

## **ECOPAY – INTEGRATING ECONOMIC AND ECOLOGICAL KNOWLEDGE FOR SOFTWARE-BASED DECISION SUPPORT FOR COST-EFFECTIVE BIODIVERSITY CONSERVATION IN GRASSLAND**

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In order to make land management in agricultural landscapes more sustainable payment schemes have been developed which compensate farmers for carrying out land use measures which are costly to them but have a positive impact on biodiversity conservation. For example, in the EU, each year several billion Euros are spent on payments for such measures which are often provided in the context of agri-environment schemes. It is of great importance to make payment schemes ecologically effective (i.e. intended goals like the improvement of the habitat quality of endangered species are actually achieved), and cost-effective (i.e. payments are designed in a way that for the available financial budget the level of goal achievement is maximised).

In order to support ecologically effective and cost-effective biodiversity conservation a software (Ecopay) has been developed to design ecologically effective and cost-effective agri-environmental schemes for grasslands conservation in the German Federal States of Saxony and Schleswig-Holstein. The purpose of Ecopay is to provide decision makers like conservation managers or agricultural administrations with information for a better design of agri-environmental schemes. The software consists of a database with species and habitat characteristics (e.g. information on life cycle, egg deposition), definitions of biodiversity-enhancing land use measures (e.g. mowing, frequency and fertilization), and land use information (e.g. information on productivity of soil, altitude, type of agricultural or other land use etc). It further contains an ecological model to assess the impact of land use measures on species and habitats and a cost assessment module to estimate the spatially differentiated costs of the different measures. The optimisation process in Ecopay is carried out through simulated annealing.

The conservation goals that the user is able to specify in Ecopay refer to the conservation of several endangered grasslands species (15 birds and 15 butterflies) and 6 rare grassland types. The user may choose as conservation goals one, several or all of these species and habitats and is able to attach weights to the different species and habitats in order express preferences for specific conservation goals. The software includes altogether more than 400 possible biodiversity-enhancing land use measures which may be supported by agri-environmental schemes. These are various mowing and grazing regimes as well as regimes with combinations of mowing and grazing. These regimes may also include prescriptions on limiting the use of fertilizer inputs. In principle, Ecopay enables the user to

(I) estimate the effects of existing or planned agri-environmental schemes on endangered grassland species and habitats in Saxony and Schleswig-Holstein for different budgets,

(II) assess the cost-effectiveness of existing or planned agri-environmental schemes, and

(III) define target species and habitats and receive the information which agri-environmental scheme maximises these objectives for selected budgets or minimizes a budget for achieving these aims.

Ecopay is designed as a flexible software as users can modify ecological and economic parameters. In this way the software can be adapted to changing circumstances (like e.g. changing prices for agricultural goods or climatic changes) and improved knowledge on the effect of conservation measures on species. Ecopay has been developed in close cooperation with potential users like the foundation Nature Conservation Schleswig-Holstein and the Saxony State Office for the Environment, Agriculture and Geology. We will show how Ecopay can be used as flexible and adaptive software using the example of agri-environmental payment design in Saxony and discuss some results.