Sustainable Land Management

Guidelines for
Impact Monitoring

SLM IMPACT MONITORING MODULE

A seven-step procedure for SLM-IM

SLM IMPACT MONITORING MODULE

Contents


PM
PPM

Module Summary

Development activities or interventions need to be adapted to their changing environment from time to time. Appropriate adaptation requires a minimum of information about the general trend in land management. This information can be obtained through SLM impact monitoring (SLM-IM) and be made available to all stakeholders concerned with SLM. Stakeholders have a diversity of perceptions and interests, but also a diversity of knowledge, which represents a huge potential for SLM. Therefore, stakeholders' participation is essential throughout the SLM procedure. The complete procedure is a sound framework consisting of seven steps, each of which presents alternative tools that assist the user in tailoring his or her own SLM procedure.

Step 1: Identification of stakeholders. Land users, traders and merchants, decision- and policy-makers, desk officers, managers and staff of development organisations, researchers, and many more are potential beneficiaries of SLM or may contribute to it. They all use SLM-IM information for their own purposes. Stakeholder analysis is the tool for identifying who can be involved in SLM and SLM-IM. Some of the stakeholders may later on assume responsibilities for SLM-IM, data analysis, storage and dissemination of information. All the following steps in SLM-IM need to be developed and defined, together with the stakeholders concerned.

Step 2: Identification of core issues. SLM is a system too complex to be monitored in great detail. Selection is required by practical considerations, such as the need to produce results within a short time and with limited resources. The stakeholders need to agree upon the most relevant and important issues, the so-called "core issues" to be addressed by SLM-IM.

Step 3: Formulation of impact hypotheses. In defining the core issues of SLM and SLM-IM, possible interventions and activities will automatically emerge. Usually, these interventions are designed to enhance SLM and their impact is assumed to be positive. However, they may cause unintended and detrimental impacts as well. To avoid unnecessary complications, it is necessary to estimate all sorts of impacts by formulating impact hypotheses.

Step 4: Identification and selection of indicator sets. Indicators are simplified representations of a more complex reality. An ideal indicator set covers ecological, economic and social aspects of sustainability and a range of levels from the household to the region. The set of indicators to be assembled is not a group of separate variables but represents components of one land management system. Thus, frameworks and structural models are introduced that assist in the search for a meaningful and inter-related indicator set. Monitoring such a set reveals the actual trend in SLM. For each indicator as well as for the entire set, target values and criteria to assess changes will be defined jointly. What will be considered satisfactory? Which stage of SLM should be reached, and at what point in time?

Step 5: Selection and development of SLM-IM methods. In general, SLM-IM methods should be selected in view of those who will apply them beyond the life-time of a project. Therefore, the Guidelines give priority to practical and cost-effective methods. Beyond this, users are encouraged to develop and document their own methodological experience and thus adapt the Guidelines to their situation.

Step 6: Data analysis and assessment of SLM. In a preparatory phase, each indicator will be analysed individually, according to the criteria that were jointly defined in Step 4. During the main phase of assessment, the results of all indicators will be compared to determine whether all objectives were met (more sustainable land management), whether some were not met (conditional sustainability) and why not.

Step 7: Information management. A user-oriented presentation and dissemination of SLM-IM results require more than writing a single report. Understandable and attractive outputs, which meet the needs of different stakeholders must also be available. Decisions need to be taken on what to store, and where and how, so that all stakeholders have permanent access to the information.

During SLM-IM, unexpected costs, lack of experienced monitoring staff, or insufficient infrastructure may constitute limitations for single projects carrying out SLM-IM on their own. Proposals are made for examining alternatives and establishing joint SLM in different projects and institutions in a certain area.

Introduction

The Impact of Development Activities

SLM - impact monitoring (SLM-IM) makes changes in land management apparent. Such changes are the result of a combined influence of the society's own internal mechanisms of development, and external political, economic and environmental factors, one of which may be a development programme or project. The mere existence of a project already has an impact on its surroundings, even before any project activity has started: it creates expectations which change peoples' behaviour. After some years, it is quite difficult to tell which factor caused which change, and it is hardly possible to isolate the project's impact from any other influence.

If this is so, does SLM-IM make sense for a development project? Monitoring changes in land management is a process of learning about the man-environment relationship. To be more effective and realistic, any decision-maker, be it a land user, a policy-maker, or a project manager reviews his or her decisions and activities from time to time and adapts them to the changing situation. For this purpose, it is necessary to estimate the direction and the extent of change, and which factors are involved. Proper adaptation of decisions and actions requires a minimum of information, and SLM-IM provides this information with reference to SLM.

SLM-IM is a tool for decision-makers - e.g. farmers, policy-makers or project managers - to better adapt future activities to a changing world

Participatory SLM-IM

Facing a diversity of perceptions and interests

SLM usually involves many different stakeholders, all of whom have a particular perception of and interest in the land. Misuse of land resources affects future production, and temporal trade-offs must be made, regarding the extent to which the resources should be used, and what investment in SLM will be necessary. In principal, ignoring the needs and interests of any stakeholder group may result in missing the target of SLM. Certainly, common understanding among all stakeholders would facilitate SLM, but conflicting perceptions, interests and power constellations may be a serious obstacle. Participatory SLM-IM brings stakeholders together, helps in formulating a common goal and harmonises conflicting interests.

Participation means revealing and managing conflicting interests

Using diversity of knowledge

The variety of perceptions and interests among different stakeholders should primarily be considered a huge potential for SLM. The "internal" stakeholders, such as land users and other local community members, will contribute indigenous practices which are already accepted and adapted to the local environment. The "external" knowledge base of researchers and experts will add experiences from other parts of the world that optimise indigenous techniques and provide alternatives. Thus a broader knowledge base is created. The theoretical knowledge of legal advisors and policy-makers should be used to design a land policy that encourages land users to practice SLM. In this context, SLM-IM is a learning process for all stakeholders and helps in combining efforts to make land management more sustainable.

Participation increases development options and the potential for SLM

Where to involve stakeholders in SLM-IM

SLM-IM is designed as a participatory process, and stakeholders' involvement is not only important but essential throughout the SLM-IM procedure:

- Steps 2 and 3: During the identification of core issues and the formulation of impact hypotheses, stakeholders express their views, perceptions and needs and thus make the SLM-IM procedure more transparent and paving the way for discussion and negotiation.
- Step 4: Participatory identification and selection of indicators further deepens understanding of different perceptions and provides more alternatives for procedure. From a scientific point of view, including indigenous indicators means making SLM-IM duplicable for everyone, and not only for subject matter specialists.
- Step 5: Participatory selection and development of SLM-IM methods assures that the methods reflect the capacity and capability of those stakeholders who will carry out long-term SLM-IM beyond the life-time of a project.
- Step 6: During data analysis and assessment of SLM, it is important that all stakeholders understand what the results represent and realise that data processing is

not limited to adding up numbers. If the results are unclear, the necessary action will not follow.

- Step 7: To make sure that the information reaches all stakeholders, participatory SLM-IM helps to design a truly user-oriented form of information management, involving user-friendly outputs, presentation, dissemination, and storage of data appropriate for each stakeholder group.

Stakeholder participation is essential throughout the SLM-IM procedure

Establishing an SLM Impact Monitoring Procedure

It is often a project or programme manager who initiates SLM-IM, who initially supervises staff that apply monitoring methods, and who organises training in SLM-IM. For the initiator of SLM-IM it is important to survey the entire procedure, because all steps in SLM-IM must be designed in the beginning. Important decisions, for example concerning information management - the last step in SLM-IM - need to be made as early as possible. It is therefore advisable to read through all steps first.

These Guidelines provide a sound basis for SLM-IM in 7 steps. Beyond this framework, the Guidelines explicitly disclaim promotion of one fixed and seemingly "best" tool per step, but supply alternative tools, such as a framework, structural models, indicators, or monitoring methods. Each step in the SLM - Impact Monitoring Module contains basic information supported by methodological hints, examples, pitfalls (caution!) and other elements. Alternative tools and examples are presented in the Toolkit Module. This will assist you in establishing your own procedure tailored to your specific situation. Whether you agree to carry out the entire SLM-IM procedure, or whether you want to use steps and tools selectively, is up to you.

Comparability of data

After SLM-IM has been conducted for the first time, unsatisfactory results may call for an adaptation of the SLM-IM procedure and tools. However, we strongly recommend thorough design of the entire SLM-IM procedure, including the selection of core issues, impact hypotheses, indicators and methods, at the outset. A substantial modification of SLM-IM at a later stage may mean that data collected by different methods are no longer comparable! In this case, SLM cannot be assessed appropriately. Should it nonetheless be necessary to modify the SLM-IM procedure, consider how to relate the previous tools and data to those that have been modified.

Effective SLM-IM must be flexible for adaptation to any specific situation

Step 1 Identification of Stakeholders

Who plays a role in SLM-IM?

Anyone who is concerned with the objectives or activities of a project or programme, who may benefit or suffer from the impact of development activities, or who can influence the outcome of development activities is actively or passively "holding a stake" in SLM and, consequently, in SLM-IM. For example:

- Land users and local groups will be the main beneficiaries of the project. They have a tremendous wealth of experience and knowledge about how to manage land resources. Depending on the division of roles and labour, there is a gender-specific land management knowledge base. Women and men often consider different aspects of resources, such as the productive aspect of cultivated land or the health aspect of forests harbouring medicinal plants. Land users are the main actors in implementing SLM beyond the life-time of a project. SLM-IM information is useful for exchanging experiences among land users, adjusting land management operations, and verifying whether their interests are met according to their own criteria.
- Traders and merchants have an economic interest in a region. They are important in supplying appropriate inputs needed for SLM. They assure marketing of land products and may thus increase the economic attractiveness of SLM to local land users. They use SLM-IM information to optimise supplies and meet demands.
- Representatives of local and district institutions and NGOs have a considerable say in the economic, cultural and political framework, which can either enhance or hinder SLM. Furthermore, they normally have links to national institutions, and are part of the policy-making process. They can assist in organising the SLM-IM and appropriate dissemination and storage of information. They use SLM-IM information in dealing with political issues, such as land tenure or access to natural resources.
- Project managers are the ones who initiate the SLM-IM procedure and identify other relevant stakeholders. They are in need of SLM-IM information for planning appropriate project activities, making mid-course corrections, and justifying decisions to beneficiaries and donors.
- Staff of development organisations and national partner organisations may initially carry out SLM-IM, and also provide training in SLM-IM. They use SLM-IM information as feedback on their own work, and they also play an important role in the storage of data.
- National and international researchers support development activities. They may not be working in the project area, but they can use SLM-IM information to adapt land management technologies, to improve scientific models, and to develop recommendations for a wider audience. Later on, their research results will be used to improve SLM and their methodological results will improve the SLM-IM procedure.
- Desk officers of donor organisations are responsible for proper resource allocation in their agencies, and for ensuring that development activities are in line with their goals, such as sustainability or poverty alleviation. They need SLM-IM information to follow up the quality of their investments.

