I. INTRODUCTION

Rehabilitation is seen as the most viable way of mitigating the effects of land degradation. Initiatives in this area have been going on for some time now in Africa, especially in Sub-Saharan Africa (SSA). There exist useful examples of success stories in rehabilitation but also of failures, both of which present opportunities as learning points. However, most of the cases exist in grey literature and are not readily available. The GFIS Africa Synthesis initiative on "Rehabilitation of Degraded Lands in Sub-Saharan Africa" was therefore initiated in an effort to bring together African scientists working on tropical forests, woodlands and allied natural resources through networking to review and appraise existing information (both published and grey) and chart the way forward on sustainable management of the resources as a further contribution to the GFIS Africa project. Specifically, the synthesis has an emphasis on case studies in Sub- Saharan Africa in order to demonstrate what has already been done in the area of rehabilitation of degraded lands and to identify what are the gaps with respect to policy, management and research. The final product will be a valuable complementary document to the report on the Trees, Agroforestry and Climate Change in Dryland Africa (TACCDA) initiative the vision of which is that "African countries develop and agree on clear national policies and strategies for addressing ecological degradation of Savannah and dryland forests taking account of management and climate change"

This synthesis covers four sections. Section II highlights the problem of land degradation in SSA, the extent of the problem and its impact. Section III provides an appraisal of land rehabilitation techniques with respect to their adaptation to and utility in each of the three ecological zones, i.e., humid, sub-humid and dry lands. An analysis of selected case studies within each of the ecological zones is summarised in Section IV and fourteen case studies are presented as annexes to the report. Section V draws lessons from the case studies. Section VI provides the way forward based on lessons learnt and recommendations from the case studies. This section also provides a guide for further rehabilitation of degraded lands in SSA. The main beneficiaries of this synthesis are expected to be students, researchers and development actors (government, development partners and NGOs) involved in different aspects relevant to natural resources in SSA.

II. DEFINING THE PROBLEM

Sub-Saharan Africa covers an area of 13.9 million km^2 or about 46 % of the continent (Encyclopaedia Britannica, 1967) and is home to some 600 million people (WRI, 1998) living in a variety of physical, cultural and economic environments. SSA can be broadly classified into three zones comprising humid lands, sub-humid lands and dry-lands based mainly on the aridity index (AI) of climate. The AI is derived from the ratio of mean annual precipitation (P) to mean annual potential evapotranspiration (PET) (UNDP/UNSO, 1997). Based on this criterion, humid lands have an aridity index value of AI>1.0; sub-humid lands fall into two categories of moist sub-humid (AI of 0.65-1.0) and dry sub-humid (AI of 0.5-0.65) while dry-lands have three categories of semi arid (AI of 0.2-0.5), arid (AI of 0.05 –0.2) and hyper arid (AI <0.05). AI values of <1.0 indicate an annual moisture deficit (Middleton and Thomas 1997),which for SSA, includes both the sub-humid and dry zones.

One of the biggest problems threatening the lives of millions of inhabitants in SSA, especially those residing in the rural areas, is land degradation, which is defined in general terms as a temporary or permanent decline in the productive capacity of the land (Stocking and Murnaghan, 2001). Although a worldwide problem, land degradation is said to be most acute in SSA where it is characterized by decreasing production of forest products and food and worsening levels of poverty and malnutrition. Land degradation is occurring in all the three zones described above occasioned by the same driving factors, albeit at different levels. Within the humid forest ecosystem key driving factors of degradation include clearing trees for agricultural expansion (subsistence or commercial farming), logging, firewood gathering and charcoal production, mining, human settlements, infrastructural and industrial developments (Evans, 1994; Raymond et al, 1994). The same factors are also responsible for land degradation in the sub-humid zone though overgrazing and uncontrolled fires become more important as one gets into the dry sub-humid areas (Kaoneka, 1999). Within the dry-lands (semi-arid and arid zones), overgrazing combined with unsustainable agriculture and over-exploitation of natural resources are important (Middleton and Thomas 1997). In general, land degradation in the dry sub-humid and dry-land zones leads to desertification. Meanwhile, there are various underlying causes of degradation which include poor policies, inequitable distribution of benefits, market and policy failures, population growth, rural poverty and the poor state of economy of the affected countries (Quinones et al, 1997; Raymond et al, 1994), among others.

