Evaluating the sustainability of integrated peasantry systems

The MESMIS Framework

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How can the sustainability of an agroecosystem be evaluated? How does a given strategy impact on the overall sustainability of the natural resource management system (NRMS)? What is the appropriate approach to explore its economic, environmental and social dimensions? These are unavoidable questions faced by any project dealing with complex agroecosystems. In Mexico, a number of development institutions, working on alternative agroecological strategies in a wide range of eco-zones, have joined forces to develop a Framework for Sustainability Assessment, the MESMIS framework.

The MESMIS project is an interdisciplinary and multi-institutional effort led by GIRA, the Interdisciplinary Group for Appropriate Rural Technology, a local NGO based in Western Mexico. The project originated in 1994 with the objectives of: a) developing an evaluation framework to assess the sustainability of alternative natural resource management systems; b) applying the framework to different case studies; c) training of individuals and institutions interested in the topic; and d) generating and disseminating materials to facilitate the application of the framework. Box 1 gives an example of how the Sustainability Assessment was put into practice by GIRA in the State of Michoacan, Mexico.

Sustainability evaluation

Most conventional evaluation approaches (e.g. cost-benefit analysis) are not always appropriate for addressing the challenges of analysing complex agroecosystems. A qualitatively distinct conceptual and practical approach is required. The MESMIS evaluation framework is such an attempt. It is a methodological tool to evaluate the sustainability of natural resource management systems, with an emphasis on small farmers and their local context (Masera *et al* 1999).

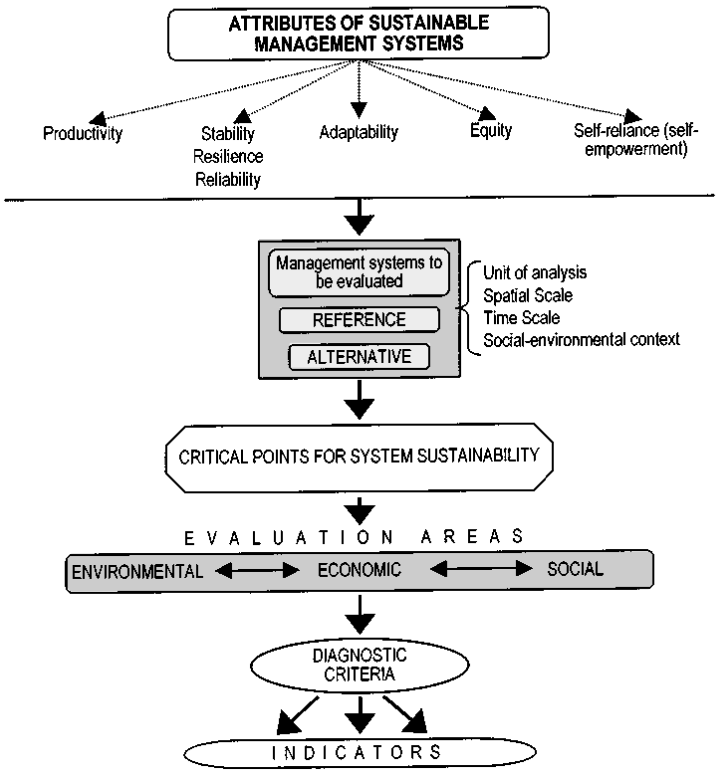
The framework is applicable within the following parameters:

1. Sustainability of NRM systems is defined by seven general attributes: productivity, stability, reliability, resilience, adaptability, equity and self-reliance.
2. The assessment is only valid for a management system in a given geographical location, spatial scale (eg. parcel, production unit, community etc.) and determined time period.
3. It is a participatory process requiring an interdisciplinary evaluation team. The evaluation team usually includes outsiders and local participants.
4. Sustainability is not measured *per se*, but is done through the comparison of two or more systems. The comparison is made either cross-sectionally (eg. comparing an alternative and a reference system at the same time), or longitudinally (e.g. by analysing the evolution of a system over time).

Figure 1 indicates the general structure of the framework. On the basis of the 7 attributes, a number of *critical points* for the sustainability of the system are identified, which are then related to three *areas of evaluation* (environmental, social and economic). In addition, for each evaluation area, diagnostic criteria and indicators are defined. This procedure guarantees a consistent relationship between the sustainability indicators and general attributes.