How to start a stakeholder analysis

"Stakeholder analysis" identifies a project's key stakeholders, assessing their interests and the ways in which their interests are linked to the project. It helps to identify appropriate forms of stakeholder participation and creates awareness of gender-specific potentials for SLM. The analysis should always be done at the beginning of a project, even if it presents only a quick list of stakeholders and their interests.

From a project's point of view, stakeholder analysis must involve as a minimum requirement

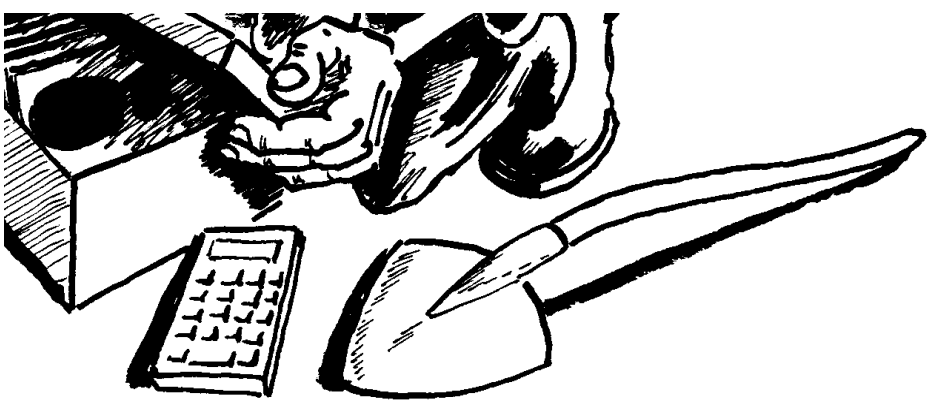
- a list of all possible stakeholders and their interests;
- an assessment of stakeholders' relative power and influence;
- stakeholders' importance to the project, their possible contributions to the success of its activities, and possible risks that might affect the project's successful implementation:
  - positive relations between stakeholders can be used as an entry point for project activities or as a catalyst for SLM activities;
  - conflicts of interest between stakeholders might hinder progress if they are ignored.

Positive relations with and among stakeholders are entry points for successful implementation of development activities

Initial questions

A set of well-designed questions can be a good start for getting into discussions with stakeholders. IUCN suggests:

- *In what way is your environment changing?*
- *Which problems have resulted from those changes, and which have always been there?*
- *How is your environment being affected by others in ways which seem out of your control?*
- *How are you affecting other people's lives?*
- *Who knows what about the environment?*
- *Who else shares your problems or has similar ones?*
- *What are your aspirations? Who is your role model?*



Stakeholders' assessment in a soil conservation project in Nicaragua

In the planning document for its second phase of implementation (1994-1996), the Programme for Sustainable Agriculture in Central American Hillsides (PASOLAC) included several indicators of improved soil properties after conservation practices had been adopted by farmers. Farmers themselves were to evaluate the expected improvement in early 1996. At the beginning a "translation workshop" was organised to translate the planning matrix into a language acceptable to evaluating and visited farmers. 12 institutions working in 3 different regions of Nicaragua were involved. In each region, each institution, represented by 3 farmers, visited the working area of another institution.

The visits were divided into two parts. During the first day, the 3 farmers visited between 3 and 6 individual farms. Their observations were organised according to key questions (indicators) discussed in the "translation workshop". In the evening, they gathered to discuss their findings. On the second day, meetings were held between the 3 farmers and the visited community. The visiting farmers presented their information and evaluation of soil conservation practices and their effects. The community members gave their opinions and further information. Finally, the adoption rate at community level, comparing 1994 and 1996, was estimated by the visiting farmers. During each visit 2 university staff members acted as secretaries to report farmers' comments. One technician of the institution visited joined the meeting with the community but had no right to interfere. At the end of the "evaluation cycle", a workshop was held in each region with only the evaluating farmers.

A national workshop at the end (again only with farmers) helped to fine-tune the evaluation report (PASOLAC 1996 a). A document was produced about the methodology used (PASOLAC 1996 b).The methodology was inspired by the "beneficiary approach" developed by L. Salmen of the World Bank.

Who will carry out SLM-IM?

The SLM-IM team must ensure that the SLM-IM procedure delivers results of a quality appropriate to the purpose and is cost-effective at the same time. The SLM-IM team will initially consist of project staff and other stakeholders. In the long run, specific and formal efforts should be made by project staff to train the local monitoring staff, so that eventually SLM-IM can be carried out without any project involvement.

Composing the SLM-IM team

The following aspects must be taken into account:

- fairness and objectivity in the perception of SLM: "internal" and "external" views need to be integrated;
- multi-disciplinary expertise: experience in data collection, analysis and in setting up an SLM-IM system is desirable;
- gender-orientation: a team composed of both women and men facilitates an appropriate and gender-specific approach to different stakeholders;
- capable local team members: post-project SLM-IM must be assured;
- co-ordination capacity: data collection and data use must involve other institutions;
- communication capacity: the participatory procedure of SLM-IM requires a communicative team, able to address and resolve conflicts between stakeholders.

Blauert, J. 1995. Creating local agendas (B). Participatory planning and evaluation methods: Suggestions for complementary methodologies. GTZ 402/95 18e (B)RMSH/NARMS Abt. 402, GTZ, Eschborn, Germany.

Davis-Case d'Arcy 1992. The community's toolbox. The idea, methods and tools for participatory assessment, monitoring and evaluation in community forestry. FAO, Forestry Paper No. 311, FAO, Rome, Italy.

Feuerstein, M.-T. 1986. Partners in evaluation: evaluating development and community programmes with participants. Macmillan Publishers Ltd, London, UK, 196 p.

Germann, D. and Gohl, E. 1996. Participatory impact monitoring. I.: Group-based impact monitoring. Deutsches Zentrum für Entwicklungstechnologien (GATE), Eschborn, Germany, 28 p.

Germann, D. and Gohl, E. 1996. Participatory impact monitoring. II.: NGO-based impact monitoring. Deutsches Zentrum für Entwicklungstechnologien (GATE), Eschborn, Germany, 38 p.

Germann, D. and Gohl, E. 1996. Participatory impact monitoring. IV.: The concepts of participatory impact monitoring. Deutsches Zentrum für Entwicklungstechnologien (GATE), Eschborn, Germany, 36 p.

Hagmann, J, Muriwa, K., Chuma, E. 1996. Learning together: development and extension of soil and water conservation in Zimbabwe. Quarterly Journal of International Agriculture, Vol. 35, No. 2.

Hagmann, J., Chuma, E., Muriwa, K. 1996. Kuturaya (let's try); participatory research, innovation and extension. ILEIA Readings in sust. agric.; Farmers' Research in Practice: 153 - 173.

IIED Sustainable Agriculture Programme 1995. Trees and trade-offs: a stakeholder approach to natural resource management. Gatekeeper Series no.52, p.5-6

IUCN 1997. (International Union for the Conservation of Nature and Natural Resources). An approach to assessing progress towards sustainability - tools and training series. IUCN/IDRC, Gland, Switzerland.

ODA 1995. Guidance note on how to do stakeholder analysis of aid projects and programmes. http://www.oneworld.org/eufiric/gb/stake1.1.htm

PASOLAC. 1996 a. Evaluación Participativa por Beneficiarios, 1996. Managua.

PASOLAC. 1996 b. Sistematización de la metodología de la evaluación participativa por beneficiarios, 1996, PASOLAC. Managua.

Schwarz, B., Germann, D. and Gohl, E. 1996. Participatory impact monitoring III. Application examples. Deutsches Zentrum für Entwicklungstechnologien (GATE), Eschborn, Germany, 68 p.

Swiss Development Co-operation 1997. Monitoring - keeping in touch with reality. Series of working instruments for planning, evaluation, monitoring, tranference into action., Strategic Controlling Unit, Berne, Switzerland, 2 Volumes, 77 p.

Werner, J. 1993. Participatory development of agricultural innovations - procedures and methods of on-farm research. Schriftenreihe der GTZ, No. 234, GTZ, Eschborn, Germany, 251 p.

Zweifel, H. 1998. The realities of gender in sustainable land management. Inputs for reflection and action. Development and Environment Reports, No. 16. CDE, Berne.

Step 2 Identification of Core Issues - What Should be Monitored?

What are core issues?

Stakeholders actively involved in SLM-IM are confronted with a large number of land management issues (sustainability aspects, land problems, system elements, processes, etc.). At first glance, most of them seem worthy of consideration in development activities. But limited time and budgets make it virtually impossible to cover and monitor everything desirable. In addition, if too many details are considered, the overview may be lost and details may not be covered satisfactorily. The most important and most relevant issues to monitor, the so-called "core issues" of SLM, depend largely on the interests and perceptions of different stakeholders. So identifying the core issues is a first crucial test of participatory SLM-IM. It is a preparatory process for selecting the definite and more specific indicators. The following methodological hint presents one possibility for identifying core issues of SLM-IM.

