Man and the Mediterranean landscape

Man is a major governing factor in Mediterranean landscapes:
- Exploitation of fragmented resources;
- Often expansion onto marginal lands under increased population pressure.

Human activities are threatened by continuous degradation.

Objective

To explore the options open to the first Neolithic farmers in Mediterranean environments. Starting from a static model, we evaluate farming strategies along a landscape gradient and compare this to the outcome of Gregg’s study (1988) for temperate Europe. This serves to:
- Highlight local and inter-regional differences;
- Reveal the sensitivity of the underlying assumptions;
- Corroborate the validity of the land use model in CALEROS.

Ultimately this allows to assess the stability of the first agricultural systems and the carrying capacity of the Neolithic landscape.

Simulating land use

In CALEROS energy requirements are fixed over time. Technological advances are prescribed by fixed scenarios detailing per period (e.g., Neolithic):
- Crop rotation and bench terrace construction;
- Crop calendar;
- Plough, sowing and harvesting techniques and associated labour costs.

This leads to a carrying capacity that changes with climate and, consequently variations in population.

Gregg (1988) imposed varying field sizes (0.35, 0.40 and 0.45 ha p.p.) for a village of 34 persons. Climate variability was included stochastically. Contrary to CALEROS, she deducted additional losses (e.g., predation) for cereal production and imposed fixed herd sizes; CALEROS supplements cereal production with stock-breeding dynamically.

CALEROS: a meso-scale landscape dynamics model

CALEROS is a process-based model and is currently implemented for the 14 km² large catchment of the Contrada Maddalena. It includes:
- Soil production and development;
- Soil hydrology;
- Sediment transport due to water induced erosion and diffuse transport (creep, tillage, landslides);
- Dynamic vegetation growth for plant-functional types (incl. cereal);
- Regional population growth;
- Field and resource allocation to meet demands of produce (crops and livestock) and wood.

Results

For the allotment of 0.40 ha per capita and herds of 40 goats and 40 cattle, Gregg obtained area estimates for cultivation and rangeland for SW Germany. Under different assumptions, we repeated these estimates with CALEROS.

In all cases, 90% of the energy intake had to come from agriculture and preferentially from cereal production. For the Mediterranean, winter wheat was planted, in SW Germany a spring crop was sown in a two-year rotation.

Outlook

Results highlight the sensitivity to the environmental setting and underlying assumption.

Gregg’s model is more detailed but does not consider landscape development and feedbacks. CALEROS does so, but at present, agricultural options are constrained.

In the next step, an optimization of land use in CALEROS will be considered and the stability of the Neolithic landscape under the first farmers explored.

References