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THE SSE PROGRAMME

ENVIRONMENTAL INDICATORS FOR DEVELOPMENT ACTIVITIES BY NORWEGIAN NGOs IN THE SSE COUNTRIES

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CONTENTS

1.0 Introduction

2.0 Scope, limitations and important aspects

3.0 Types of environmental indicators

3.1. UNDP's sustainable agricultural programme

3.2 Environmental unsustainability in relation to agiculture

3.3 Field factors measured for land degradation indicator assessment

3.4 Pressure, state and response indicator framework

4.0 Assessing the impact of SSE project activities on environmental rehabilitation

4.1 Indicators in a Logical Framework Approach

4.1.1 Soil conservation indicators

4.1.2 Soil fertility indicators

4.1.3 Indicators in relation to water management activities

4.1.4 Indicators of fuelwood availability

4.1.5 Indicators of improvements in pastoralists' welfare

4.2 Indicators by activity (independent of LFA)

5.0 Monitoring

6.0 Conclusion

7.0 Literature

1.0 Introduction

Whether or not development activities are "successful" is important to a wide range of actors, each of whom require some form of information on the progress and effectiveness of investment in development. It is important to be able to collect, analyze and report the information necessary, in the appropriate degree of detail for each actor and in an accurate way.

The purpose of this study is to provide ideas and tools for how to assess the effect of project activities through the use of appropriate indicators. It is assumed that an appropriate set of indicators could contribute to improving the impact of the projects as well as improving the quality of reporting.

This paper is developed at the request of Norwegian NGOs and NORAD in connection with the SSE programme (a long-term development programme for the Sudano-Sahel Belt of Africa). Improved food security and environmental rehabilitation are the two main objectives of the programme. The main questions we address are: how can we assess the impact of different SSE project activities on the environment in the project areas; what kind of indicators should be used for different activities and in different situations; how should we go about choosing the most appropriate indicators; and what kind of methods should we use to measure/assess the indicators.

In the NORAD application form "Søknad om støtte til nye tiltak" the NGOs are asked to fill in information on expected outcome/results, as well as specify which indicators will be used in project impact assessment (måloppnåelse). We expect this paper to be of use to NGOs when filling in these NORAD forms, particularly as regards identifying indicators which can assess project impact on environmental rehabilitation and contributions towards sustainable production systems.

This paper is prepared on the assumption that each NGO has some system of monitoring already in place for its project activities. It is therefore not a goal of this study to design a separate or complete project monitoring system for NGOs. Instead, we recommend ways in which the identification and assessment of environmental indicators might be integrated in the projects' present monitoring and/or management systems. This gives NGOs the flexibility to pick and choose from a list of possible indicators those which are most applicable for their specific project activities.

2.0 Scope, limitations and important aspects

The concept of environmental indicators includes the physical environment (soil, water and air) as well as the biological environment (plants and animals). The study of environmental indicators also includes social and economic

behaviour, to the extent that such behaviour (for example out-migration) is linked to the state of physical and biological environment.

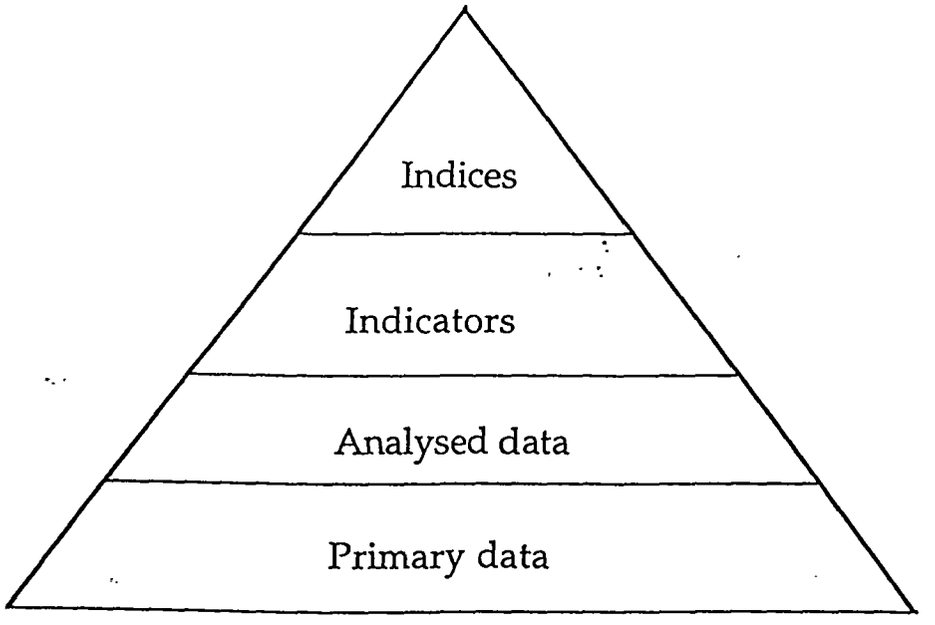
For the purpose of this study, a clear focus and some limitations need to be defined within the wide range of environmental issues. First, air quality is not considered to be an issue in rural areas of the Sahel. Second, narrow measures of each of the other main factors that constitute the environment (soil, water, plants and animals) may not be interesting as such. The important issue is how these factors, under influence of human activity, combine to constitute livelihoods for human beings.