You cannot monitor everything;
make a relevant and realistic choice

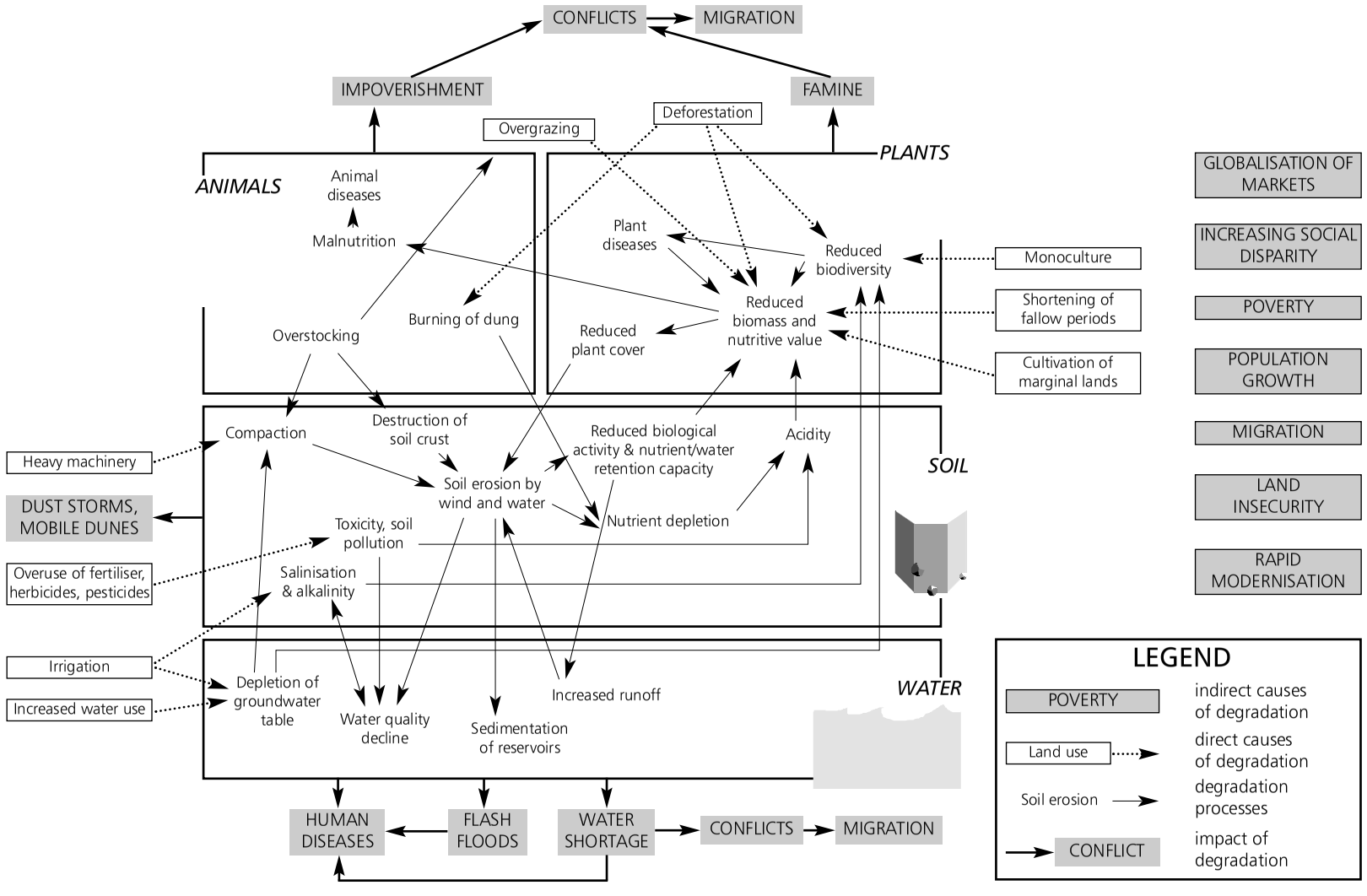
Identifying core issues of SLM-IM - The inter-relationship of society and resource management

There are basically two ways to begin work according to the flow diagram below. If you have a socio-economic background, you may prefer to begin with the identification of societal changes or problems along the margins of the diagram. If you have a biophysical background, you may wish to start with the resource degradation symptoms in the centre of the diagram. Either way will eventually lead you to the inter-linkage of society and land resources.

- Along the margins of the diagram you will find societal problems (e.g. land insecurity, poverty, migration, etc.) that could be causes and/or effects of resource degradation. Identify apparent societal problems in your area and define their relationship to land management problems (e.g. cultivation of marginal lands, deforestation, overgrazing, etc.) by adding arrows between the different components. You may also observe issues other than those included in the diagram. Add them and try to find their links with other components. Land management problems often result in resource degradation, the facets of which are indicated in the centre of the diagram.
- The centre of the diagram contains four examples of land resources. Identify the symptoms of resource degradation prevailing in your project area (e.g. reduced biodiversity, salinisation, water quality decline, etc.). Follow the arrows forward and backward and notice how different symptoms are inter-linked. In your area you may observe symptoms other than those included in the diagram. Add them and try to find their connections with other symptoms. These degradation processes may have different impacts on the society, examples of which are indicated by arrows leading from the centre to the margins of the diagram (e.g. water shortage, famine, etc.).

Note that the society experiences the degradation of water, plant and animal resources directly. Degradation of the soil resource, by contrast, is mostly felt indirectly through its detrimental impacts on the other resources. Therefore, soil degradation is often not perceived as a problem until the damage is considerable and corrections are costly!

see also sections A and B2 of the Toolkit



SLM IMPACT MONITORING

Agreement on core issues

Local stakeholders in particular have long "internal" experience in managing their environment. Thus they also have an opinion on what needs to be done and what should be monitored. As a cross-check on these "internal" opinions, "external" stakeholders such as project personnel are advised to make their own preliminary assessment of what they find important. This cross-check will enable them to formulate their own opinion about the prevailing core issues. But it should not be forgotten that this represents only one view and is not the only possible perception! It will provide additional alternatives for the general debate with other stakeholders, the aim of which is to reach an agreement on the core issues of SLM-IM.

Bellows, B. 1996. Indicators of sustainability. Workbook for the SANREM CRSP. Washington State University/University of Wisconsin, USA.

Defoer, T., De Groote, H., Hilhorst, T., Kanté, S., Budelman, A. (forthcoming). Farmer participatory research and quantitative analysis - a fruitful marriage? Journal of Agriculture, Ecosystems and Environment.

Hurni, H. Ludi, E. 1998, with the assistance of an interdisciplinary group of contributors (1998, forthcoming): Reconciling conservation with sustainable development. A participatory study in villages inside and around the Simen Mountains National Park, Ethiopia.

Kläy, A., Perich, I.; Hurni, H.; Huguenin, A.; Schläfli, K. 1992. Environmental assessment in development co-operation: principles of ecological planning. Development and Environment Reports, Vol. 4, Berne, Switzerland, 46 p.

Vester, F. 1986[2]**.** Ballungsgebiete in der Krise. DTV, 151 p.

Step 3 Formulation of Impact Hypotheses

From core issues to impact hypotheses

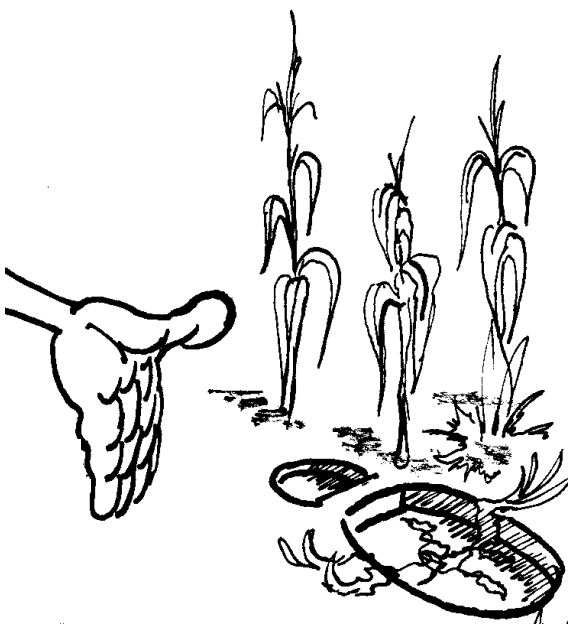
The core issues are those issues in the land management system under consideration that are found to be most relevant. Many stakeholders will have their own opinion about which interventions will improve land management and make it more sustainable. It is assumed for the most part that the proposed interventions will have a positive impact. However, because SLM is a complex system, they can cause a number of impacts, desirable and detrimental, planned and unexpected. Likewise, an impact may not be restricted to the specific core issue addressed but may influence other issues as well. So before starting any intervention, it is necessary to estimate all its possible impacts by formulating impact hypotheses. If this is not done, negative impacts may keep a project busy with corrective action, and it may eventually lose sight of the goal: SLM.

Assessing the impacts of project activities ahead of time

Proposals for SLM-enhancing interventions or activities are collected from all stakeholder groups. Thereafter, they will be invited to estimate which impact (on land management) they expect from each intervention (in which direction they want it to go, to what degree they want change, what the modalities will be, etc.). The different hypotheses will again reflect various perceptions, interests and expectations, and again, the wide range of views will help to critically compare different scenarios and options. The debate makes it easier to segregate the most realistic options and also to create awareness of a number of unintended impacts. It may thus avoid costly corrective action at a later stage. Whether the predicted or other impacts take place and why will be tested during the following steps of SLM-IM.

see also sections A and B2 of the Toolkit

Proposed project activities may have more than the intended positive impact!



The variety of impact hypotheses

SLM activity: terracing on steep slopes to reduce soil erosion. Possible impact hypotheses from the point of view of the ...

	... Ministry of Agriculture	***... local farmers***	***... project***	***... local merchants***
desired impact	*soil loss reduced; soil fertility maintained; production improved*	*incentives and subsidies received; crop yield increased*	*technology adopted by farmers inside and outside the project area*	*demand for tools and inputs increased; supply of agricultural products increased*
undesired impact		*labour demand for soil conservation increased*	*incentives become more important than conservation*	*competition of merchants increased*

Beyond these expected impacts (desired and undesired), the following may occur unexpectedly:

unexpected impact	*no adoption of the technology*	*problems turning the ox-plough; rodents settling in and waterlogging behind the structures*	*no adoption of the technology*	

Unexpected impacts

Farmers were assisted through a project nursery in planting grass on contour bunds in order to provide more fodder and thatching material. Unfortunately, the grass planted harboured snakes and harmful crop pests. Farmers found that the presence of these pests outweighed the benefit of the additional grass. The project now needs to re-consider the grass nursery programme, or look into ways of managing the grass (through species selection or cultural practices) which will minimise the effect of the harmful pests. This type of "in situ" *analysis of observations on unintended consequences or impacts can directly feed into the project process in order to improve the delivery of outputs. But when deciding on corrective actions, their possibly detrimental effects must be estimated simultaneously by formulating new impact hypotheses.*

Side effects

Planting a particular fodder tree species on contour bunds was selected as an indicator that farmers are investing in the maintenance of soil-conserving technology. At the start of the project it was assumed that this agro-forestry species would improve livestock nutrition. Similarly, it was assumed that the demand for milk would increase, and therefore increased production of fodder from the recommended tree would give higher milk yields and increase the household income. However, later research showed that this species had a toxic side effect: milk production increased at the expense of the reproductive capacity of the livestock. In addition, an external factor, the removal of subsidised government services (for agricultural inputs, veterinary support, and milk marketing) made milk production an unattractive commercial venture, and therefore extra fodder was no longer required. Farmers decided to remove the fodder trees and instead planted sweet potatoes and cassava on their contour bunds, increasing the risk of de-stabilisation of the bunds. Improving this situation requires a thorough understanding of the whole land management system rather than a hasty correction at the spot where the detrimental impact occurred.

Swiss Development Co-operation/Centre for Development and Environment. 1994. Impact Hypotheses: Development and its Environmental Impacts. Berne, Switzerland, 101 p.

Swiss Development Co-operation 1997. Monitoring - Keeping in touch with reality. Series of working instruments for planning, evaluation, monitoring, transference into action. Strategic Controlling Unit, Berne, Switzerland, 2 Volumes, 77 p.