As a result of the above anthropogenic factors, which, however, operate in a complex interplay with natural causes, large areas of SSA have undergone or are experiencing different levels of degradation. The process usually starts with deforestation; for example, the rain forests of West Africa are said to be disappearing at the rate of 5% annually with nearly 90% of the original moist forests having gone or having become fragmented and/or degraded remnants (FAO, 2001). Deforestation rates over the ten-year period 1990 to 2000 in the humid zone countries are shown in Table 1.

Table 1: Forest Cover Change (1990-2000) in Humid Zone Countries in SSA

Country	Total forest, 1990 ('000 ha)	Total forest, 2000 ('000 ha)	Forest cover change (1990-2000)	
			Annual change ('000 ha)	Annual rate of change (%)
Benin	3,349	2,650	-70	-2.3
Cameroon	26,076	23,858	-222	-0.9
Central Africa Republic	23,207	22,907	-30	0.1
Comoros	12	8	n.s.	-4.3
Congo	22,235	22,060	-17	-0.1
Cote d'Ivoire	9,766	7,117	-265	-3.1
Dem. Rep. of the Congo	140,531	135,207	-532	-0.4
Equatorial Guinea	1,858	1,752	-11	-3.3
Gabon	21,927	21,826	-10	n.s.
Ghana	7,535	6,335	-120	-1.7
Guinea	7,276	6,929	-35	-0.5
Guinea-Bissau	2,403	2,187	-22	-0.9
Liberia	4,241	3,481	-76	-2.0
Madagascar	12,901	11,727	-117	-0.9
Nigeria	17,501	13,517	-398	-2.6
Sierra Leone	1,416	1,055	-36	-2.9
Togo	719	510	-21	-3.4
Uganda	5,103	4,190	-91	-2.0

Source: FAO, 2001

Studies within the Miombo woodlands of the sub-humid zone also reveal high rates of deforestation. In the SADC region for example, Shaba (1993) estimated that about 600,000 ha of indigenous forests are being cleared annually for other land uses. Table 2 illustrates the generally high deforestation rates ranging from 40,000 – 765,000 ha between1980 and 1990 and 50,000 – 740,000 ha between 1990 and 1995.

Table 2: Forest Cover Changes in Selected Miombo Countries Since 1980

Country	Total forest cover (Thousand ha)			Annual deforestation rate			
	1980	1990	1995	1980 -1990		1990 -1995	
				Area (000ha)	%	Area (000 ha)	%
Angola	24,812	23,385	22,200	-143	-0.6	-237	-1.0
Malawi	4,011	3,612	3,339	-40	-1.0	-55	-1.6
Mozambique	18,683	17,443	16,862	-124	-0.7	-116	-0.7
Tanzania	37,936	34,123	32,510	-381	-1.0	-323	-1.0
Zambia	35,931	32,720	31,398	-321	-0.9	-264	-0.8
Zimbabwe	9,506	8,960	8,710	-55	-0.6	-50	-0.6

Source: WRI (1994), FAO (1999) and Nduwamungu (2001).

A recent assessment by FAO has attempted to quantify the extent of deforestation in Africa by different land uses (FAO, 2001). Based on this study, 4% of forests were deforested through shifting cultivation, 8% through intensification of agriculture in already shifting agricultural areas, 60% as direct conversion of forest area to small-scale permanent agriculture, 12% as direct conversion of forest area to large-scale permanent agriculture and 17% for other purposes such as settlements. Nevertheless, there have been slight gains in forest cover in some countries mainly as a result of afforestation, e.g. in the Gambia and in Swaziland (FAO, 2001).

Within the dry-lands zone, land degradation or desertification is reported to be occurring at various levels depending on land use. For example, it is moderate in irrigated croplands (1.9 million hectares or 18% of total irrigated cropland) while it is high in rain-fed croplands and rangelands (48.9 million ha or 61% of rain-fed croplands and 995.1 million ha or 74% of rangelands) (INFORSE, 1998). The annual rate of desertification is about 10% in arid lands, 1% in semi-arid lands and 0.1% in dry sub-humid lands, leading to an annual increase of lands affected of: 156.9 million ha in arid areas, 23.0 million ha in semi-arid areas and 1.3 million ha in dry sub-humid areas. These give an average rate of desertification of 3.5% per year.

