A farming system modelling (FSM) approach linked to a farming system reference monitoring network (FSRMN) to assist in decision making processes for development projects supporting Direct seeding, Mulch-based Cropping systems (DMC) in Madagascar.

Two agricultural development projects are currently implemented in Madagascar taking into account both a watershed approach and a farming system approach for dissemination:
- BV-lac in the area of LA ALAOtra and
- BVPI in Vakinankaratra (Central highlands) and South-East.

A farming systems reference monitoring network (FSRMN) has been set up since 2007 for the attainment of two objectives:
1) to help the project in decision making processes for choosing appropriate technologies that will be developed according to a farmer’s typology using prospective analysis,
2) to monitor the project’s economical impact in the short and medium term.

A farming system modelling approach using software developed by INRA-CIRAD-IAMM ("Olympe", JM Attonaty, INRA), is used to select the best adapted technologies for farmers’ conditions including DMC.

The approach is based on partnership, farming system analysis, and modelling for a Decision Support Systems (DSS) project orientation.

This poster presents the methodology and the tools. FSMRN and farming system modelling (FSM) among other tools include a partnership approach that leads to identification of innovation processes and adaptation and/or adoption of DMC systems by farmers in order to understand farmers' strategies and to adapt technologies to farmers’ situations. The model provides economic results displaying real income evolution and impact on farming practices, labour and organizational changes (credit …).

FSRMN and FSM have been so far well adopted as tools at project levels to cope with the best combination between farmers’ needs and the projects’ proposals for DMC techniques.

A budget oriented farming system modelling tool: the software “Olympe”.

Olympe is based on the systematic analysis of farming systems:
1) To identify smallholders’ constraints and opportunities in a rapidly changing environment.
2) To understand farmers’ strategies, decision-making process and their capacity for innovation (adaptation to changing economic conditions, price crises and technological change).
3) To undertake prospective analysis and build scenarios based on climatic risks, major climatic events such as “El Nino years” and fluctuating commodity prices.

It is possible to build several scenarios as a function of changing prices, climatic events and different types of risks.

FSRMN and DMC are based on 3 principles: i) Continuous minimum mechanical soil disturbance, ii) Permanent organic soil cover, iii) Diversified crop rotations in the case of perennial crops. The permanent cover can come from i) ex situ mulch, ii) instu produced mulch, iii) in situ live mulch iv) in situ residual mulch. The suppression of ploughing creates an environment favourable to the development of the biological ground activity, prevents the development of weeds, limits evaporation, limits runoff. The sharp cover allows a physical soil reorganization via its root system and plays the role of a biological pump: just as in the agroforestry systems. No tillage and limited weeds decrease labour requirements and increase return to labour.

A Reference Farming System Monitoring Network (RFSMN): a comprehension tool of farmers’ strategies and follow-up evaluation.

A Reference Farming System Monitoring Network (RFSMN) is a set of representative farms that show various agricultural situations dependent on morpho-pedological and climatic units as well as socio-economic situations, resulting from a typology. Farms are surveyed in-depth then followed and updated every year in order to measure i) the impact of the projects’ implementations, ii) the development policies in progress, iii) the resulting innovations processes.

The objective through a follow-up is to measure the impact, the evaluation, the prospective analysis and decision-making process inside projects (choice of technologies to be promoted and level of intensification according to farm types for example …). A prospective analysis allows the comparison between potential scenarios and reality. The final objective is to allow development operators in contract with DSS to have an appropriate choice for their programmes.

The right modelling tool to the right use

In the past, methods were developed for farming system counselling (Altounay et al., 1992, 1999). Today, several different stakeholders involved have different interests. The aim is not to find THE optimal solution as do models based on linear programming (Rieu et al., 1994) or game theory (Thoyer et al., 2001) but to create models that lead to acceptable compromises between the different stakeholders.

Diversification and DMC for sustainable development

The sustainability of agriculture is a major concern. “Ecological sustainability” is linked with degraded environment and fragile soils and thus fertility, biodiversity, and the protection of watersheds. Crop diversification and technical change characterise the evolution of existing farming systems. It seems crucial to understand key factors of the history of innovations and innovation processes to be in a position to release viable recommendations for development. Among other technologies, DMC triggers a real change of paradigm for farmers. Though yields might not be significantly above that of traditional intensive tillage systems, DMC provides a more sustainable production pattern through the climatic buffer effect of mulching.