Van der Burg, G. & Caldwell, R.1998. Monitoring Evaluating Reporting - MER. Management tools for development organisations. CARE International (www.kcenter.com)

Step 4 Identification and Selection of Indicator Sets

What is the role of indicators in SLM-IM?

After selecting the core issues of SLM-IM and formulating impact hypotheses for possible interventions, the next step is to define how to verify the hypotheses - the projected changes in land management compared to the present situation. Again, we face on the one hand the complexity of SLM and many different perceptions of it. On the other hand, there are practical considerations, such as the need to produce results in a short time and with limited resources. In the interest of compromise, two procedures are proposed:

(1) identify simplified representations of these complex realities, the so-called "indicators", to verify the impact hypotheses;

(2) assemble a reasonable set of indicators, since no single indicator can provide sufficient information to assess ecological, economic and social aspects of sustainability from the household level to the regional level.

Indicators are simplified representations of more complex realities

Indicators will firstly pertain to the status quo of what they represent (e.g. soil fertility, forest cover, population density). Ideally, SLM-IM starts with a baseline study prior to any project intervention as a reference for comparison with future situations. Secondly, the same indicators can be used to highlight changes (e.g. higher available nutrient content, deforestation, increasing population density), if there are at least two sets of observations. The analysis and quality of the SLM-IM improves though, if long-term observations are made. Careful comparison between project and non-project sites in the course of the project can substitute for time-series analyses to a certain extent. Thirdly, the indicators also have a normative character because they can be used to evaluate changes ("better" or "worse" than before).

Paving the way for indicator selection

Indicators are a means of communicating perceptions of sustainability among stakeholders. They are also tools for monitoring and assessing sustainability, and for predicting trends in sustainability. The type and quality of information needed for decision-making depend on the specific situation and the expectations of each project. The following list will assist you in defining which criteria are relevant for the indicator selection process in your situation.

Possible criteria for selecting indicators

Select from, modify, or complete this list of proposed criteria according to your needs:

- Validity: the set of indicators provides sufficient information about the situation to be observed.
- User-orientation: indicators are significant for different users who need the information.
- Gender-orientation: indicators are sensitive to the domains of both men and women, so that important gender-specific knowledge bases are not neglected.
- Practicability: there is a sufficient number of simple and practical indicators that are usually more effective in communicating results to and creating awareness among non-technical or non-scientific stakeholders.
- Policy relevance: there is a sufficient number of indicators that are of importance to policy makers and address environmental issues that require a political resolution.
- Sensitivity: the set contains indicators that reflect short-term, mid-term, and long-term changes in land management.
- Reliability: monitoring of indicators by different persons and at different times gives the same results.
- Timeliness: the indicators selected provide data that can be analysed and presented in time for all stakeholders who need the information.
- Compatibility: data and formats are compatible with existing data.
- Cost-effectiveness: indicator selection implies an agreeable compromise between precision of information, the time and equipment required/available, and the representativeness of data collection.
- Feasibility: required inputs (staff, funds) can be made available to monitor the indicators according to the time intervals and spatial resolution agreed upon.

see also section B1 of the Toolkit

Using a framework or model to link the indicators

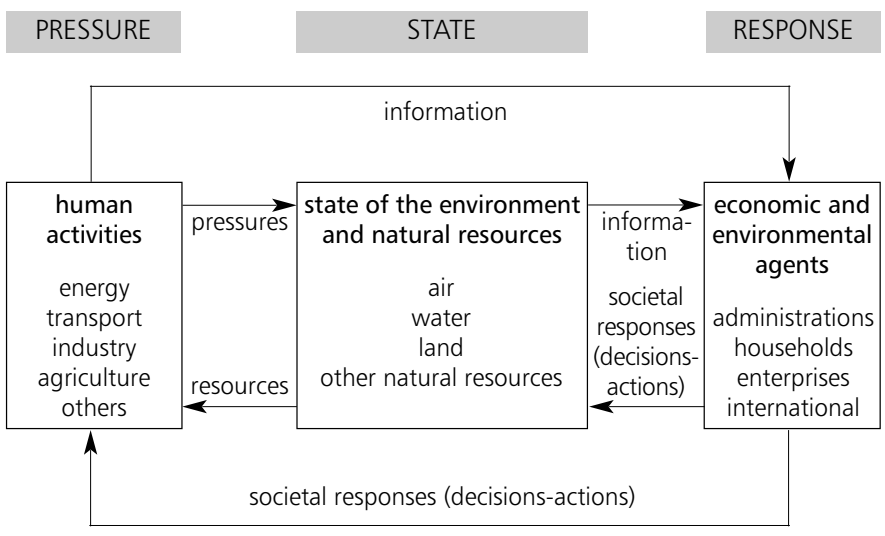
Indicators are inter-linked components and processes in one land management system, and not a group of separate variables. Although each single indicator could be interpreted independently, SLM as an entity can only be assessed if its indicators show a meaningful linkage. Therefore, a framework or structural model will be developed before selecting single indicators. For example, indicators such as "rainfall", "infiltration", "runoff" and "evaporation" are measured in the same measurement unit: millimetres (mm). Thus they can be combined in a water balance equation, which is, in effect, the quantitative framework or model linking the indicators to the hydrological issue of water balance. In the context of SLM, you will usually select different biophysical and socio-economic indicators, of both a quantitative and a qualitative nature. This heterogeneous mix requires a qualitative frame or structural model for a meaningful linkage of the indicators.

see also sections A and B2 of the Toolkit

Only a meaningful linkage of indicators leads to a sound assessment of SLM

The Pressure-State-Response Framework

The following example presents the Pressure-State-Response framework. It can be used as a structural model for identifying core issues, formulating impact hypotheses, and selecting a meaningful set of indicators. The indicators are related to the components of the model.



Indicator selection following the PSR Framework

The Sahara and Sahel Observatory identified the following topics for coverage when developing impact indicators, using the Pressure-State-Response Framework:

***Driving Forces** causing pressure on natural resources*

- *population pressure, economic growth, urbanisation*
- *policy failures/distortions (stagnant technology, delayed intensification)*
- *imperfect markets (lack of markets, poor market access)*
- *transaction costs and imperfect information (limited access to information about market opportunities)*
- *social inequity, poverty*
- *political and social instability*

Pressure indicators

- *changes in cropping techniques*
- *financial position of holdings*
- *fuelwood/charcoal consumption*
- *use of crop residues*
- *use of animal dung for fuel*
- *price of fuelwood/charcoal*
- *...*

State indicators

- *rate of deforestation*
- *rate of soil erosion*
- *degree of salinisation*
- *soil crusting and compaction*
- *crop productivity*
- *livestock productivity*
- *nutrient balance (on-farm organic matter recycling)*
- *...*

Response indicators

- *change of legislation*
- *investments*
- *tree planting*
- *state conservation programmes*
- *farmer conservation groups*
- *farmer adoption of tree planting and soil and water conservation*
- *...*

Covering all important aspects of sustainability

To insure that the indicator set covers all important aspects of SLM, the indicators can be classified, for example, according to the " 5 pillars of sustainability". The Land Quality Indicator Initiative of the World Bank (LQI) identified common (generic) and internationally agreed upon indicators for monitoring and evaluating SLM as follows:

Productivity	***Security***	***Protection***	***Viability***	***Acceptability***
• *crop yield*	• *soil cover* • *yield variability* • *climate*	• *soil quality/ quantity* • *water quality/ quantity* • *biological diversity*	• *net farm profitability* • *input use efficiency (pesticides, fertilisers, nutrients)* • *off-farm income* • *return to labour*	• *use of conservation practices* • *farm decision-making criteria*

see also chapter 1 of the SLM Module

Embedding the indicator set in a broader context

Besides the importance of an "inner" linkage of the indicator set - represented by a structural model - there is also a wider - "outer" - context to be taken into consideration:

- The **temporal** point of view: using existing data bases (generated by the project, other agencies, etc.) saves time and costs, if your choice of indicators, type of data, format, and frequency of reporting can be made compatible. If so, this would "extend" your own monitoring period and your initial monitoring would already indicate a trend in land management. Secondary data can consist of activity and evaluation reports of institutions and organisations, information held by key persons, statistics, a census, or other monitoring systems. For example, if you are in need of rainfall data, the data base of a meteorological service can extend your information base by many decades!
- The **spatial** point of view: the indicator set must reflect the fact that a project impact is not necessarily restricted to the project area (on-site impact), but may reach much further (off-site impact). For example, where terraces are applied (on-site), they affect the amount of water, soil and nutrients that leave the watershed. Thus people living downstream (off-site) are also affected by these technologies. The selection of representative monitoring locations will help reduce the costs of on-site and off-site SLM-IM.
- The **hierarchical** point of view: local indicators are site-specific, which might limit the aggregation of information at national or international level. Nonetheless, when selecting local indicators, consideration should be given to whether and how they can possibly be aggregated to become an even more useful tool for decision- and policy-making. For example, a local indicator such as the colour of plant leaves can be calibrated with generic soil fertility indicators such as nutrient deficiency, which can be costed. In this case, these indicators are useful for calculating the relevance of resource degradation for a national economy.

The impact of a project is not restricted to the project area

Indicators of SLM

The literature in the field provides a wealth of information on "indicators", but no common classification. Instead there are different ways of perceiving, grouping or categorising SLM Indicators:

Generic (external) indicators are based on international agreements reached by "external" stakeholders such as project staff, researchers or policy makers. **Local (indigenous, site-specific)** indicators are mainly used by local ("internal") stakeholders and vary from place to place. The latter are often **hidden (crypto-)** indicators, which means they may not appear to "external" stakeholders to have a clear relation to issues under study. For local stakeholders, however, they portray the most significant changes in the system (e.g. replacement of cattle by goats in areas with degrading rangeland).

Linking generic and local indicators

Generic (external) indicator	*Local (indigenous) indicator*
higher level of nutrients and organic matter, leading to higher crop yields	*a locally specific plant species*

For a common understanding among stakeholders, it is important to determine potential interactions or links between the local and the generic indicators that basically represent the same aspect: Are the local indicators valid only for specific times, environmental conditions, and social groups? How and when are the indicators used? Are there any possible long-term relationships associated with the indicators? In this example, long-term indicators include the environmental conditions and succession processes that must exist for a specific plant species, the way these conditions are related to current land use practices, and the implications for maintaining soil fertility in the area.

A **measurement** (often **scientific**) indicator contains quantitative information based on precise and replicable measurements. **Proxy** or **surrogate** indicators have a more indirect relation to the issue. They may be quantitative and qualitative. **Experiential (anecdotal)** indicators contain qualitative and semi-quantitative information based on experiences and people's perceptions and attitudes. In general, measurement indicators emphasise objects and often show short-term impacts, whereas experiential indicators emphasise subjective views and frequently reflect long-term changes.