A further analysis of the extent of land degradation in the dry lands due to human activities on vegetation is summarized in Table 3

Table 3: Extent of Land Degradation Due to Deforestation and De-vegetation in Dryland Africa (million ha)

	Aridity		
Factor	Arid	Semi-arid	Total
Overgrazing	119.9	61.9	181.8
Agricultural activity	11.1	33.8	44.9
Over exploitation	42.0	11.7	53.7
Deforestation	3.9	7.6	11.5
Total	176.9	115.0	291.9

Source: World Atlas of Desertification, 1997

However, a word of caution is needed when discussing the extent of land degradation. Whereas it is generally agreed that degradation is taking place in SSA, the actual magnitude of such degradation remains uncertain due to lack of reliable data on areas, stocks and yields (Misana et al, 1996). It is also widely known that owing to high variability in climatic conditions (especially rainfall amount and distribution) accompanied by drought and anthropogenic factors, dry land boundaries due to degradation are shifting over time (Tucker et al, 1991, Helden, 1991). This raises a number of questions, notably the choice of suitable and harmonized methods for generating data, the appropriate frequency for monitoring changes, given the dynamism inherent in the climatic regions and the capacity within SSA to generate data and monitor trends. These are issues that need to be addressed.

The consequences of land degradation are usually deleterious to human populations. The main consequences of such degradation and deforestation include: shortage of firewood, other wood products and non-wood forest products, increased sediment deposits, floods and land slides leading to loss of life, population displacement and reduced food production, sheet and gully erosion making land unproductive, reduced quantity and quality of water from catchments, drying up of springs, siltation of dams, increased incidences of water-borne diseases, loss of biodiversity, climate change and desertification. Since many areas in SSA are managed as range for domestic livestock a decline in the productivity of these systems is also of increasing importance.

III. APPRAISAL OF TECHNIQUES FOR REHABILITATION OF DEGRADED LANDS

The choice of techniques for rehabilitating specific degraded areas depends first on the priorities and management objectives of stakeholders followed by the costs and benefits associated with available rehabilitation techniques and the economic, social, and environmental values of the land resources in their current and desired future states (Lamb, 1994). This section reviews rehabilitation techniques which are being used in SSA in the agricultural and forest sectors. As already noted, livestock is often a key element in land management although too often it is inadequately considered in rehabilitation planning. These techniques are:

- Natural Regeneration
- Assisted Natural Regeneration
- Fire
- Enrichment Planting
- Plantations
- Agroforestry
- Soil and Water Conservation

Each of these techniques will be described, its advantages and disadvantages outlined and ecological zone, where it is more appropriate, indicated.

Natural Regeneration

Natural regeneration involves deliberately protecting degraded land to enhance and accelerate the natural processes of forest succession in order to re-establish a healthy and resilient productive – generally a forest – ecosystem. Where land is suited to direct human use and has not been stripped of topsoil, substantial recovery may be achieved in as few as 3 to 5 years but more typically may take 20 years. For example in Shinyanga, Tanzania, a sub-humid area, recovery of an *Acacia nilotica* ecosystem took less than 10 years whilst in the more diverse humid ecosystems of West Africa, it takes between 15 to 20 years depending on the intensity of degradation and the tree species used.

This technique is simple and cheap, though it may be difficult to implement because of pressure from other land uses especially in highly populated areas. Uncontrolled grazing can have a major influence.

When land has been degraded for a long period, natural processes are often disturbed and barriers are formed which block the natural pathways of forest succession. These barriers include: low availability of native seeds and other propagules on-site, seed and seedling predation, seasonal drought, root competition, and poor soil conditions. These factors need to be ameliorated before successful restoration can be attempted.

Natural regeneration can be used in all ecological zones. However, as earlier mentioned, the degree of success depends on the ecological characteristics of each specific site.

