and some smaller remaining areas of arable land. Of the 414 farmers (mainly cattle farms) more than half (232) are working on a small farm scale of 10 to 20 ha. According to the data collected by Statistics Austria (www.statistik.at) the years 1981 to 1991 show a trend

in decreasing labour force in the primary sector (approx. -30 %) causing a trend from full time to part time farming practices (*Oberösterreichische Landesregierung…, 2004*).
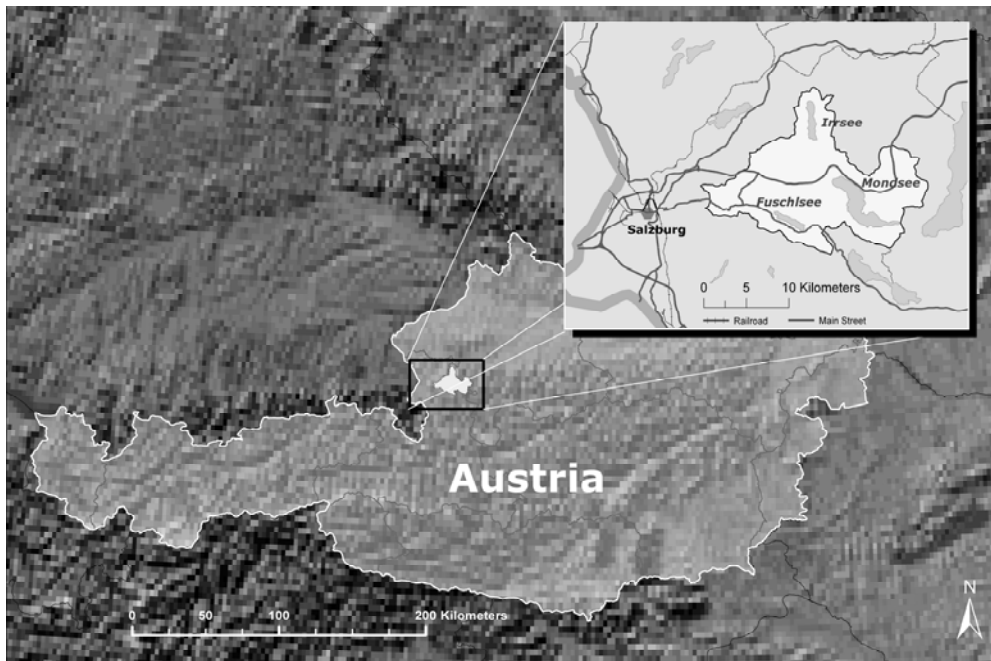

Fig. 1. The case study area Mondsee, Austria. **Source:** *author's compilation.*

METHODOLOGY

Since the farming system in Austria is not economic viable on its own, key subsidy payments are necessary to retain agricultural practices. These payments are coupled to the Common Agricultural Policy (CAP) which has been implemented by the EU to guarantee a stable price system for producers and to preserve our rural heritage. The CAP is based on the Cross Compliance where both regulations (VO (EG) Nr. 1782/2003 and VO (EG) Nr. 796/2004) are mandatory in order to be eligible to receive subsidy payments since the beginning of January 1st, 2005. The company Agrar Market Austria (AMA) is legally obliged to promote agricultural marketing and thereby coordinates the funding payment in Austria. AMA employed an Integrated Administration Control System (IACS) to register the subsidy payments based on the farmers' parcel and farm level. This inventory serves as a validation dataset for modelling.

This new model approach rests on collected information on subsidy programmes of international, national and regionalised subsidy agreements which can be employed by farmers in the Mondsee catchment. We complemented this database by the farmers' real-life experiences for e.g. fuel costs or yield gained per hectare. The

national Austrian Agri-Environmental Programme (ÖPUL) is of significant importance to the farmers in Austria.