Measurement, surrogate and experiential indicators

Important SLM issue	*Experiental indicators*	*Surrogate (proxy) indicators*	*Measurement indicators*
soil fertility	• *topsoil colour and texture* • *no. of bags of produce harvested from a field* • *symptoms of poor growth in crops and weed species* • *colour of stream*	• *species and diversity of plants on fallow land* • *pest levels in the field* • *amount of stream siltation*	• *soil nutrient content* • *crop yield*
Health and nutrition	• *appearance of children (stunting, hair loss, etc.)*	• *family income level* • *crop production level*	• *growth rate of children* • *protein and vitamin levels in the body*
Household income	• *type of clothing* • *ability to pay off loans*	• *number and quality of household items*	• *net returns on investment* • *off-farm income of each family member*

see also section B3 of the Toolkit

An alternative categorisation distinguishes **strategic** and **cumulative** indicators. Strategic indicators show a direct cause-effect relationship where one statement or recommendation will be made for each indicator (e.g. crop yield indicating soil fertility). The cause-effect relationship with cumulative indicators is not necessarily direct, and several indicators will be required for each statement or recommendation (e.g. soil organic matter, available N, P, K; CEC indicating soil fertility).

How to start - Guiding questions for indicator selection

Guiding assessment questions for the development of indicators on a community basis could be modelled on those formulated by IUCN

- How are you doing, how is the ecosystem doing?
- What needs to be done?
- How would you know if things were getting better or worse?
- Where would you get such information?
- Who has the information?
- What would you need to look at in order to find out?
- What would you need to count in order to measure or find out?

Preparing assessment and information management

Whatever "model" and set of indicators you choose, it will later be the basis for analysing the data and assessing the degree of sustainability during Step 6 of SLM-IM. Later disagreement between stakeholders is inevitable if the criteria for assessment are not debated during the SLM-IM step of indicator selection. In the debate among stakeholders, prior agreement should be reached on:

(1) definitions, target and threshold values for single indicators:
At what level are we now? What level do we want to achieve? Such evaluations depend on the perception of the stakeholders and can be both quantitative ratings (numeric values) and qualitative ratings (very good, satisfactory, indifferent, unsatisfactory, very bad). Both systems can also be "calibrated" to each other if necessary.

(2) an overall SLM assessment scheme:
How can the indicators be evaluated in combination? What weight or importance will be given to each indicator in relation to the others? Which indicators reflect ecological, economic and social aspects of sustainability? Which aspects are not yet at a satisfactory level and need to be further improved, and how?

see also SLM-IM Step 6

Define the assessment criteria now to avoid conflicting interpretations later

As stakeholders will interpret monitoring results differently, their different needs regarding information management are also best discussed during indicator selection. Who requires what form of output or reporting? How should the results be presented to different stakeholders? Where and how would different stakeholders prefer to have the information stored?

see also SLM-IM Step 7

Incompatible interpretation

The incidence of rural poverty in India offers an example of cross-validation in SLM-IM. Household incomes declined for 20 years. This quantitative measurement indicator may have led researchers or policy makers to the conclusion that general development was moving away from sustainability. However, poor people's interpretation of the trend was rather positive. For them, qualitative and experiential indicators such as mobility and independence were more important. They felt that the conditions of their lives were more sustainable because they were more mobile and less dependent on the village elite. Such conflicting judgements and misunderstandings will eventually be counterproductive and destroy development efforts.

Bellows, B. (Ed.) 1995. Proceedings of the indicators of sustainability conference and workshop. August 1-5, 1994 Arlington VA. SANREM CRSP Research Report 1-95, 312 p.

Bellows, B. 1996. Indicators of sustainability. Workbook for the SANREM CRSP. Washington State University/University of Wisconsin, USA.

CIMMYT. 1993. La adopción de tecnologías agrícolas: guía para el diseño de encuestas. Mexico.

Dumanski, J. 1997. Criteria and indicators for land quality and sustainable land management. Paper presented at the SLM Workshop, Enschede, The Netherlands.

CIAT 1997 a. Indicadores locales de la calidad del suelo. By Charlotte Gaye Burpee and Willmer R. Turcios. Tegucigalpa.

CIAT 1997 b. Cuadro de indicadores de la calidad de suelo. Tegucigalpa.

CIDA. 1996. Guide to gender sensitive indicators. CIDA, Ottawa, Canada.

CIDA. 1996. The why and how of gender sensitive indicators: A project level handbook. CIDA, Ottawa, Canada.

Defoer, T., De Groote, H., Hilhorst, T., Kanté, S., Budelman, A. forthcoming. Farmer participatory research and quantitative analysis - a fruitful marriage? Journal of Agriculture, Ecosystems and Environment.

Dumanski, J., Gameda, S, & Pieri, C. 1997. Indicators of land quality and sustainable land management. Annotated bibliography. The World Bank, Agriculture and Agri-Food Canada. 157 pp.

Eswaran, H., Sloger, C. 1997. Considerations on indicators for sustainable land management

Holden, S., Shiferaw, B., Wik, M. 1996. Importance of poverty, credit constraints, and time preferences of relevance for environmental policy. Discussion paper No. D-26/1997, Agric. Univ. of Norway, Dept. of econ. and soc. sciences.

IUCN 1997. (World Conservation Union). An approach to assessing progress towards sustainability - tools and training series. IUCN/IDRC, Gland, Switzerland: Lee-Smith, D. Community based indicators.

INSAH, 1997. Cadre méthodologique provisoire de suivi-impact en gestion des ressources natureles/systèmes de production; document prepared for the OSS workshop on impact indicators in June 1997

Lal, Rattan 1994. Methods and guidelines for assessing sustainable use of soil and water resources in the tropics. SMSS Technical Monograph No. 21. Columbus OH, USA, 78 p.

Maitre, A. & Kuan, E. 1997. La experiencia de PASOLAC con la metodología de la evaluación participativa por beneficiarios en la medición de la adopción de prácticas de conservación de suelos y agua. In: PASOLAC. PRM. PROFRIJOL. Memoria del Taller de estudios de adopción. Managua.

Müller, S. 1996. How to measure sustainability: A proposal for the agricultural and natural resources sector. Discussion Paper Series on Sustainable Agriculture and Natural Resources No. 1. Inter-American Institute for Co-operation in Agriculture (IICA) and German Agency for Technical Co-operation (GTZ), GTZ, Eschborn, Germany, pp. 36-55.

OECD. 1997. Environmental indicators for agriculture. OECD, Paris, France, 62 p.

PASOLAC. 1996 a. Evaluación Participativa por Beneficiarios, 1996. Managua.

PASOLAC. 1996 b. Sistematización de la metodología de la evaluación participativa por beneficiarios, 1996. Managua.

Sahara and Sahel Observatory 1997 a. Implementation and impact indicators for the convention to combat desertification. 34pp.

Sahara and Sahel Observatory 1997 b. Impact indicators and monitoring-evaluation for action programmes to combat desertification. 27pp.

Pieri, C., Dumanski, J., Hamblin, A. and Young, A. 1996. Land quality indicators. World Bank Discussion Paper No. 315, World Bank, Washington DC, USA.

Saín, G. & Barreto, H. 1996. The adoption of soil conservation technology in El Salvador: Linking productivity and conservation. In: Journal of Soil and Water Conservation, 51(4): 313-321.

Smyth, A.J. and Dumanski, J. 1993. FESLM: An international framework for evaluating SLM. World Soil Resources Report No. 73, FAO, Rome, Italy.

Templeton, S., Scherr, S. (forthcoming). Population pressure and the microeconomy of land management in hills and mountains of developing countries.

Traeger, H. 1997. Indicators of sustainable land management. A literature review. GTZ, Eschborn, Germany.

Trzyna, T.C. 1995. A sustainable world. Defining and measuring sustainable development. International Centre for the Environment and Public Policy, California Institute of Public Affairs, Sacramento/Claremont, USA. 272 p.

Ulloa, S. et al. 1997. Adopción de Tecnologías de Conservación de Suelos y Agua en Cinco Pinos y El Chaparral (Chinandega). SGJRL. Managua.

Van der Burg, G. & Caldwell, R.1998. Monitoring Evaluating Reporting - MER. Management tools for development organisations. CARE International (www.kcenter.com)

Van Niewskoop, M. et al. 1994. La adopción de las tecnologías de labranza de conservación en La Fraylesca, Chiapas. CIMMYT. INIFAP. Mexico.

Zweifel, H. 1998. The realities of gender in sustainable land management. Inputs for reflection and action. Development and Environment Reports, No. 16. CDE, Berne.

Step 5 Selection and Development of SLM-IM Methods

Considering existing monitoring procedures

If you have come across existing monitoring systems during SLM-IM Step 4, your decision on indicators and methods for SLM-IM may have been anticipated to a large extent. Using existing systems makes it possible to deal with common perceptions of SLM, to reduce the costs of monitoring, and to make SLM-IM a standard activity of local organisations. Unless existing monitoring methods are entirely unsuitable for your project and its stakeholders, it is advisable to continue with previously applied methods. But what do you do if monitoring experience is not available, or the methods used are too sophisticated for the project's purpose? In this case, appropriate SLM-IM methods must be selected or developed, in line with the indicators that were chosen earlier.

Wherever possible, continue with existing monitoring methods

The nature of monitoring methods

These Guidelines distinguish two basic groups of methods, trans-sectoral and sectoral.

(1) Trans-sectoral methods make it possible to monitor a variety of indicators using the same tool. For example, informal interviews provide information on both socio-economic and biophysical indicators. Trans-sectoral methods are included in a methodological set such as Participatory Rural Appraisal (PRA) or Participatory Learning and Action (PLA).

(2) Sectoral methods usually monitor single indicators, particularly of a biophysical nature. Many sectoral methods are scientific and quite sophisticated. This may be because cost-effective "rough" methods are rarely developed by researchers who need a more sophisticated methodology. Practitioners, by contrast, may have developed a number of practical methods but rarely document or publish them.

see also section C of the Toolkit (C1 and C2)

These Guidelines are an attempt to bridge this gap and present practical and cost-effective methods. The Toolkit contains an initial selection of such methods as well as criteria for a brief methodological protocol. It would require further effort to supplement this selection, on the one hand, calling upon researchers to give more emphasis to practical methods. On the other hand, it is also suggested that project staff develop their own monitoring methods and use the proposed protocol criteria to document their own methodological experience.

see also section C of the Toolkit

Criteria for selecting and developing SLM-IM methods

Selection of the appropriate method will depend on the objectives of SLM-IM and requires some clarification in advance: what is expected from the data collected? Is it sufficient to get qualitative results or is there a need for quantitative information? The following list of criteria provides assistance in what to think about when selecting methods. Note that questions like "Do you need a rough or accurate method?" do not suggest that there are only two extremes. Often a complementary mix of both is recommendable, and certainly there is also a range of choices in between. Polarisation is merely an attempt to guide your thinking about several aspects that may otherwise be forgotten.