Assisted Natural Regeneration

An alternative approach to the restoration of degraded lands is to accelerate regeneration by assisting the natural processes of succession. Assisted natural regeneration (ANR) involves: cutting or pressing down the weeds around existing naturally established seedlings, protecting the area from fire and interplanting with desired species if necessary. ANR differs from 'natural regeneration', as it allows some human intervention but generally precludes tree planting. For example, in the Maradi region of central Niger, the Maradi Integrated Development Project has been encouraging farmers to deliberately protect regenerating bushes and shrubs in their millet fields (USAID/CILSS/IRG 2002) whilst in Aynalem Tabaia, Wukro Woreda in north eastern Ethiopia, enclosures have been used as a tool for rehabilitating degraded lands (Birhane et al. 2003).

As with natural regeneration, ANR is also simple and cheap to implement. However, it is important to know what specific factors limit the rate of regeneration of trees in deforested areas, so that minimum input strategies may be devised to overcome them. This technique can be used in all the ecological zones of SSA.

Enrichment Planting

Enrichment planting is defined as the introduction of valuable species to degraded forests without the elimination of valuable individuals already present (Catinot, 1965 cited in Lamprecht, 1990; Weaver, 1987). The technique includes: line-, strip-, gap- and under- planting. Enrichment planting practice is intermediate in intensity between natural regeneration and plantations. This technique has been suggested for restoration of over-exploited primary and secondary forests as it can increase total tree volume and the economic value of forests (Weaver, 1987, Sips, 1993; Korpelainen et al. 1995). In addition, there are biological, environmental and economic arguments in favour of enrichment planting. When compared to other artificial regeneration systems, enrichment planting has the advantages of mimicking natural gap dynamics and protecting the soil by maintaining vegetative cover on site. Although enrichment planting is mainly used in the humid zone for production of timber, it has potential for application in other ecological zones.

The main constraints for the application of this technique include: difficulty in selection of appropriate species and/or a lack of adherence to sound planting and tending practices. Others include: insufficient over storey opening prior to planting, insufficient follow-up tending, pest attacks, labour demand and high costs of establishment and maintenance of planting in the initial years.

Fire

Fire is a major ecological factor, which is of fundamental importance in the maintenance of Miombo woodland (Lawton, 1978). It is for this reason that fire is deliberately used in the management of savannah woodlands in many places, especially in the Miombo. The technique involves carrying out early burning, that is, burning patches of undergrowth in the early dry season before the grass gets too dry in order to avoid more intense and more-damaging fires later in the season (Campbell, 1996). Early burning has been shown to improve regeneration and to reduce the fuel load as compared to complete protection, which tends to increase fuel load and may lead to more damaging fires. Additional benefits include: inducement of new grass for livestock and control of pests.

While early burning is simple and easy to implement, its main constraint relates to the timing and frequency of burning which if not practised appropriately can lead to increase in flammable biomass.

Plantations

This technique involves planting trees and/or shrubs as single or mixed species on degraded lands. The main benefit of plantations is to catalyse forest succession in the understories, particularly where silvicultural management has been neglected, on sites where persistent ecological barriers to succession would otherwise preclude recolonisation by native forest species (Lubbe and Geldenhuys 1991, Geldenhuys 1993, 1996, and van Wyk et al. 1995, Fimbel and Fimbel 1996). The catalytic effect of plantations is due to changes in understory microclimatic conditions, increased vegetation structural complexity, and development of litter and humus layers that occur during the early years of plantation growth. These changes lead to increased seed inputs from neighbouring native forests (and sometimes also from nearby exotic or weedy species) by seed dispersing agents, suppression of grasses or other light-demanding species that normally prevent tree seed germination or seedling survival, and improved light, temperature and moisture conditions for seedling growth.

There is increasing evidence that mixed-species plantations are more effective for rehabilitation than the use of single-species plantations due to their high potential for biomass production and attraction to animal seed dispersers as well as increased soil fertility and soil microbiological activity (Vanclay 1994, Parotta 1999). The inclusion of promising indigenous tree species along with exotic species would further improve the ecological stability and sustainability of forest plantations (Yirdaw 2002). Mixed forest plantations, therefore, should be given serious consideration in the planning and establishment of rehabilitation programmes. Major considerations in the use of plantations for rehabilitation include:

- Careful and accurate species/site matching.
- Choice of complementary species in case of mixed species plantations.
- Critical timing of forest management interventions.
- Provision of adequate protection against fire and grazing especially in the savannah and drylands.