Von Thünen (1826) based his land rent model on the theory that spatial context and present place conditions matter to the net income of farmers. Hence, this model tries to systematize the economic principles of location based factors such as income and expenditures and maps them spatially explicit with Formula 1:

land rent = ((yield * (production fee + improvement value) + subvention)
- (seeds + nutrients + pesticides + labour costs + production costs +   Formula 1
machine costs + transport costs + rental costs)
(see Schroers, 2006)

Together with the database on funding programmes, we employed a present state scenario at parcel and farm level to assess the economic balance. We used ESRI's ArcGIS 9 with the ArcGIS Model Builder and Python scripts to semi-operationalize the model framework. In this framework we coupled the spatial explicit dataset from IACS with the developed databases. In a first step we analysed income (e.g. subsidies, yield) and expenditures (e.g. fuel, work labour, seeds) at farm and single parcel level based on a model integrating the funding schemes, estimated yield and respective salary. In a second step, we compared the modelled farm balances with the payments the farmers received from AMA for validation.

To gain an idea what might happen in the near and mid future, we employed possible short term scenarios as outlined by the Austrian minister of the Environment Josef Pröll. The minister argues for a strong reduction in the subsidy payment to maintain an open cultural landscape (OFFENKUL, tab. 1). Effects on possible landscape changes caused by the altered agricultural funding bodies are assessed on the basis of the Rural Development Programme from 2007 to 2013 and the draft of the following period 2013 - 2019.

RESULTS

The result of this work is a general assessment system adapted to the regional natural, cultural, political and economic conditions of the given case study area in the province of Salzburg and Upper Austria, Austria. As a first result, the goal oriented planning procedure is shown to be a useful tool to enhance communication, scenario development, and planning of potential land use developments. Especially the analysis of subsidy programmes and their frequentation by farmers give insights into present shares of funding compared to the overall income. Furthermore, likely changing subsidy programmes causing spatial explicit changes give decision makers indicators of rural disparities.

Subsidy programmes

The cataloguing and the analysis of funding programmes, their content and designations as well as the amount of subsidy payment per area are developed in databases. Table 1 shows that especially programmes on grassland funding dominate the acquisition by farmers in this area.

Tab. 1. Used programme measures in the Mondsee catchment.

Measures	Participation [%]
Baseline funding (GRUND)	100,00
renunciation of silage (VERSIL)	77,29
renunciation of yield increasing measures in grassland areas (VBG)	76,33
maintenance of slopes (OFFENKUL)	65,46
maintenance of valuable areas (WERTV)	31,88
biological practices (BIO)	17,63
Salzburg regional project ground water protection and maintenance of grassland areas (REGSALZ)	10,63
renunciation of yield increasing measures in arable areas (VBA)	8,21
maintenance of orchards (ERHSTREU)	8,21
others	40,82

Source: author's compilation.

Spatial explicit results

The development of a semi-operational GI toolbox helped to model the net yield for each parcel and farm. Considering Formula 1, income from agricultural yields and subsidies as well as expenditures (e.g. fuel costs, insurance, seeds) could be established on a hectare basis. Considering the balance in fig. 2 one easily can see that the areas in green and yellow accompany the highest yield per parcel whereas some parcels in red have a negative or equal to zero balance.

Model validation

A comparison of the results from the ground rent model and the datasets gained from AMA is used for model validation (tab. 2). On average of all programme measures (GRUND, VERSIL, VBG, etc.) considered, a level of 85 % correctness is reached while a view measures reveal more or less variance between modelled output and real payments.