By providing an integrated strategy for sustainability assessment and evaluation, the MESMIS project has generated increased interest within academic and extension organisations. Several farmer organisations, research institutions and NGOs are currently using the MESMIS framework as a tool to evaluate sustainability. Since 1996 it has been applied in more than 20 case studies in Mexico and Latin America. It has also been used in more than 30 courses, workshops and seminars, and included in 14 university programmes in Latin America and Spain. The project has resulted in 15 publications, including one book on the MESMIS framework (Masera et al 1999), and another describing five case studies of sustainability evaluation within Mexico (Masera and López-Ridaura 2000).

Figure 1. General Structure of the MESMIS. From Attributes to Indicators



Implementing the Framework

The operational structure of the MESMIS framework consists of an *evaluation cycle* of six steps.

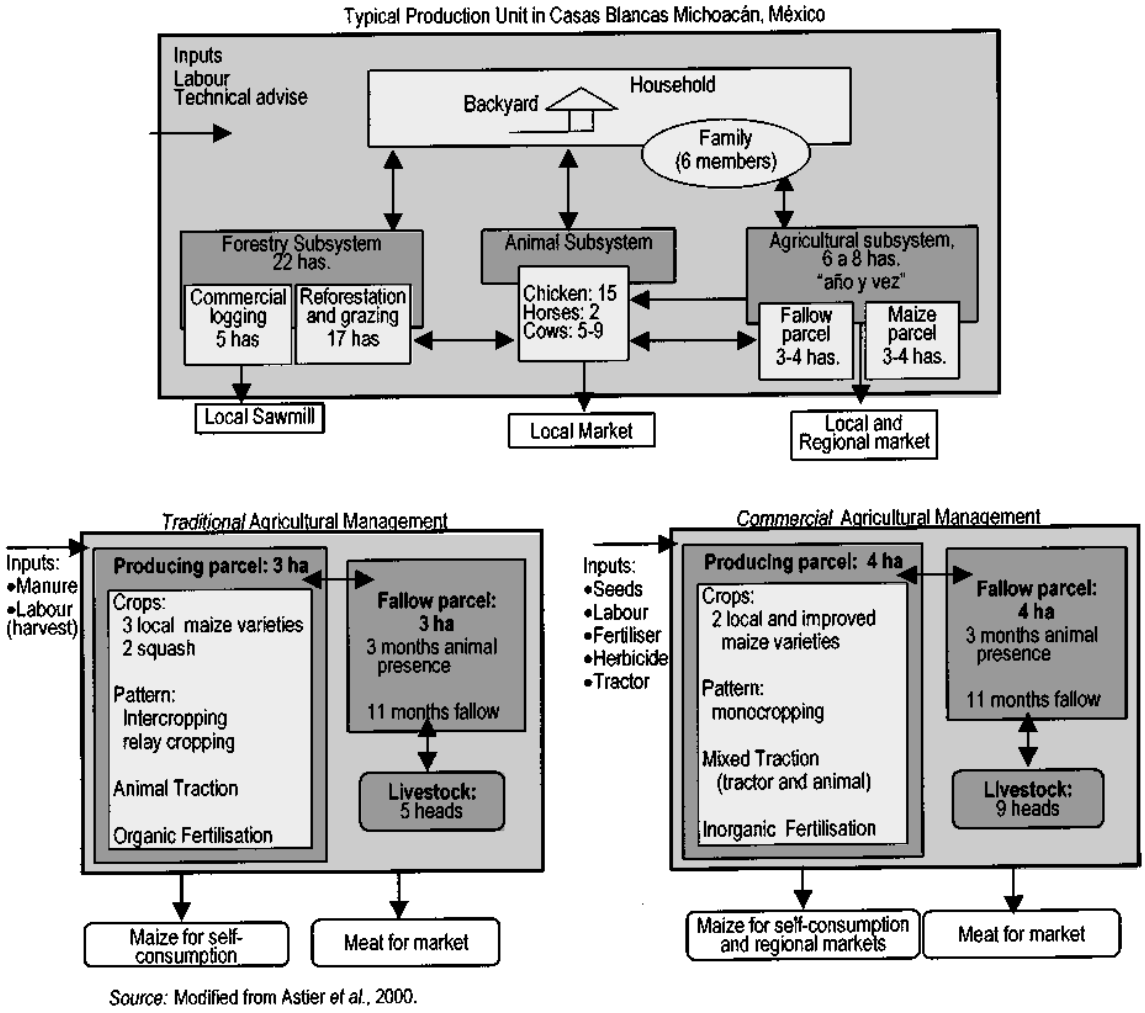
Step 1 Definition of the evaluation object