Land Rehabilitation Using Agroforestry

Reclamation agroforestry involves two stages. In the first stage, tree and/or shrub species are introduced on to degraded forestland together with any necessary mycorrhizal or rhizobial symbionts, with the objective of checking erosion and restoring soil organic matter and fertility status. In the second stage, the cover may be selectively removed and agricultural production introduced (Young, 1989, 1995; Kieppe and Rao, 1994; Kessler and Wiersum, 1995). However, time is needed to build-up the enlarged plant-litter-soil nutrient cycle (Kellman, 1979 in Kessler and Wiersum, 1995), a period during which exploitation of the vegetative biomass should be kept low with necessary protection from grazing etc. The initial tree removal can be along contour aligned strips, with belts of trees remaining in between, leading by stages towards hedgerow intercropping (Young, 1989, 1995). Other options include fodder incorporation along strips or multi-storey systems (Young, 1989, 1995).

Agroforestry can be practised in any of the ecological zones. It can be a way to reduce deforestation or land clearing and to increase crop yields (of food, fodder, fibres etc) and the diversity of products grown, but an additional benefit is the creation of a C sink that removes CO_2 from the atmosphere, or the maintenance of C in existing vegetation and, therefore, has implications for climatic change

(Shroeder, 1994). Agroforestry, being one of several approaches for improving land use, is also frequently invoked as an answer to shortages of fuelwood, cash income, animal fodder and building materials in SSA (Rocheleau et al., 1988). Rehabilitation agroforestry being a new technique for land rehabilitation, constraints are now gradually emerging and they may be site specific.

Soil and Water Conservation

Soil and water conservation techniques entail creating structures which improve the retention of water for plant growth. The structures are generally micro-catchments of different types including: square, V-shape, W-shape, line barriers and tie-ridging. These techniques are more suitable for the dry sub-humid and dry land areas, which experience severe moisture deficits. The techniques are, however, generally labour-intensive.

Further Research Needs

The following are questions that need to be answered through further research:

- What characteristics of tree plantations lead to arrested successions and how can they be avoided?
- Can succession be accelerated in tree plantations designed specifically for the re-establishment of species richness?
- Are native tree species more efficient in accelerating succession than exotic species?
- Can succession be accelerated, or is there a time tax (*sensu* Lugo, 1988b) that cannot be short-circuited due to site degradation?
- Are there key species or processes missing in successions that occur on degraded sites?
- Can species be introduced at any time into a succession, or do they require a particular stand history before they can survive?
- Do plantations accelerate natural forest succession on degraded tropical sites?
- If so, what site conditions, plantation designs (species selection, spacing, etc.), and silvicultural management practices (site preparation, understory management, thinning regimes) favour the adoption of this technique for native forest rehabilitation or restoration over alternative methods?
- What is the role of wildlife in rehabilitation and how can plantations be designed to increase their effectiveness as seed-dispersers?
- To what extent does the regeneration of a diverse understory flora affect the productivity of the planted crop in plantations established primarily for timber production, and how can the regeneration process be managed to optimise yields of a diverse product mix to meet economic, social and environmental conservation objectives?
- What are the potential uses of the ‘catalytic effect’ of plantations to harmonize forest production goals and forest rehabilitation and/or restoration objectives?
- What is the influence of overstory (planted) species architecture and phenology on understory micro-climate heterogeneity (spatial and temporal patterns)

- What aspects of forest floor and soil development influence recruitment of native forest species under a variety of site and landscape conditions?

- What is the role of understory growth on ecosystem development and nutrient cycling?

- What is the role of management practices (site preparation methods, use of fire, thinning regimes etc) on the planted crops and understory?

IV. REVIEW OF SELECTED CASE STUDIES IN THE DIFFERENT ECOSYSTEMS

Thirteen practical case studies are included as annexes to this report. They cover the main climatic zones and are as follows:

The Humid Forest Zone

- Joint Management as an option for rehabilitating degraded forests: The Case of the Gwira Banso Project in the Wassa West District of the Western Region of Ghana

- Rehabilitation of Degraded Forests through the Collaboration of Local Communities in the Dormaa District of the Brong Ahafo Region of Ghana

- Agricultural Reclamation of Nueng North Forest Reserve in the Western Region of Ghana

The Sub-Humid Zones

- Restoring the Vegetation and Improving the Livelihood of the Kamba and Maasai People in Kenya

- *Ngitili*: a Traditional Method of Land Rehabilitation in Shinyanga Region, Tanzania.