- Data accuracy: in order to meet the agreed objectives of SLM-IM, do you need on-station experimentation or on-farm monitoring, elaborate or quick observation, accurate or rough methods?
- Potentials/limitations: does careful evaluation of the pros and cons of each method show that they are in line with or conflicting with the objectives and expectations of SLM-IM?
- Investments required: are labour requirements, knowledge and skills, equipment, materials, and supervision in line with the project resources available, and with the resources of those who will implement a post-project SLM-IM?
- Requisites for implementation: what expert advice, facilities such as laboratories and data bases, logistics such as transport and computers, and attitudes of the participants implementing the method are available or can be organised, possibly with other projects in a similar situation?
- Application level: on which hierarchical levels, such as plot/household, village/watershed, or district will SLM-IM take place?
- Area coverage: do you need studies with great area coverage (aerial surveys), or detailed in-depth studies covering a few representative locations?
- Frequency of SLM-IM: can the costs of an increasing number of observations over time be covered or must the number observations be reduced?
- Feedback: in view of the necessity to provide quick feedback to stakeholders, does the project have the facilities for quick data collection, immediate analysis, and presentation of the results?

Qualitative and quantitative methods

What data quality will eventually be expected for which indicator or result? Any SLM-IM starts with a qualitative survey to get an overview of the land management system. In general, a **qualitative** method allows a more flexible design for SLM-IM. For example, it can incorporate local indicators and stakeholders' perceptions much more easily than a quantitative method. Qualitative methods are used when:

- a broad understanding of several dimensions of a problem is adequate;
- people's perceptions, attitudes and priorities are to be explored;
- time and money are short, or a rapid assessment of the problem is required.

A qualitative survey and assessment makes clear

- where a more comprehensive understanding of the facets of a problem is adequate;
- where sectoral and highly accurate information is needed (statistical evidence and hard data);
- where the problem needs to be investigated and understood in great detail.

This usually implies the need for quantitative methods. A **quantitative** method provides numerical data, and it requires a more rigid monitoring structure, more time, more sophisticated equipment, well-trained and often high-level personnel. Data collection must be closely supervised. The requirement for statistical proof or significance should be defined during the stage of indicator selection, because considerable amounts of high-quality data are needed to apply statistical analysis.

If statistics are applied on the basis of data of poor quality, the interpretation will not be reliable. Therefore, a statistician should be consulted when defining core issues and selecting indicators, and prior to selection of the corresponding SLM-IM methods.

SLM-IM incorporates a complementary selection of qualitative and quantitative methods

Developing your own methods

There are plenty of opportunities to create and incrementally improve your own monitoring methods, particularly if you are in need of qualitative or semi-quantitative information. Already during the identification phase of a project, ideas about how to observe and measure various parameters will come up: while holding informal discussions with local land users and other stakeholders, walking through the project area, or mapping phenomena related to land management, etc. In collaboration with experienced researchers, you may be able to improve the documentation or even the quantification of such observations and develop a tailor-made cost-effective and sound SLM-IM system.

see also section C1 of the Toolkit

Develop and thoroughly document your own methodological field experience

Low-cost monitoring of soil and water conservation measures: The "kite method"

The major objective of the Rural Development Project in Tahoua, Niger is protection and sustainable management of natural resources to improve the livelihood conditions of the population. The project approach is based on participatory land use planning. Due to the long dry season and heavy but insufficient rainfall (392 mm mean annual rainfall) during the rainy season, soil and water conservation (SWC) measures are a major component of the project activities. In order to monitor progress in implementation of SWC techniques like "demi-lune", and to measure their impact on biomass and millet production, the "kite method" was developed by GTZ, MAE in co-operation with the University of Hohenheim, Germany:

A camera is attached to a kite and photos of the SWC sites are taken from 300 m above the ground at regular intervals (before and during the vegetation period). Thus the biomass development and soil rehabilitation can easily be monitored over a period of several years by comparing photographs. The method is a low-cost alternative to conventional aerial photography and allows more detailed monitoring of small plots.

GTZ, MAE, 1997. Gestion durable des ressources naturelles:leçons tirées du savoir des paysans de l'Adar. Eschborn

Hinchcliffe, F., Guijt, I., Pretty, J.N., Shah, P. 1995. New horizons: The economic, social and environmental impacts of participatory watershed development. IIED Gatekeeper Series No. 50, IIED, London, UK, 22 p.

IIED PLA Notes - Notes on Participatory Learning and Action. IIED, London, UK.

Pretty, J., Guijt, I., Thompson, J. & Scoones, I. 1995. A trainer's guide for participatory learning and action. IIED participatory methodology series, London, UK, 267 p.

Step 6 Data Analysis and Assessment of SLM

The objectives, indicators and methods selected for SLM-IM determine the type of analysis. It is not possible to cover all topics in data analysis within these Guidelines. Instead, emphasis is given to general considerations and recommendations.

When to carry out SLM impact analysis

SIM Impact analysis is done at any time during and after an intervention. The purpose of analysis, however, may vary as follows. From a project's point of view, during the life-time of a project, as in the case of a mid-term review, the purpose of the analysis is to determine if project activities resulted or will result in the intended impact and contribute to SLM. At this stage, a time series of data may be short or incomplete and thus not finally conclusive. Consequently, the analysis will only show the general trend in the context of the desired impacts, but it provides valuable information for corrections or adjustments of project activities. At the end of a project, the purpose of impact analysis is to learn what worked and what did not, and to make recommendations for future activities. Later, an overall analysis of similar projects can also help to improve government and donor policies.

SLM impact analysis is trend analysis that provides information for strategic adjustment of plans

Analytical approach

The analytical approach reflects the "model" you have chosen earlier (cf. SLM-IM Steps 2 to 4), in which the indicators - and consequently the results of their monitoring - are inter-linked. The approach consists of:

(1) a preparatory phase, when each indicator is analysed separately in light of its own agreed targets.

(2) the main phase of analysis and assessment, with an aggregation of all indicator values or judgements in an overall scoring (rating) system, where the indicators are analysed in light of their contribution to SLM and to verify the impact hypotheses.

Data exploration and analysis

Qualitative exploration and analysis

Analysis of qualitative data is more complicated than quantitative analysis because it involves data with a different level of accuracy. A semi-quantitative analysis - converting qualitative information into a rating or scoring system - may process qualitative data more satisfactorily. One way of doing such an analysis is to categorise or classify data according to a defined scale referring to the desired situation. The procedure for this method is described below.

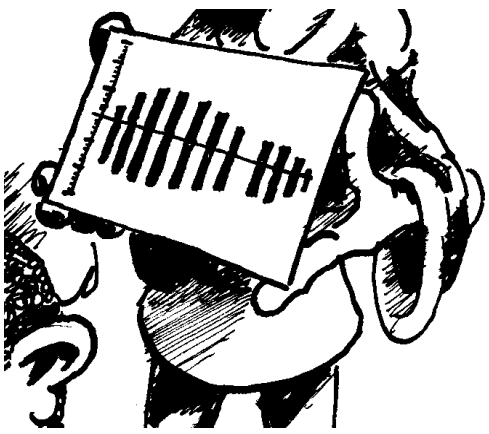
Procedure for analysing qualitative data

As qualitative data are sometimes difficult to classify or lump together, transforming these data into a semi-quantitative format may facilitate the analysis. Such a transformation, and the subsequent analysis, consist of the following procedures:

1) Invite stakeholders to assess the status quo of each topic (e.g. soil erosion has been reduced, which is considered positive).
2) Group similar topical assessments into categories, each concerned with a certain issue (e.g. reduced soil erosion, increased biodiversity and improved water quality can be grouped as "minimised resource degradation").
3) Within each issue, arrange the topical assessments according to how closely they approach the desired situation (e.g. was the reduction in soil erosion sufficient to meet the expected or desired target?).
4) Use the defined critical values for each issue in order to divide topical assessments among three or more classes (e.g. from 1 = highly unsatisfactory to 5 = highly satisfactory).
5) Verify whether the topical assessments are put into the correct classes.
6) Present the results in tables or diagrams. This allows a more general assessment (several topics) for different periods or locations.

Rating, quantitatively or qualitatively, with numerical weighting schemes is a common tool for aggregating indicator values. Rating is the transformation of indicator values into uniform values so that they can be compared or used for calculation. The rating must now reflect what you decided during SLM-IM Step 4: whether each indicator is considered equally important in the framework or model of SLM, or whether some are considered more important than others, implying that they have been given a different weight according to their estimated importance.

For a general assessment with the participation of all stakeholders, it may be helpful to engage a facilitator to assist the participants.



Aggregating indicator values by rating

The performances of different soil indicators (topics) will be assessed in view of their limitations with regard to SLM. For each indicator 5 limitation classes are defined from 1 = lowest limitation to 5 = highest limitation. Each indicator's performance is then related to a certain class. Finally, the aim is to assess all soil indicators in one cumulative rating index that represents the entire soil component, e.g. in the framework of SLM. 5 assessment classes are also created for the cumulative rating index, from highly sustainable to unsustainable, and the index is judged accordingly. Within this example, all indicators have been found to be of equal importance or weight.

soil indicator	***limitation class***
rooting depth	*3*
acidity	*5*
Al toxicity	*4*
available water capacity	*2*
texture	*1*
bulk density	*2*
nutrient status	*5*
soil organic carbon	*3*
percent aggregation	*1*
soil erosion	*3*
cumulative rating index	***29***

cumulative rating index	***assessment of cumulative rating***
<20	*highly sustainable*
20-25	*sustainable*
25-30	*sustainable with high input*
30-40	*sustainable with another land use*
>40	*unsustainable*

Quantitative exploration and analysis

If quantitative data and analysis are required, consult professionals during indicator selection.

Suggestions for carrying out a first quantitative exploration and analysis are presented below. By analysing the data supplied by individual indicators and interpreting the results, it is possible to signal positive and negative trends and changes in indicators, and where changes differ from the expected outcomes. Depending on the accuracy of the method, results imply uncertainty. In other words, the trends are often not as clear as the data seem to indicate. This should be taken into consideration before crucial decisions - which may affect the livelihood of people - are based on the interpretation of results! The quantitative data collected with this kind of monitoring often do not justify a statistical analysis, as these data are often not normally distributed and perhaps were not obtained through random sampling.

see also section D of the Toolkit

Hints for semi-quantitative data analysis

For exploratory analysis:

- arrange data individually or grouped in distribution classes according to the magnitude of the value of the variable, and calculate standard measures such as range, minimum and maximum, arithmetic mean or median, standard deviation;
- draw graphs to facilitate detection of possible patterns and identification of outliers and data distributions that may suggest additional lines of analysis;
- decide upon criteria for trimming data (outliers) beforehand;
- consider transformation of data:
  - convert to percentages;
  - convert to indices, such as removing the mean from all data and dividing the result by the mean; this enables the comparison of two data sets with different means;
  - convert to standardised normal deviates, which measure the variability of the data set.