The concept of **land quality** embraces this interaction of biological and physical environmental factors. For deterioration of land quality, The term **land degradation** is used for deterioration of land quality, while the term **land rehabilitation** is used for improvement of land quality. Thus, the three concepts will be covered by the same indicators. Land degradation and land rehabilitation are seen as opposite processes, such that the two processes will be measured by the same indicators, with opposite signs. Both processes are changes in land quality. An example is: The percentage vegetation cover of the land is an indicator of land quality. If the vegetation cover is reducing, it is an indicator of land degradation. On the other hand, if the vegetation cover is increasing, it is an indicator of land rehabilitation.

Land quality can be measured on a macro or micro scale, or in between (meso level). A macro scale assessment would include a whole country or for example a large part of the Sahel. Such macro measurements have been conducted by remote sensing. The opposite approach would be to focus on micro levels, e.g. the single farm. The focus of this study will be the project, farm and village levels. The farm level for land quality indicators will correspond closely to the household level for food security indicators.

The concept of indicators can be defined in terms of their position in the information pyramid, as shown in Fig. 1. Primary data are the building blocks of the information pyramid. Analyzed data are produced by combining and processing primary data. Reduction and aggregation of analyzed data is necessary to arrive at indicators. Indicators also differ from analyzed data by aiming to steer or control action. The highest level, indices, combines indicators to constitute an overall measure of a situation. For example, given that the objectives of the SSE programme are environmental rehabilitation and food security, an index for SSE projects would include one or more indicators for food security and one or more indicators for environmental rehabilitation.

Fig. 1 The information pyramid (WRI, 1995)



3.0 Types of environmental indicators

Development activities can be measured and monitored in several ways. One way is to measure project output through comparing whether planned activities have or have not been implemented, or whether production goals have been met. Several project planning tools (i.e. Logical Framework Analysis) are available for this type of measurement. Another concern, however, is measuring the impact of a project on the welfare of the population. Indicators can be used in a logical framework analysis context or independent of certain frameworks to measure different kind of impacts. Indicators should not be regarded as perfect measures of a phenomena. General and objective indicators will only exist under ideal circumstances. Although the aim must be to define as objective indicators as possible, indicators are still subjective measures due to the fact that someone has to define the indicator. The degree to which the indicators reflect reality will vary - for certain areas the indicators are far from ideal, but still the best available (Poulsen, 1994).

> *Indicators provide qualitative and quantitative information, simplify complex phenomena that can be readily understood by decisionmakers, and can best capture improvement or detoriation in environment and land resource quality* (WRI, 1995).

Indicators should preferably have the following characteristics:

- **Reliability:** The indicator must give a reliable measure of the parameter considered
- **Specificity:** The indicator should be specific to the parameter measured.
- **Low cost:** It should be possible to undertake the assessment at low-cost

- Reproducibility: Different observers should be able report the same status of the indicator.
- Independence of weather.
- Acceptability: The indicator should be acceptable to all users

The environmental indicators chosen should as much as possible reflect the capability of the society to deal with environmental stress (including rainfall) and be an assessment to which extent the environmental stress has been reduced. It is difficult to isolate project effects from other socio-economic, climatic, and political factors effecting the local population. The criteria of independence of climate require some further comments. It is common knowledge that climate condition change can vary from year to year in the Sahelian region. Climate changes strongly influence farmers as well as pastoralists. Prices of agricultural products are also influenced by rainfall conditions. The indicators chosen should therefore be as independent as possible of rainfall. Hence, indicators like yield and price of agricultural products should be used with caution. It might be necessary to adjust for climate variations by introducing an adjusting standard for growing seasons with poor rainfalls, average rainfalls and excellent rainfalls.