In this first step, the evaluation team characterises the system under study (both reference and alternative), as well as the socio-environmental context and scope (spatial or temporal) of the evaluation. An accurate description should include: the components of the system (subsystems), the system's inputs and outputs, the main management and productive activities in each subsystem and the main social and economic characteristics of the stakeholders and the form of organisation they have.

Step 2 Determination of the critical points

The critical points of a system are the main features or processes threatening or

Figure 2. Characterization of Casas Blancas production unit. *Traditional* and *commercial* agricultural management



Source: Modified from Astier *et al.*, 2000.

strengthening the system's sustainability. Identification of the critical points will focus the evaluation process to the most important aspects of the system under analysis. Some key questions in identifying critical points are: What makes the system vulnerable? What particular problems are presented? What constitutes the strongest, most prominent feature? Examples of critical points are low yield and product quality (productivity attribute), soil loss, deforestation and pest damage (stability, resilience and reliability), or peasant indebtedness (self-reliance).

Step 3 Selection of diagnostic criteria and indicators

The diagnostic criteria elaborate on the seven attributes of sustainability. They represent a level of analysis more detailed than attributes, but less than indicators. Diagnostic criteria serve as a necessary intermediary link between attributes, critical points and indicators, enabling a more effective and coherent evaluation of sustainability. The set of indicators used in an evaluation process is specific for the system under analysis. They should be easy to measure, possible to monitor, derived from

Box 1 THE MESMIS FRAMEWORK IN PRACTICE

In the Casas Blancas *ejido,* an indigenous community in the Purhepecha Region of Michoacán State, GIRA has facilitated the development of alternatives for an agrosilvopastoral system. This was done by diversifying the cultivated plots (*milpa)* in order to obtain better stubble quality, avoid extensive grassing and control erosion. (Masera and López-Ridaura 2000).

The Casas Blancas *ejido* is representative of how many communities in the region manage their natural resources. Each farmer manages approximately 30 hectares - about 70% being forested (logging and reforestation) and 30% used for maize production and cattle raising. The agricultural management system, known as *año y vez,* consists of mainly maize production on one parcel for a year and a fallow for 1 to 3 years. In Casas Blancas, a *commercial* and a *traditional* strategy can be identified. They differ mainly in the type of fertilisation (inorganic or organic) and use of seeds (local or improved varieties), the type of traction (animal or tractor), the source of labour (wage or family), and the main objective of agricultural production (market or self consumption) (Figure 2).

A number of critical points were identified jointly by farmers and an external team through surveys, interviews and workshops. For each critical point, the evaluation team selected the diagnostic criteria and the indicators to be measured. Table 1 shows the critical points, diagnostic criteria and indicators used in this case study (Astier 2000). Figure 3 presents an AMOEBA diagram with the results from some of the indicators used.

The first evaluation cycle of the Casas Blancas case study helped in designing an alternative system, considering the strengths and weaknesses of the two different management strategies. The alternative system, now adopted by farmers is the focus of a second evaluation cycle, which proposes: a) the diversification of agricultural production by re-introducing amaranth and two edible leguminous species as intercrops, b) the use of organic and inorganic sources of fertilisation with special emphasis on phosphorus, c) the use of mixed traction for ploughing, and d) the introduction of leguminous cover crops and controlled grazing in the fallow parcel.

Table 1. Critical points, diagnostic criteria and indicators for sustainability evaluation in Casas Blancas Michoacán.