Statistically, environmental data are often not normally distributed and the sample size is small. In this case, not all standard measures can be used!

Assessment

With little training and support, representatives of all stakeholder groups will be able to actively participate in exploration and analysis. During the discussions various opinions and different interests are likely to arise. The project may not resolve these differences, but it may facilitate an exchange of viewpoints and, if invited, mediate or provide suggestions for resolving conflicts.

The process of analysis is not predetermined but guided by the stakeholders

What is the impact of an intervention on SLM, and what needs to be done from now on? These are the key questions to be finally answered through SLM-IM. In accordance with the analytical approach mentioned earlier, this will be done in two phases.

Preparatory phase

Each indicator is separately seen in light of its contribution to SLM. During SLM-IM Step 4, the stakeholders agreed on the evaluation criteria to judge the performance of each separate indicator. Such conditional assessment (conditional rating) is used to determine whether all objectives are met, some objectives are temporarily not met, or some objectives are not met. Separate analysis is only preparatory in view of phase (2) of analysis and assessment, when assessment and debate about why targets were met or not met also take place. A huge number of indicators may suggest that individual indicators are combined in meaningful categories and assessed by category. This is done using the same rating procedure described earlier.

see also the examples in SLM-IM Step 4 and the Toolkit, section D

Analysis and assessment of indicators by category

The impacts of project activities on SLM can be divided into logical categories, for example, to summarise the bio-physical, the socio-economic and the policy-relevant impacts:

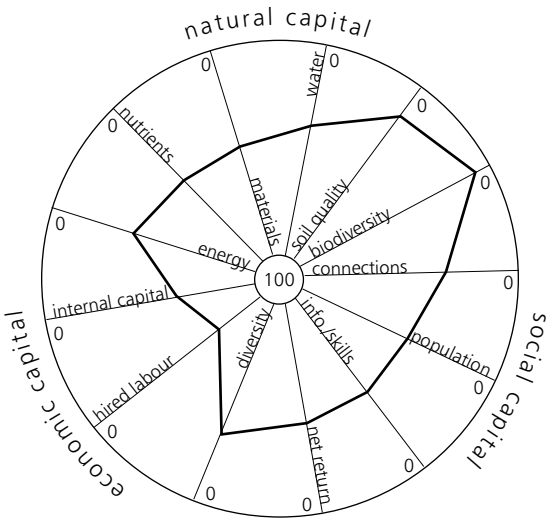
- *A positively assessed biophysical impact shows how activities contributed to SLM - for instance by reducing resource degradation - and ideally provides information about cause-effect-relations or inter-linkages and who and what contributed to the impact (land users, NGOs, government, agribusiness). If the biophysical impact is assessed negatively, it may provide conclusions about what practices are to be changed or how project activities would contribute to more sustainable land management. The impact can also be estimated from response indicators such as the reaction of land users, their participation in project activities, the rate of adoption of new technologies, and the adaptations they made in proposed technologies.*
- *The socio-economic impact will include income level and distribution, return to labour, access to basic services, and food security. Positive impacts, e.g. viable SLM technologies or a high adoption rate, may also suggest a good project performance, if they have not been manipulated through careless use of incentives and subsidies.*
- *The policy-relevant impact combines indicators that stress the effect of policies on SLM and indicates what kind of policies are to be prioritised or changed, e.g. land tenure, user rights, market policy, use of subsidies, etc.*

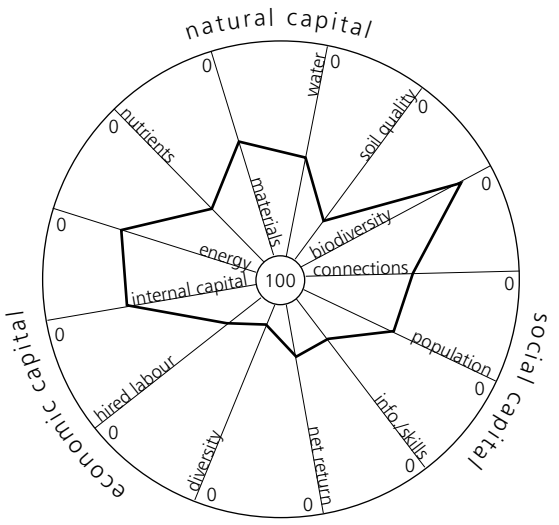
Main phase

The overall analysis involves all indicators or indicator categories to verify the impact hypotheses and to detect a general trend in SLM. For this phase the weight of each indicator within the framework or model is important, as agreed upon during Step 4. Overall analysis and assessment requires judgement, because the relative value given to each indicator, category of indicators, aspect or pillar, is subjective. It reflects the expectations, wishes and aspirations of the stakeholders in view of the outcomes. The results of any periodic SLM-IM therefore deserve new discussion and negotiation among the stakeholders.

Index of sustainability - Sustainability polygons

The sustainability index can be used to compare two or more representative monitoring sites, such as farms, communities or watersheds. The indicators selected are arranged in the form of a wheel. Beforehand, the stakeholders define how to rank each indicator from 0 (=lowest sustainability level) to 100 (highest sustainability level). On each of the wheel's spokes, the rank of the indicator is marked and all marks are then connected. Assessing the polygons of single sites shows where there is a deficit area that needs further attention and corrective action. Comparing the polygons of two or more sites reveals sites from which others can possibly learn. The same method used for several months or years will indicate whether or not corrective action fulfilled its purpose and led to more sustainable land management.





Unsustainability or conditional sustainability?

In final assessment of the overall sustainability of land management, sustainability requirements of some dimensions, aspects or pillars may be met, while others may not. Sustainability appears to be conditional. For example, corrective measures may have led to satisfactory protection of land resources. In this respect, satisfactory means that the target value defined by the stakeholders was met (reduced soil loss per year, crop production level maintained, drinking water quality improved, etc.). However, the measures may have involved unexpected costs which cannot be covered by the land users, and therefore target values attached to the costs of protective measures were not met. Apparently, biophysical indicators suggest that the quality of the resource base is being enhanced, while socio-economic indicators simultaneously suggest that the quality of life is perceptibly decreased. In this case, the farming system could be rated as "unsustainable because of low viability of the corrective measures" or it could be rated "conditionally sustainable pending a correction of the viability".

A step towards more sustainable land management is made only if all targets are satisfactorily met

Conditional sustainability requires further debate and investigation of the indicators whose target values were not reached and the reasons why, the probability of reaching the target in future, and options for improvement. It is interesting to see which stakeholders come to the conclusion that land management is more sustainable than before, and how different project areas developed in relation to each other. Contradictory indications require a participatory assessment to weigh their relative importance. Solutions can only evolve from the stakeholders' discussion. When assessing conditional or overall sustainability, the following classification can be of help. It may need adaptation to local conditions, but it encourages stakeholders to include the temporal aspect and it is a reminder that land management systems are subject to constant change.

Sustainability classification

	class	**confidence limits**
sustainable	1 sustainable in the long term	25 years or more
	2 sustainable in the medium term	15-25 years
	3 sustainable in the short term	7-15 years
unsustainable	4 slightly unstable	5-7 years
	5 moderately unstable	2-5 years
	6 highly unstable	less than 2 years

Corrective action

Corrective actions or decisions are usually connected with indicators that did not meet the targets, and debate will focus on which activities to change and how. Also, unintended consequences call for more concern in the next phase of a project. Identifying unsatisfactory results and unintended consequences requires further investigation. Since they may be symptoms rather than causes of "what is wrong", it would be too simple to mechanically apply corrective action at these points only. SLM is a complex system and manipulating one element will also affect the others. During the course of project implementation, unintended consequences often come to light through dialogue between project team members and other stakeholders. Again, only a debate among all stakeholders provides a certain security that important consequences will not be forgotten while determining corrective actions. The debate will eventually lead to participatory confirming or redefining of project activities to obtain better results in the future.

Corrective action requires more than repairing an error

Casley, D.J. & Kumar, K. 1985. The collection, analysis and use of Monitoring and Evaluation data. John Hopkins University Press, Baltimore, USA.

Dalsgaard, J.P.T., Lightfoot, C. and Christensen, V. 1995. Towards quantification of ecological sustainability in farming systems analysis. Ecological Engineering 4, pp. 181-189.

Dumanski, J. (forthcoming). Guidelines for conducting case studies under the international framework for evaluation of sustainable land management.

Francis, C., Aschmann, S., Olson, R. 1997. Indicators of functional sustainability of farms and watersheds. Proceedings of the conference on "Investigating Ecosystem Dynamics at the Watershed Scale". SWC Society, Athens, GA, USA.

Gomez, A.A., Swete Kelly, D.E., Syers, J.K. and Coughlan, K.J. 1996. Measuring sustainability of agricultural systems at the farm level. In: Methods for assessing soil quality, SSSA Special Publication No. 49, Soil Science Society of America, Madison, USA, pp. 401-409.

IUCN International Assessment Team. 1995. Assessing progress towards sustainability: A new approach. In: Trzyna, T.C. (Ed). A sustainable world. Defining and measuring sustainable development. International Centre for the Environment and Public Policy, California Institute of Public Affairs, Sacramento/Claremont, USA, pp. 152-172.

International working group for the FESLM, 1995. Guidelines for conducting case studies under the international framework for evaluation of sustainable land management (FESLM). ISSS. (unpublished).

Kwan-Kai-Hong, P., Lecomte, B. & Pierret, M.-H. 1996. Cinq outils pour l'auto-evaluation. Service d'évaluation DDC, Berne, Switzerland and Edition GRAD, Bonneville, France.

Lal, R. 1994. Methods and guidelines for assessing sustainable use of soil and water resources in the tropics. Dept. of Agronomy, Ohio State Univ.. Columbus,78 pp.

Marks, M.K. 1996. Monitoring and evaluation toolkit. International resources group. Contract No.624-0265-C-00-3026; Project No. 683-0265. Washington D.C. 171 pp.

Smyth, A.J. and Dumanski, J. 1993. FESLM: An international framework for evaluating SLM. World Soil Resources Report No. 73, FAO, Rome, Italy.

Swiss Development Co-operation 1997. Monitoring - keeping in touch with reality. Series of working instruments for planning, evaluation, monitoring, transference into action. Strategic Controlling Unit, Berne, Switzerland, 2 Volumes, 77 p.

Van der Burg, G. & Caldwell, R.1998. Monitoring Evaluating Reporting - MER. Management tools for development organisations. CARE International (www.kcenter.com)

Zweifel, H. 1998. The realities of gender in sustainable land management. Inputs for reflection and action. Development and Environment Reports, No. 16. CDE, Berne.