Choosing the best indicators of environmental rehabilitation is a difficult task, in particularlt with regard to how these indicators are measured. A review of different sets of indicators which are commonly used in measuring environmental impact is presented in the following section.

3.1. UNDP's sustainable agricultural programme

UNDP has developed a simple set of general indicators for measuring agricultural sustainability. These indicators are divided into three categories: people, productivity and food security (Poulsen, 1994). As some of these indicators are not readily measurable, such as soil degradation and biodiversity, there is a need for further specification to make these indicators measurable.

A. Pressure
  --people/ha land used
  --civil unrest
  --demographics
  --distribution and access to commons
B. Productivity
  --production
  --inputs
  --water management
  --soil degradation
  --biological biodiversity
C. Food security
  --calorie supply/demand
  --food supply
  --food aid
  --food expenditures

3.2 Environmental unsustainability in relation to agriculture

Other sets of indicators are less general than the UNDP set and more readily measurable. The indicators developed by Eckman (1992) emphasize measurement of unsustainability in relation to agricultural activities:

A. General
- -- fewer species of plants, animals and insects
- -- trees and plants used for traditional medicine are more difficult to find
- -- trees that are considered sacred are cut for firewood
- -- farmers must add increasing amount of fertilizer each year to produce the same yield

B. Indicators of surface erosion
- -- a stream turns muddy just after a rain
- -- roots of trees and scrubs are exposed
- -- small cracks form in a cobble pattern in the bare soil surface that are several cm deep
- -- rills or small channels form on sloping land
- -- the amount of soil humus is reduced

C. Indicators of wind erosion
- -- parallel lines or ripple designs appear on sandy soil
- -- sand accumulates against grass stems and the trunks in the direction of prevailing winds
- -- large whirlwinds appear, laden with soil and dust
- -- fine sand/soil particles accumulate inside huts, sheds or other buildings
- -- level of dust in the air (dry season)

D. Indicators of soil degradation
- -- white crystals or powder appear on the soil surface (salinity)
- -- powdery dusty soil appears where livestock is herded (soil compaction/damage soil structure)
- -- digging with a spade is difficult even when the soil is moist (when a hole is dug after a good rainfall, water accumulates in the hole and is not absorbed into the soil)

E. Indicators of vegetation degradation
- -- more than 30% of the ground is bare soil by reduction in plant species
- -- reduction in the diversity of plants
- -- increasing scarcity of plant species that were once indigenous to a locality
- -- increase in weeds
- -- forest cover gradually lessens
- -- indigenous tree species fail to reproduce
- -- increased damage from pests and diseases

F. Sosio-economic unsustainability

-- shortening of fallow period
-- price on fuelwood and dungcakes
-- traditional medicine becomes commercialized rather than being a common good
-- increase in the time required to gather and carry fuelwood
-- increasing conflicts relating the use of the commons
-- agricultural residues such as stalks, dung, cobs are increasingly substituted f or firewood

3.3. Field factors measured for land degradation indicator assessment

Wahome (1994) has developed a comprehensive overview of factors effecting land degradation categorized as physical, biological and sosio-economic measures (table 3.3). This framework might be used as a baseline to get an in-depth understanding of a situation as well as to monitor change.

Table 3.3 Field factors measured for land degradation indicator assessment (Wahome, 1994)

Physical Measurement			Biological Measurements		Socio-economic Measurements		
Water Availability	Climate	Soil	Vegetation cover (t)	Livestock Numbers	Human Population	Agricultural Management	Forest land Management
a) Drainage Pattern	a) Rainfall	a) Soil type units	a) Vegetation type units	a) Movements	a) Settlements	a) Large scale	a) Timber production
b) Water quality	b) Temperature	b) Texture	b) Species composition (desirable & undesirable)	b) Abundance	b) Density and distribution of permanent structure	b) Small scale	b) Woodfuel production
c) Sediment Loads	c) Rainfall erosivity (calulated)	c) Structure	c) Herbaceous canopy cover and biomass production	c) Distribution	c) Conservation perception	c) Soil conservation structures	c) Catchment conservati
d) Underground Waters	d) Wind erosivity, wind speed, direction, frequency	d) Organic matter content	d) Percent bareground		d) Land tenure	d) Maintance of structures	d) Biodiversi conservati
e) Water Cathments	e) Sunlight duration	e) Permeability			e) Level of technical knowledge	Grazing land Management	e) Recreation (Scenic beauty)
Landuse/ landcover (t)	f) Potential Evapotrans-piration (calculated)	f) Erodibility			f) Access to credit	a) Improved grazing	f) Agricultur encroachme
a) Agic. land	g) Wind Velocity	g) Salinity				b) Unimproved grazing	
b) Forest land	h) Sandstorm/ dustatorm frequency	h) Alkalinity				c) Stocking rates	
c) Grazing land		i) Water erosion j) Wind erosion				d) Carrying capacity	
d) Settlement (urban)		k) Erosion features l) Erosion indicators				e) Overgrazed Land	

