



## Participatory research to support sustainable land management on the Mahafaly Plateau in south-western Madagascar (“SuLaMa”)



**Module A** Interaction between land management, climate change and ecosystem services  
**Priority area A2** Interaction between land management and ecosystem functions/services"

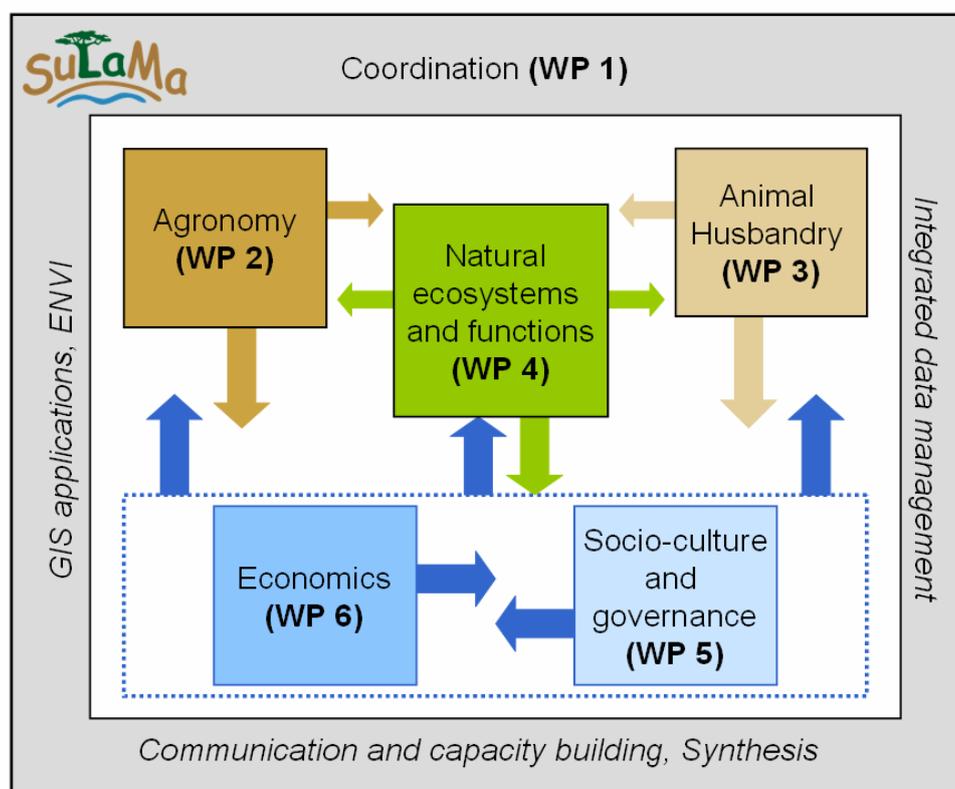
In many regions of the world current unsustainable land use practices are driven by rational decisions on management options. The relationships and effects on interactions of ecosystems and their biological diversity with in-situ land management are often poorly understood – or neglected. To make matters worse population pressure, poverty, lacking capacities and effects of climate change aggravate non-sustainable land use. The SuLaMa project focuses on this problem by providing land use alternatives for a sustainable improvement of livelihoods of present and future generations in combination with maintaining and enhancing ecosystem biodiversity and related ecosystem functions and ecosystem services (ESS/F).

Along an agro-ecological transect from the sea to the Mahafaly Plateau in semi-arid SW Madagascar, the development of alternatives to non-sustainable land use practices will be achieved through participatory research, stakeholder dialogues and concerted capacity building, thereby strengthening existing efforts of sustainable development. This region was selected as test site as it forms one of the most unique and biologically rich drylands on earth, with a large number of plants and animals that are found nowhere else. Likewise, it is the economically and climatically most disadvantaged part of Madagascar, characterized by non-sustainable forms of land use combined with high population pressure, endangered biodiversity, and to a large degree non-marketed ESS/F. Here, high reliance on natural resources for livelihoods and economic development is compounded by recurrent droughts, low level of education, limited livelihood options apart from the exploitation of natural resources, and low levels of development.

