

## The Remote Sensing Imagery as Support of the Thematic Data within the “Project Apuseni”



View of the traditional landscape in the area under investigation.

A traditional land-use system in Apuseni Mountains, Romania, and its potentials of sustainable development is investigated by an interdisciplinary research project coordinated by the University of Freiburg, and financed by the German Ministry of Science and Education (BMBF). Co-operation exists with a number of other German and Romanian partners. The duration of the project is between October 2000 and March 2003. The study is focusing on mountain villages where people still live largely from subsistence production, animal husbandry, forest use, and wood processing. The inventory of all those aspects is facilitated by the integration of the thematic data in a GIS. Aerial photos and maps at different scales identified in different archives together with recent satellite imagery (Landsat TM, SPOT and IKONOS) constitute the basic layers for the integration of the thematic data.



Unique architecture: The traditional blockhouses are roofed with spruce twigs.

### Aims of the project are:

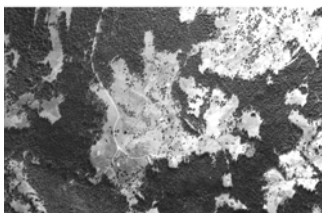
- Analyses of the landscape, its species and ecosystems; the land-use techniques in agriculture and forestry. This will be performed by analysing the area around Ghetari, a representative village of the region. Environmental and vegetation data are collected in disciplinary approaches, and stored and analysed using GIS („landscape model”).
- Using general statistical data, the households of the village are divided into four categories. Based upon this stratification, representative households are studied in detail (“household model”). Aim of the analysis is to balance the households, their different types of work during the year, the invested money and/or material, and the products.
- Both models are part of the „general model” of the community Ghetari. Central link between the „landscape model” and the „household model” are the parcels. All boundaries between parcels will be defined, each piece of land attributed to an owner and/or user. Each parcel of the complete landscape around Ghetari will be evaluated with regards to nature conservation, production potentials, present land-use, and future options under various socio-economic conditions. Each household will be analysed in respect to input and yield of each parcel it uses.
- The up-scaling of households to the village, and from the village to the landscape will give a regional model („bottom-up-approach”). These results can be compared with regional socio-economic balances deriving from general statistic data and indirect indicators („top-down-approach”).
- Three scenarios and future development of households, village and landscape are applied and discussed under two concepts of economical and political frameworks and constraints.
- Strategies for environmental sound, sustainable land-use systems will be recommended.



The polygons digitised on the IKONOS image.

### Role of the remote sensing, photogrammetry and GIS

The most accurate data we obtained from the Romanian cadastre are topographical maps at 1: 5 000 and 1: 10 000 scales. All the topographical sheets were scanned and rectified using ERDAS Imagine. Because the main part of the available cartographic documents were realized using Gauss-Krüger projection it was decided to keep this georeferencing system for the realization of the GIS in order to ensure the compatibility with the national projection system. The lack of the updated information (recent aerial photographs, topographic and thematic maps) required the acquisition of the IKONOS satellite image (1 m resolution). The rectified image became the main source of information regarding the evolution and the actual situation of the landscape.



The village of Ghetari: Fragment of the rectified archive aerial photograph (1970).

Other important raster layers containing rectified recent satellite images Spot Panchromatic (10m resolution) and Landsat TM (30 m) were created in order to complete the objective source of information available.

Various layers (i.e. vegetation, farmland parcels etc.) will be contributed to the GIS by specialists.

The quantification of this process was obtained by simple photo-interpretation and delineation of the affected areas. The following figure shows the polygons digitized directly on the display superposed on the IKONOS image. The surfaces of destroyed forest could become in short time an important source of erosion. The evolutions during the last 3 decades of the surfaces covered by forests were analysed also by interpreting the scanned maps at different scales (editions 1972, 1982), aerial photographs (1970).

### Five methodological principles:

- **Scaling up** from a detailed inventory of one village to the analysis of the entire region at different resolutions and methodologies.
- **Transdisciplinary approach.**
- **Active participation** of villagers and other key actors which allows for transdisciplinary components in the project.
- Analysis of the situation, evaluation and joint creation of **scenarios for further development**, which will result in **implementation of pilot projects.**
- **Intercultural co-operation** between Germans and Romanian scientific partners and local actors will contribute to transference of knowledge and technologies between both cultures.



Traditional barn, nowadays most of the buildings are roofed with ebernit or corrugated sheet.



### SHORT CONCLUSIONS

The preliminary results obtained since the start of the project demonstrated the utility of the remote sensing techniques and GIS, as an important tool able to prepare the application of the specialized model in order to find solutions for the sustainable development of a natural area.

The GIS of the “Project Apuseni” provides basic and specialized information not just for project purposes (i. e. orientation, modeling, detecting risk zones) but for planning, investigation of potentials and future water supply.

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