3.4 Pressure, state, and response indicator framework (PSR framework)
OECD has developed an indicator framework where indicators are used to measure three situations: assessment of human activity causing different kind of pressure on the natural environment (pressure indicators), measurement of the environmental situation caused by the human activity (state indicators), and finally, assessment of the social response applied by humans to cope with the situation. The PSR framework has the advantage of showing the interaction among the three components and provide a feedback mechanism that can help monitor trends and introduce policy and management decision (World Bank, 1995). However, the framework also has certain shortcomings such as the simplification of the relationship between human activities and land resources is linear; and there are difficulties in distinguishing between the three types of indicators (e.g. inappropriate land use can be both a pressure and a response indicator). This framework could be used by SSE projects to plan activities and to monitor environmental changes in the project area. However, this framework might not be all that useful in assessing the impact of project activities.

Table 3.4 PSR framework: Soil fertility decline and livestock density (World Bank, 1995)

Pressure indicator	State indicator	Response indicator
reduction in fallow period	• cultivation/fallow ratio • yield/cultivated land ratio • rainfall variability	• adoption of organic and inorganic technologies • change in fallow period • use of drought tolerant crops
extent of cropping intensity	• cultivated/cultivable land ratio • soil conserving/soil degrading crops • nutrient input/output ratio	• off-farm employment • diversification
decrease in farm size	• change in crop yields and productivity	• agricultural expansion to marginal lands and forest area • out-migration
extent of reliance on monocropping or cash crops	• change in soil nutrient status • monocropping/multicropping land ratio	• use of fertilizer • mixed cropping techniques
inappropriate land use pattern	• change in erosion level • loss of top soil visible • sign of erosion (gullies)	• adoption of erosion control & conservation practices • adoption of alternative land use systems
shortage of pasture and grazing area	• livestock/grazing area ratio • change in land and vegetative cover	• integration of crops with pasture and forage • expansion into protected area
overgrazing on common property resources and rangeland	• livestock/rural population pressure • rangeland degradation	• introducing policies in rangeland & common property regimes

The above review of different sets of indicators provides information on different ways to measure and utilize indicators. Indicators can serve many different purposes such as input to policy planning and assessment, early warning and/or monitoring of the environmental and food security situation in an area, measuring impact of project activities etc. Prior to developing a set of indicators, It is important to determine the purpose and intended use of a set of indicators prior to their develop to ensure their appropriateness. It is also important to remember that indicators might be location specific, and therefore the an indicator cannot automatically be used in another area. As regards local specificity, local people's understanding of environmental degradation and possible local indicators to assess such degradation should be taken into account when identifying appropriate indicators. NGOs in general can be said to have been in the forefront of the development of techniques which allow for active participation by the local population in the planning, implementation, monitoring and evaluation of development interventions. NGOs should consider using such experience in developing appropriate environmental indicators.

4.0 Assessing the impact of SSE project activities on environmental rehabilitation

There are various ways of identifying and measuring environmental indicators in accordance with SSE project objectives and activities. However, determination of the impact of project activities is by no means straight forward. It is difficult to isolate project effects from other socio-economic, climatic, and political factors affecting the local population.

From a cursory overview of Norwegian NGO projects in the SSE countries [1], project activities can be broadly categorised by their general purpose (some of the activities can fall into several of these categories):

- rehabilitation of the environment
- agricultural production activities
- food distribution activities
- general development activities (health, education, off-farm training).

The scope of this report is limited to addressing activities in relation to *rehabilitation of the environment*. . Indicators relating to the food security objective of the SSE programme are presented in the report prepared by Nyborg and Haug (1994): Food security indicators for development activities by Norwegian NGOs in the SSE programme.

[1] based on project information available in Cowiconsult's 1992 evaluation of the SSE program for the Norwegian Ministry of Foreign Affairs as well as field visits.