Atri-bute	Diagnostic criteria	Critical points	Indicators	AE[1]	MM[2]
Productivity	Efficiency	Low agricultural productivity	1 Grain yield	A	i,a
			2 Harvesting index	A	i,a
		Low animal productivity	3 Fodder availability	A	a,f
			4 Animal pressure capability	A	j
		Low profitability	5 Production costs	E	a,b,c
			6 Income	E	a,b
			7 Utility	E	k
			8 Cost/benefit ratio	E	k
Equity	Costs and benefits distribution	High costs for commercial systems adoption	9 Grade of adoption	S	g
		Limited basic grain supply	10 Grade of grain self-reliance	S	a,b,l
Stability	Resource conservation	High risk of erosion	11 Soil erosion control	A	m, d
		Soil degradation	12 Stability in nutrient balance	A	a,f,m
	Space and time diversity	Monocropping domination	13 Species diversity in parcel	A	a,f,b
Adaptability	Innovation capability	Failure of technological packages	14 Grade of technological innovation	S	a,b,e
			15 Permanence in technological packages	S	b,e
			16 Capability to adapt to environmental and political changes	S/A	a,b,m
Self-reliance	Participation, control and organisation	Lack of co-operation among farmers	17 Participation in "ejido" assemblies	S	g
			18 Number of farmers in workshops	S	h
			19 Grade of External input dependence	S	a,b

[1] Areas of evaluation	
E	Economic
S	Social
A	Environm

[2] Measuring Methods			
a	Survey	e meetings with farmers	i Random grain sampling (C.P., 1986)
b	Interviews	f Direct field measurements	j Calculation as Trillas (1982)
c	Workshops	g Assemblies archives	k Calculation as Masera *et al.*, (1999)
d	Field visits	h Registry of participation farmers in workshops	l Calculation as Alarcón (1997)
			m Literature review

Source: Astier *et al.*, 2000.

available and reliable information, and clear and simple to understand. E.g. A common diagnostic criterion for the stability attribute is *Diversity.* Indicators reflecting this criterion are the *Number of species* in the environmental area, or *Number of markets* in the economic area.

Step 4 Measurement and monitoring of indicators

This step includes the design of analytical tools and the methods of data collection. Indicators can be measured in a variety of ways. Methods that have been used in the MESMIS case studies include direct field measurements, setting-up of experimental plots, literature review, surveys, formal and informal interviews and participatory group techniques. Selection of the type of measurement depends on the availability of human and financial resources. A combination of direct and indirect measurement techniques is advised in applying the MESMIS framework. Here, farmer participation is important as has been proven by the great accuracy of the indicators selected and measured by them.

Step 5 Presentation of results

At this stage, the results obtained are summarised and integrated. Generally speaking, there are three techniques for presenting the results: quantitative, qualitative and graphical techniques. When properly designed, graphical techniques may provide the most effective way for identifying problems. In the MESMIS framework, an AMOEBA-type diagram is recommended. This diagram shows, in qualitative terms, how far the objective has been reached for each indicator by giving the percentage of the actual value with respect to the ideal value (reference value). This enables a simple, yet comprehensive comparison of the advantages and limitations of the system under evaluation.

Step 6 Conclusions and recommendations.

Step six recapitulates the results of the analysis. Firstly, the evaluation team appraises how the reference and alternative systems compare in terms of sustainability. Secondly, they discuss the main elements that enhance or inhibit the alternative system compared to the reference system. Based on these conclusions and considering the needs and priorities of all stakeholders, the evaluation team proposes recommendations to improve the system's sustainability. Step six is also the phase for reflection upon the evaluation process itself, its logistical and technical aspects.

Making sustainability evaluation a permanent and cyclic process

An evaluation process is considered successful when it helps to improve the social and environmental profile of a NRMS. In other words an evaluation should aim not only at *qualifying* management options, but also at effectively helping to formulate an action plan geared towards improving the management system. Evaluating sustainability must be, ultimately, a *tool for planning and design.* Its success lies in its ability to be applied in the day-to-day activities of agroecological projects. Consequently, in the MESMIS framework, evaluation is not conceived as a linear process but as an iterative spiral. The conclusions and recommendations obtained form the starting point of a new cycle. ■

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Figure 3. AMOEBA-type diagram for the evaluation of agrosilvopastoral systems in Casas Blancas Michoacan