Envisioning the future

With a reduction of subsidy payments "maintaining an open cultural landscape" (OFFENKUL), we demonstrated that the annual balance for some parcels in the case study area will definitely be negative. The farmers' expenditures are higher than their income. Hence, with decreasing funding the farming of land is non-profitable any more and can cause the abandonment of farming and ultimately the abandonment of land. This causes either a reduction of work labour in farming forcing the farmer to take on a second job or surrender farming all together or finally retire. Especially parcels in remote areas and barren land with partly steep slopes are at particular risk to loose their cultural landscape characteristics which in turn has consequences for the tourism industry and the biodiversity of flora and fauna.
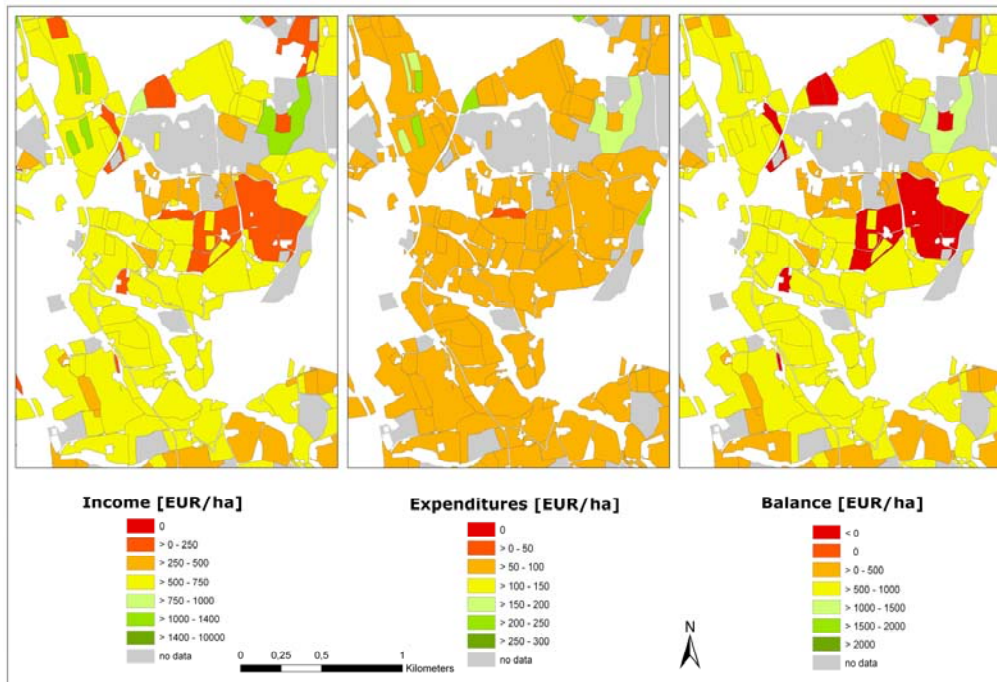

Fig. 2. Calculation of the ground rent per hectare. *Source: author's compilation.*

Tab. 2. Comparison of model results and real payments from AMA in %.

Measures	AMA [%]	model [%]	variance [%]
GRUND	17,05	11,11	34,81
VBG	32,64	32,64	0,00
VERSIL	47,04	37,67	19,92
OFFENKUL	3,27	3,36	-2,75
total	100,00	84,79	15,21

Source: author's compilation.

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DISCUSSION

Present agrarian funding mechanisms at international, national and regional scale cannot be maintained in future. Hence there is a strong need to find strategies out of the dilemma of financing agricultural practices. According to our present knowledge, far reaching changes - especially in remote areas - are diagnosed. Hence, when we cannot cope with these changes or compensate the decreasing financial payments with other funding strategies, landscape change will happen on high income parcels as well as low income parcels without doubt. That this trend is still in process is underpinned by Heißenhuber (2003) who reported on the abandonment of parcels due to non-profitable yields. Furthermore, Silber et al. (2006) noted that since 1960 the forested area in Austria was increased about 2700 km^2.

Altogether, this approach cannot solve the problem of decreasing funding bodies. But with this toolbox developed we can offer help to identify the main areas at risk and together with stakeholders and decision makers develop an action plan towards the maintenance of those areas. Hence, this model framework is able to run a monetary indicator system able to capture the basic characteristic of spatially adapted distribution of financial resources.

FINAL CONCLUSION

To conclude, this model serves as a decision making tool for policy makers. They are able to predict the consequences of reduced subsidies for certain areas and hence can assess whether the instruments used and the policies implemented for rural development have an efficient and effective impact on rural areas in Europe.

Furthermore, this model serves as a tool for farmers and the farm advisory service. Applying this model can supply farmers with information regarding land use strategies which are financially feasible. Hence, this paper contributes to the development of tools supporting policy makers and farm advisory services in the implementation of Strategic Guidelines for Rural Development Policies.

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SUMMARY

USING THE LEITBILD APPROACH AND ECONOMIC MODELLING TO FACILITATE LANDSCAPE PLANNING IN THE PRE-ALPINE LAKE DISTRICT OF SALZBURG

Landscape change is occurring faster and faster and it is mainly - among other influences - driven by political decisions. Decreasing agricultural subsidy payments at international, national and regional scale have an impact on present agricultural structures including social and environmental consequences. Employing a ground rent model after von Thünen in a GIS helped us to model the spatially explicit distribution of finances on farm and parcel level. Experiments with changing subsidy payments have been carried out and the spatially explicit impacts on the landscape was visualised in maps.