Environmental conservation and rehabilitation activities should prevent and improve on the situation as regards:

- deforestation
- land degradation (soil erosion, soil fertility decline, degradation of rangeland)
- loss of biodiversity
- water shortage

An overview of SSE project activities which fall into the *Environmental Rehabilitation* category is as follows:

Afforestation:

-- tree planting
-- farmer nurseries
-- forest conservation
-- fruit tree plantations
-- live fences
-- windbreaks

Soil conservation

-- terracing
-- dune fixation
-- composting
-- range management, vegetation regeneration
-- fodder grass production (bourgou)

Water conservation and irrigation

-- dyke construction
-- sluice gates construction
-- water harvesting
-- support to watering points
-- irrigated agriculture

Ways of dealing with indicators vary according to the kind of planning approaches the projects have. This report suggests various indicators in a Logical Framework Approach (LFA)[2]. After this, it suggests another way of presenting the indicators which is independent of LFA. Both approaches include output indicators which are direct results of project activities. They are often physical measurements such as weight, height, length, area treated and other types of measures. The number of training courses organized is an example of an output indicator for soil conservation projects. Changes related to social behaviour and changes in markets are beyond the project control and are thus excluded as output indicators. Establishing, for example, soil conservation structures in this type of project would be an output for the project and cannot be used as an indicator of the immediate objective of the project.

[2] LFA is an analytic tool for objectives-oriented project planning and management (NORAD, 1992)

4.1 Indicators in a Logical Framework Approach

In the Logical Framework Approach, indicators are collected with regards to output indicators, immediate objective and development goal. Output indicators are results that the project management should be able to guarantee while the immediate objective is the effect which is expected to be achieved as a result of the project. The immediate objective can also be said to be the purpose of the project. Development objectives will not be discussed further since the SSE programme objectives have been defined as *food security and environmental rehabilitation*. Indicators of output are normally easy to measure as direct counts or registrations can be used.

The immediate objective is often closely linked to change in behaviour, making the community better prepared to cope with problems like shortage of rainfall and other stress factors. Changes in farming practices can therefore be used in relation to the immediate objective. Indicators related to market can also be used, especially if the fulfillment of the immediate objective is closely linked to purchase of some specific materials. Sale of seeds of nitrogen fixing species or fertilizers can be examples of such indicators in agroforestry projects. Physical measurements can also be as used as indicators in relation to the immediate objective of the project. Reduced soil erosion in soil conservation project is for example not something that is within the complete control of the project as it depends on farmer participation. Physical measurements of soil erosion must therefore be considered as an indicator for this immediate objective.

4.1.1 Soil conservation indicators

Activities in project intended to reduce soil erosion are training courses for farmers, staff training, demonstration and testing of new techniques and promotion and strengthening of service organization like for example credit schemes. Measurements like number of courses organized, number of staff trained and new techniques tested are appropriate output measurements.

Several indicators will have to be used in order to measure the immediate objective of the project. Table 4.1.1 suggests indicators to be considered. Depth of gullies can be difficult to measure, but it is possible to measure depth of gullies between two fixed reference points at the beginning of the project and then repeat the measuring, for example, five years later. Reference measurement should be taken in areas not affected by project activities. Indicators related to market such as sale of materials used in soil conservation are relevant, especially if conservation activity involves the purchased use of some materials specific to soil conservation. In areas where land has a market price, the price of land can be a very precise indicator of changes in land quality.

Table 4.1.1 Soil conservation indicators in a Logical Framework Approach

	Indicators (impact and output)	Measurement
Immediate objective Farmers adopt soil conservation practices	- no.of farmers practicing soil conservation - depth of gullies - increased use of perennials - maintenance of soil conservation structures - conservation structures build on own initiative - changes in soil management practices - price of land increases	-counts -measurements ---------- -PRA techniques (key informants, group interviews, transect walks, trends, seasonal and annual calendars) etc. -questionnaire survey ---------- -market studies
Output indicators	-m.of terraces built -no.courses organized -no.of trained farmers -no.of techniques tested -no.of credit schemes established	
Activities -training courses -establishment of training centres -testing of conservation techniques - strengthening extension service - development of credit schemes		

4.1.2 Soil fertility indicators

Indicators of improved soil fertility have considerable resemblance to the indicators used to measure the effect of soil conservation projects because in both cases soil quality is enhanced. However, the effects of soil fertility enhancing methods are normally more temporary than investments in soil conservation. Use of soil fertility enhancing methods will therefore affect the price of land to a lesser degree than investment in soil conservation measures. Higher yield can be used as an indicator of increased soil fertility. However, yield is a difficult measure of increased soil fertility because it is strongly influenced by climate conditions (including pest and diseases).