Step 7 Information Management

The results of the SLM-IM procedure - the overall assessment as well as detailed information - are valuable for different user groups. However, each user group has its own interests and its own role to play in SLM. Consequently, different user groups require different types of information to be stored and presented, using a language and a means that meet its needs.

Address different users in ways appropriate to their respective needs

User-oriented output presentation and dissemination

Eventually, findings are summarised and presented to all stakeholders in order to get their reactions. If necessary, these reactions will guide further stages of analysis. A common practice for documenting SLM-IM results - particularly in development co-operation - is to write a report. However, a report may be of great value for some, but by no means sufficient for all stakeholders. Many participants are thus excluded from general debate and communication. Which format and output is appropriate for which stakeholder group?

Defining users of SLM-IM information and their requirements

Modify and complete the following examples according to your own situation:

selected stakeholders

	land users	*provincial and national authorities*	*international, multilateral agencies*
their role in SLM	application of SLM-enhancing practices, ...	priority setting of areas to be supported by the government, dissemination of research findings, ...	identification of and investment in new development programmes, ...
type of information needed	technical, economic, and policy, ...	policy issues, planning and administrative issues, ...	aggregated and strategic information, ...
use of information	for improving farm economics, crop production, ...	to predict trends and changes in resource degradation, to mediate in conflict management, ...	strategy development for project selection, optimise investments, ...
means of storage	graphs, filing cards, ...	reports, digital data base, ...	reports, meta-data-base, ...
means of dissemination/ presentation	discussion platform, leaflets, ...	reports, workshops, planning sessions, leaflets, ...	reports, Internet, ...
language of communication	local language, technical and common terminology, ...	local and national language, administrative and scientific terminology, ...	English, French, Spanish, economic and scientific terminology, ...

The following points may help to establish user-friendly information management. Is the information relevant to the users' situation and perceived problems? Is it practical and credible from the users' point of view? Does the presentation meet users' expectations, is it understandable, and does it invite comments and discussion? As a rule of thumb:

- First, visualise SLM-IM results using tables, cross tables, line graphs, histograms, bar-, pie-, flow- and organisational charts, maps and overlays. There are various means for disseminating SLM-IM information, such as a full report, a summary report, a newsletter, pictures/slides/videos, workshops, posters, puppet shows, theatre, etc. Visualisation will minimise the danger that M&E specialists are blinding other stakeholders with fancy data and statistics.
- Second, a presentation of results soon after the SLM-IM keeps the stakeholders informed and involved in SLM-IM. It allows them to analyse and reflect on the situation immediately. Moreover, it certainly will evoke their reactions, which makes it possible to verify information gathered and to perceive impacts in another way.
- Third, it is motivating to have regular gatherings to present and discuss the development of SLM over time, highlighting the changes in indicators.

Delayed data analysis

Common interest in data may be lost if they are not analysed as they are obtained and immediately communicated to all stakeholders.

Practical hints for …

... writing the SLM-IM report

- keep it short and clear
- use subheadings
- emphasise key points
- use short sentences
- plan spacing and layout (one idea per paragraph)
- use a running commentary
- use listings and checklists
- avoid long footnotes
- submit it on time

... presenting SLM-IM output

- report only the information that is needed
- highlight and start with the important points
- ensure an attractive, evocative way of presenting the outputs
- relate the information to necessary actions or decisions, and state implications in if-then terms
- present both positive and negative experiences (the latter stresses what the project should do differently in future instead of talking about "failures")!

Storage of information

Monitoring the impact of development activities on SLM implies taking a long-term perspective in land management. Only the proper storage of data guarantees appropriate assessment of changes, and only permanent access to information ensures stakeholders' interest. Establishing a well-thought-out storage system raises some crucial questions: what, where and how should information be stored?

see also Step 7 of this module

Users' needs determine what, where, and how to store SLM-IM information

What to store

Initially, there may be uncertainty about what information is really needed, and a tendency to collect more data than necessary. To avoid a data cemetery which contains a load of unused or unusable information, storage should be restricted to information that is essential and relevant to the users involved. Appropriate selection may not be possible right from the beginning of the SLM-IM procedure. But after a prolonged period of SLM-IM, when more data are collected, analysed, and jointly assessed, it becomes possible to segregate essential information from less important information. For those who are actively involved in the SLM-IM, it is most relevant to thoroughly document the details of the SLM-IM procedure. This is particularly necessary because participants change during the SLM-IM period, and their successors may not have been involved from the beginning.

Beware of data cemeteries

At the beginning of a monitoring procedure, one tends to collect as much data as possible (according to the motto: "you never know what we may need it for"). However, the result is often a huge quantity of data, a so-called "data cemetery", impossible to process, administer, analyse or publish, and thus not useful. Instead, it is advisable to collect a limited but manageable amount of data.

Creating an institutional memory

For those applying SLM-IM, storage of the following information is essential:

- Topics that were discussed from the beginning of SLM-IM;
- The SLM-IM methodology used, and the accuracy of methods and data;
- A concise overview of the most important data;
- A summary of data that may contain a concise presentation of tables and more detailed tables in appendices;
- Source and reference periods of the material presented;
- Conclusions, recommendations and considerations that emerge when formulating the conclusions;
- Reference material and literature used;
- Remarks, impressions, observations, experiences, successes and obstacles, classified as "personal" if necessary.

Besides data, do not forget to document methodological protocols to make the SLM-IM procedure transparent

Where and how to store

Storage depends on the stakeholders' preferences. In view of the long-term character of SLM-IM, storage must be insured by an institution, organisation, or group that is likely to exist even in the distant future. If possible, various means of storage should be considered. The digital format for more efficient data processing, handling and research is as important as paper copies, posters, etc., for those who do not have access to computers.

Since first-hand information is always rare and desirable, storage of information in meta-databases with international access may be considered. Such a database must not necessarily contain all the information at one location and in the same format. But it informs users about the type of information available, where it is stored, and the procedures for getting access to this information. In this way the basic information remains available at all levels. Long-term projects or national and international (research) institutions are the appropriate organisations to initiate and maintain such databases.

Search for an appropriate long-term storage of data that guarantees permanent access for all stakeholders

Feuerstein, M.T. 1986. Partners in evaluation: Evaluating development and community programmes with participants. Macmillan Publishers Ltd, London, UK, 196 p.

Lyons Morris, L., Taylor Fitz-Gibbon, C. & Freeman, M.E. 1987. How to communicate evaluation findings. Sage Publications Inc., Newbury Park, USA, 92 p.

Van der Burg, G. & Caldwell, R.1998. Monitoring Evaluating Reporting - MER. Management tools for development organisations. CARE International (www.kcenter.com).

Follow-up

Reflecting about the SLM-IM procedure

SLM-IM not only provides information about the land management system, but also sheds light on the quality and appropriateness of the SLM-IM procedure, particularly the indicators and methods used. This information may indicate how to modify the SLM-IM procedure in order to improve it. It can also bring about changes in perception of issues or priorities among the core issues. Besides being helpful during a given project phase, SLM-IM also yields information that can be used for post-project SLM-IM. It might clarify

- who will implement the post-project SLM-IM (local government, local NGO, farmers' organisation),
- the definite set of indicators, and
- which methods will definitely be used for a reliable and cost-effective long-term SLM-IM.

Prepare for the post-project SLM-IM

What if SLM-IM is desirable but not practicable?

As long as the trend in SLM can easily be monitored with cost-effective methods, you may not face substantial difficulties. However, in the case of some indicators, you may need more detailed results, which in turn require a more sophisticated SLM-IM procedure, indicators, methods and analysis. On the one hand, these requirements may exceed your budget. On the other hand, you may not be able to prove the contribution of your activities to SLM, for example, without a sound soil survey, river discharge measurement, demographic data collection, etc. In this case you need to try to minimise the efforts and the costs of SLM-IM.

Minimising the costs of SLM-IM

To bring SLM-IM in line with the project resources, consider the advantages and limitations of the following hints

- concentrate on a reduced number of core issues
- emphasise indicators that represent more complex components (e.g. soil fertility) rather than very detailed components (e.g. the cation exchange capacity) of SLM
- focus on specific hierarchical levels (farm, community, region)
- conduct monitoring at a reduced number of representative locations
- prolong the time intervals of the SLM-IM

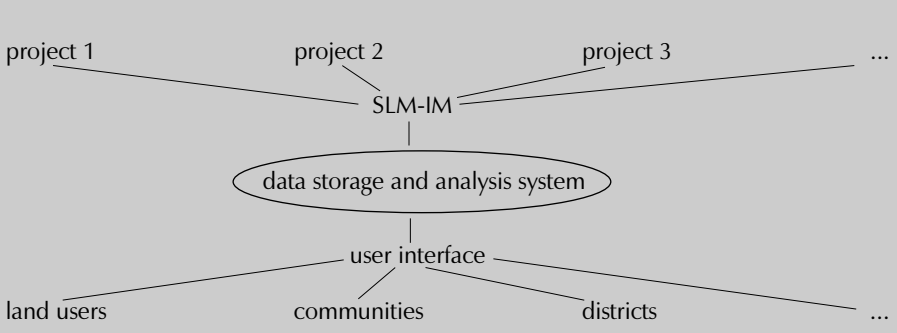
If you still do not have the means to carry out such investigations, look for solutions outside the project's scope and mandate. A first result could be a list of issues which are desirable but difficult to monitor within the given situation. List the prerequisites which are necessary, particularly the ones which are not fulfilled, and the reasons why. Then look for options to overcome these constraints. Other projects in your area may face the same types of problems and a solution could be easily found using the synergy of several organisations. If single projects are not in a position to take care of certain SLM-IM components, a common monitoring service, for instance a soil laboratory, could be jointly funded and established.

How to overcome limitations on SLM-IM

Modify and complete the following examples according to your own situation:

desirable to monitor	*prerequisites*	*fulfilled yes/no*	*reasons (if no)*	*alternatives*
soil fertility	soil survey and soil laboratory analysis	no	high laboratory costs	• establish a soil laboratory with other projects • use a national soil laboratory • purchase a portable soil lab kit
detailed land problems	well-trained field personnel	no	not justifiable for a single project	• develop a joint SLM-IM training programme with other institutions, projects and donor agencies
complex land problems • • •	detailed inter-disciplinary SLM-IM	no	high costs and labour requirements	• establish a joint SLM-IM programme with other institutions, projects and donor agencies

e.g.: a joint SLM-IM programme



Combining efforts with other projects minimises the costs of SLM-IM

For example, **Contact:** World Overview of Conservation Approaches and Technologies (WOCAT), Centre for Development and Environment (CDE), Hallerstrasse 12, 3012 Berne, Switzerland. e-mail: wocat@giub.unibe.ch