Based on an assessment of the current situation, SuLaMa analyses the interdependencies and interactions between major land use practices and ESS/F using an interdisciplinary approach that combines expertise in the fields of ecology, socio-economy, global change and

natural resources management. The following **Interdisciplinary methodological approaches** for qualitative and quantitative analysis will be implemented for this reason:

- Participatory methods (informative meetings, stakeholder workshops, development of local certification strategies and implementation of the results in cooperation with local stakeholders, education and knowledge transfer, participatory GIS);
- Interviews (structured and semi-structured interviews of relevant stakeholders, baseline survey, feed-back seminars);
- Inventories and experimental research (agriculture, animal husbandry and forestry, biodiversity, key and indicator species);
- GIS and remote sensing (classification/mapping of land use and land cover, time series and scenarios analysis, implementation of an Environmental Information System (ENVIS), models and maps for different stakeholders);
- Scenario development, modelling and integrated assessment of ESS/F (modelling and evaluation of land use and climate scenarios).



**Figure 1.** Integration of work packages (WP)

The project will be organized in six closely linked work packages (Figure 1) focusing on agronomy (WP 2), animal husbandry (WP 3), natural ecosystems and functions (WP 4), socio-cultural aspects and governance (WP 5) and economics (WP 6). The coordination (WP 1) will guarantee the implementation of a harmonized methodology, a consistent project data base, joined surveys and inquiries, and the organization of meetings and workshops.

SuLaMa focuses on the development and application of stakeholder-based solutions to replace non-sustainable land use practices under the scenario of global change (a growing human population, the impact of climate change) and prospective land transformation programs associated with mining and export oriented agriculture. Using a participatory approach, a management plan for a sustainable land use will be developed, which is environmentally sound, socially acceptable, and economically viable. The objectives to be achieved by the project are:

1. Development of robust methods for the **qualitative and quantitative analysis and evaluation of ecosystem functions and services** and for determining the resilience of the given ecosystems:
  - Functions and services of ecosystem components are identified and assessed for their importance in natural and anthropogenic systems (plants, animals, interactions, processes);
  - A robust standard indicator system for ecosystem health (water conditions, soil conditions, diseases, vegetation structure, and biodiversity) is developed and implemented with local stakeholders.
2. Functional and quantitative studies dealing with the **dependence of ecosystem functions and services on biodiversity, climate change and land management**: Interactions and effects of existing and promising alternative forms of land use and production on ESS/F are assessed, and the most suitable to maintain natural ESS/F in an anthropogenic landscape and under different scenarios of global change are identified and promoted.
3. **Analysis of cumulative effects in terms of space and time** and recording of transregional secondary and substitution effects: Based on the implementation of a hierarchical assessment system, spatial and time series analysis techniques including modeling approaches will be developed that facilitate the evaluation of existing relationships and dependencies of ESS/F and land use and allow for upscaling of the project findings beyond the area of the test site.
4. **Trade-offs and synergies** between land management that takes special account of ESS/F and other goals of land use (e.g. food production, climate and biodiversity protection, etc.):
  - Small scale irrigation projects using both surface and subterranean water resources and intensification of vegetable gardening through better integration of animal husbandry and agriculture combined with the use of biocharcoal (BioChar) and tannins are tested under field conditions;
  - Local and regional human resource and institutional capacities are developed and accessible for promoting alternative livelihoods and production practices that are favorable to ESS/F restoration and maintenance;
  - A landscape management plan for the Mahafaly Plateau is completed and implemented based on an understanding of past and present tendencies and future models of land use that integrate traditional knowledge and customs of local communities.
5. **Development of socio-economic tools for consideration of ESS/F in land management**:
  - Evaluation of ESS/F through payment schemes and elaboration of alternative income sources (local labelling);
  - Participative measures for a concerted integration of proposed land management and practices as well as knowledge transfer are determined.

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