Changes in soil organic matter content can be considered as a soil chemical indicator of improved fertility. However, it is not easy to observe changes in soil organic matter in projects of short duration (less than five years). In the cases where the project would like to measure changes in soil organic matter, it is recommended that samples are taken at the beginning of the project and then dried stored. Each sample should consist of at least 10 sub-samples which are then mixed. New samples are then taken five years later at exactly the same spots and at the same depths (0-15 cm) (using a soil auger). All samples can then be analyzed and changes in soil organic carbon can be observed. A soil organic carbon (SOC) of less than 1 % is considered as low. It has generally been found that it is very difficult to increase the level of SOC, the best a project can hope for is that SOC is maintained at the same level. pH or available P are other important indicators of changes in soil fertility. If pH (H_2O) is below 5 and available P (Bray 1 method) is below 10 ppm these factors will seriously effect crop productivity.

Table 4.1.2 Soil fertility indicators in LFA

	Indicators (impact and output)	Measurement
Immediate objective Farmer use soil fertility enhancing methods	- no.of farmers practising soil fertility enhancing methods - area treated with fertility enhancing methods - input/output of nutrients - trends in soil chemical properties - no,of years with continuos cropping - use of legumes, residues, manure, fertilizer , lime - practice of shifting cultivation - sale of seeds of nitrogen fixing species - sale of fertilizer - price fertilizer /price of grain - increased price of land	-counting -measuring -chemical analyses ---------- -PRA (interviews, other techniques) -survey ---------- -market studies -PRA
Output indicators	- no.of courses organized - no.of farmers trained - no.of techniques tested - no.credit schemes supported	
Activities -training courses -establishment of training centres -testing of conservation techniques - strengthening extension service - development of credit schemes		

4.1.3 Indicators in relation to water management activities

Project activities intended to increase availability of water are dyke construction, supply of motor pumps and other pumping devices, support to credit schemes etc. The creation of irrigation facilities in food for work projects is within the control of the project. A project can take full responsibility for the constructions if larger investments are involved. Under such conditions the irrigation facility is a an output of the project. When the project operates as a facilitator in the construction process, the irrigation facility is related to the immediate objective.

Several indicators can be used in relation to the immediate objective. The project should make sure that there are no severe changes in relation to ground water level in wells or that there is a build up of soil salinity in soil. In order to check

salinity, soil samples will have to be taken. Salinity becomes a problem if electrical conductivity is greater than 4 dSm^{-1} or if the exchangeable sodium percent is above 15. The project should monitor the trend in these two parameters. There are differences between species as regards tolerance to salinity: generally, legumes have low tolerance, while barley is a tolerant species.

Table 4.1.3 Water availability indicators in LFA

	Indicators (impact and output)	Measurement
Immediate objective Improved access to water	-no.of dykes maintained - maintenance of motor pumps - ground water level in wells - degree of salinity -farmers making use of irrigation facilities -degree of investment in irrigation facilities on own initiative - funds set side for maintenance of irrigation facilities - use of fertility enhancing measures in irrigated areas - increased price of land - increased sale of materials for irrigation purposes	-counting -measuring -soil chemical analyses --- -PRA (interviews and other techniques) -questionnaire survey --- market studies/PRA
Output indicators	- area with access to irrigation facilities -no.of dykes constructed - no.of farmers trained - no.credit schemes supported	
Activities -dyke construction - motor pumps - wells for irrigation -support to credit schemes		

4.1.4 Indicators of fuelwood availability

Activities intented to increase the availability of fuelwood can be: training in the use of improved stoves, supply of planting material and training the farmers in social forestry. Different types of indicators can be used in relation to the immediate objective in this type of projects. The quality of marketed fuelwood is an appropriate physical indicator. The best indicator is probably the number of hours spent collecting fuelwood by different socio-economic groups of people, because this indicator is closely related to the accessibility of fuelwood. Use of crop residues and cowdung for fuel could be indicators of severe energy crises. Increased fuelwood prices compared to other consumer goods can be used as an indicator of market change. The ratio between fuelwood prices and several

consumer goods would have to be established in order to avoid the problem of changes in the relative price of one particular type of consumer goods.

Table 4.1.4 Indicators of fuelwood availability in LFA

	Indicators (impact and output)	Measurement
Immediate objective Energy more easily available	- no. of surviving trees - circumflex of marketed fuelwood - species used for fuelwood - percent of improved stoves in use -hours per day spent to collect fuelwood -use of wood saving devices in households -cowdung and residues used for fuel -price of fuelwood -price ratio fuelwood/consumer goods	-registration --- -PRA (interviews etc.) -survey --- -market survey -PRA
Output indicators	- no.of improved stoves built - no.of trees planted -training in social forestry	
Activities Supply of planting material - courses in social forestry -training in building of improved stoves		

4.1.5 Indicators of improvements in pastoralists welfare

Project activities intended to increase welfare of pastoralists include vaccination programmes, digging of wells, literacy programmes, activities related improve the organization of pastoralists. Output indicators can be such as the number people attending classes, number of wells dug, etc. It is difficult to establish good indicators for projects intended to improve pastoralists welfare. One reason is that fluctuations in rainfall will have a strong influence on pastoralists livelihood from year to year. It is therefore difficult to differentiate between the effects related to seasonal climate changes and changes related to degrading rangeland. Indicators related to market are not well suited because market price and price ratios will be strongly influence by the rainfall situation. Indicators of social change can be the establishment of local pastoral organizations. Such organizations might include tasks related to the maintenance of wells, claiming water fees, development of cereal banks and negotiationswith governments concerning public services and grazing rights.

Cattle health is an important indicator in relation to improvement of pastoral resources. This information is normally found in statistics from veterinary services. Reduced distance between wells is an other improvement indicator because wells increase the accessibility to pasture lands during the dry season,

thereby increasing the area's carrying capacity. Maintenance of wells is another important indicator.

Table 4.1.5 Indicators of improvements in pastoralists welfare in LFA

	Indicators (impact and output)	Measurement
Immediate objective Improved management of pastoral resources	- incidence of disease of cattle - distance between wells - no.of wells maintained - participation in pastoralist organization - access to pastures - drought preparedness (cereal banks etc) - less conflicts related to user rights	-registration --- -PRA (interviews etc.) -survey
Output indicators	-no.of cows vaccinated - no.of wells dug - no.pastoralists organizations formed like credit schemes, cereal banks - no.attending literacy programmes	-registration
Activities - vaccination programmes - literacy programmes - digging of wells - organizational training of pastoralists		

4.2 Indicators by activity (independent of LFA)

There are other ways of presenting and applying indicators for those SSE projects which are not using LFA as their planning tool. As with most other methods, LFA has both advantages and disadvantages. Chambers (1996, 6) assesses the limitations of LFA as follows:

- **Top-down**
- **Reductionism to one core problem:** Does not recognize that different people have different problems and different mixtures of problems
- **Consensus:** Can reflect the interests and wishes of the powerful and articulate rather than those of the weak and inarticulate
- **People as target:** Trying to hit the target rather than enabling people to move, choose and determine their own destinies
- **Language:** Acquire fluency in the language used, usually English
- **The assumption that we know best:** Those who are dominant and powerfully transfer their reality to others rather than empower others to express their own

- LFA workshops do often not consider: Who is present? Who is participating? And on what terms? Whose reality counts?

This report does not intend to judge the appropriateness or otherwise of LFA or other planning frameworks or methods. The purpose of this report is to provide ideas and tools on how to assess the effect of project activities through the use of output and impact indicators.

Another way of using indicators in relation to activities and within the framework of the SSE programme objectives *of environmental rehabilitation and food security* is suggested below. Whether the project prefers to combine environmental rehabilitation and food security in one table or chooses to develop different tables for each of these two programme objectives is optional. It is possible to select indicators directly from the different sets reviewed in chapter 3 if the indicators suggested in Table 4.2 do not appear appropriate,

Table 4.2 Indicators to assess the impact of environmental rehabilitation activities

SSE programme objectives: Food security and environmental rehabilitation
Sub objectives in relation to environmental rehabilitation: Afforrestation, soil conservation, water conservation and irrigation

Activity	Output indicator	Environmental impact indicators	Food security impact indicators	Means of Measure-ment
<u>Afforestation</u> farmer nurseries, tree planting, forest conservation, fruit trees, live fences, windbreaks, training	-no.of seedlings produced -no.of farmers participating in treeplanting etc. -no.of courses conducted -no.of farmers trained	-no.of seedlings sold -no.of seedlings planted -tree survival rate -increase in vegetation and forestry cover -increase in biomass production -increase in fuelwood & building material availability -decrease in hours pr day spent collecting fuelwood -price of fuelwood -price of building material	*Food security impact indicators to be selected e.g. from the SSE programme food security indicator report by Nyborg & Haug (1994)*	-counting/ registration -ground cover analysis -vegetation analysis -PRA -survey -market studies
<u>Soil conservation</u> terracing, dune fixation, composting, range management, vegetation regeneration, fodder grass production, extension and training, credit	-m.of terraces built, duned fixed etc. -no.and category of farmers/peopl e participating -no.of farmers trained -no.and type of credit schemes established	-less rills in cultivated fields after rain -depth of gullies -trends in soil chemical properties -less loss of topsoil -increased use of perennials -yield increase pr cultivated land -adoption rates of soil conservation (compost, perennials etc.) -m.of terraces maintained -degree of soil conservation on own initiative - increase price of land		-counting/ registration -chemical analysis (soil samples) -PRA/ interviews -survey -market studies
<u>Water conservation and irrigation</u> dyke construction, sluice gates, water harvesting, watering points, irrigation, credit schemes, waterpumps, training	-areas with access to irrigation facilities -no.of dykes constructed -no.of farmers trained -no,of motorpumps supported -no.of credit schemes supported	-no.of dykes, motorpumps etc. maintained -change in groundwater level in wells -degree of salinity -degree of water erosion -increase in cultivable land -increase in yield level pr cultivated land -adoption of water conservation/irrigation over time -degree of investment on own initiative -maintainance of irrigation facility -increase price of land -increased sale of materials for irrigation purposes		-counting/ registration -chemical analysis (soil samples) -PRA/ interviews -survey -market studies

Measurements in the above table should be reported by category as appropriate (e.g. socio-economic group, language/ethnic group and sex). The indicators are given as examples from which a selection can be made to suit the given situation.

A question which may arise after a review of the above table is: What if there are no improvements in the environmental impact indicators? If such is the case, the project could consider the following: How appropriate is the chosen set of indicators? How appropriate is the project activity regarding attainment of the environmental rehabilitation objective? How appropriate is the time aspect? Will more time be needed before the expected results become apparent?

5.0 Monitoring

Once environmental impact indicators have been identified, they should be integrated into existing project monitoring systems. Project staff must determine how often each indicator is to be measured, and by whom. Monitoring of projects, however, is of no use if the information is not actively used to improve project activities. Hence the following factors should be defined:

- purpose of using indicators
- which indicators to use
- how to measure the indicator
- when to measure
- cost of measurement
- target level
- how to integrate the indicators in the project monitoring system.

The choice of appropriate sets of indicators could take place in different ways. The project staff will have an important role in relation to the above listed issues. The understanding of the local people of environmental degradation and rehabilitation and possible local indicators to assess such degradation should be taken into account when identifying appropriate indicators. The targets set should be as realistic as possible. In many cases the target must be set in relation to relative changes in the indicator. It will be difficult to establish the same target level in all projects because there are considerable differences between agroecological and socio-economic conditions. In addition, there are differences between projects in relation to the resources available. In order for NGOs o assess the efficiency (cost/unit) of their projects, budgetting and accounting should be prepared in relation to activities.

6.0 Conclusion

The purpose of this study is to provide ideas and tools for how to assess the effect of project activities through the use of appropriate indicators. It is assumed that an appropriate set of indicators could contribute to improving the impact of the projects as well as improving the quality of reporting. This first draft report addresses the above purpose. It is for NGOs and their collaborative partners to assess to what degree is has been able to fulfill this purpose. As there are considerable differences between NGOs and their project activities, the focus of

this phase has been kept to a general level rather than asking NGOs to respond to the initial work before attempting any further degree of detail.

Thus, the next step is to present the report and to discuss its application together with the NGOs in various workshops and contact meetings. The report will then be revised according to feedback and comments received from the NGOs during this process of presentation and discussion.

NGOs and their collaborative partners are encouraged to promote a process of bottom-up, participatory monitoring and assessment of environmental rehabilitation indicators. This process should involve the targeted population, as well as front-line extension agents and/or project workers in identifying and assessing indicators as well as in designing measurement systems. While this report might provide ideas and tools for possible indicators, it is up to each NGO and project to decide on appropriate indicators for their particular project, and how these should be measured/assessed. It is hoped that this report has helped spark an interest on the part of NGOs to explore new ways of addressing environmental rehabilitation in their project areas.

7.0 Literature

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