- Successful Community-based Management of Duru-Haitemba Miombo Forest, Babati District, Northern Tanzania

- Community Efforts at Rehabilitating Degraded Lands in the Upper East Region of Ghana

The Dryland Zones

- Community Resources Management by the Elangata Wuas Ecosystem Management Programme, Kajiado District, Kenya

- Rehabilitation of Degraded Lands in the Lake Chad Basin, Cameroun

- Enclosures as a Tool for Rehabilitating Degraded Woodlands of Ethiopia

- Community-based Rehabilitation of the Nazinon Forest in Burkina Faso

- Participatory Extension Strategies for Promoting Agroforestry in the Drylands of West Pokot District, Kenya

- Land Rehabilitation through Participatory Soil and Water Conservation in the Yatenga Region, Burkina Faso

- Land Rehabilitation by the Hado Project in Kondoa District, Dodoma Region, Tanzania

V. GENERAL LESSONS LEARNT

From this review a number of important lessons have been drawn that provide the basis for recommendations to guide the way forward in land rehabilitation in Sub-Saharan Africa. Projects considered to be successful were found to have at least one of the following characteristics:

- They are perceived by local communities to have a direct bearing on their livelihoods, i.e., the project is believed to have a clear potential to deliver tangible and short term benefits such as wood and non-timber forest products for human and livestock direct use and for income generation. Thus, rehabilitation projects which use high-value trees or which improve animal fodder supply are likely to be more successful than projects which restrict their objectives to the repair of biophysical degradation of soils and vegetation.

- The existence of a favourable political and policy environment that provides a clear legal framework for ownership and/or usufruct rights of local communities over their natural resources.

- Rehabilitation techniques and technologies are simple and inexpensive (both in terms of cash and labour), and relate as much as possible to local knowledge and practice.

The following were found to be particularly important learning points throughout the project design and implementation cycle:

- Rehabilitation activities should be preceded by creation or raising the awareness of the stakeholders. Various approaches can be used but it is essential that the causes and consequences of land degradation, feasible rehabilitation techniques and benefits of rehabilitation are covered.

- Baseline studies are necessary to evaluate success or failure, to monitor flora and fauna changes over time and to assess the impact of rehabilitation on the livelihoods of people.

- Participation in planning, implementation and benefits-sharing must involve all stakeholders. The process should take place at all levels, village, divisional, district, regional and national and should include local communities, natural resource management extension staff, and rural development experts.

- Land tenure problems often hold up rehabilitation efforts and affect adoption and sustainability. Land tenure therefore needs to be addressed in the earliest stages of planning.

- Empowerment of local communities for effective participation in rehabilitation requires the fulfilment of several conditions, including:

    - A functional institutional framework at village level to oversee planning, implementation and monitoring;

    - Capacity building of communities to enable them implement projects; and

- o Equitable sharing of costs and benefits within communities and between them and government to give the communities a sense of ownership.

VI. THE WAY FORWARD

Based mainly on the lessons learned from the case studies presented here, the following recommendations are presented to guide future rehabilitation efforts to mitigate land degradation in Sub-Saharan Africa:

Policy Aspects:

Appropriate policies should be adopted that, among others, allow a paradigm shift in forest governance from centralised to decentralised management involving local communities (community based forest management or joint forest management) and other stakeholders and there should be equitable and transparent sharing of both benefits and costs.

Land policies should be reviewed so as to enable families and communities to have secure and clear tenure rights. The review should be based on a well designed national land use plan taking into account soil and land characteristics as well as the socio-economic characteristics of the rural people and communities.

Management Aspects:

Rehabilitation efforts must be preceded by the collection of baseline data on biophysical and socio-economic conditions, followed by monitoring of these aspects during the rehabilitation process.

Integrated and holistic approaches, including industrial and other off-farm livelihood opportunities must be implemented in order to reduce pressure on forest and range resources.
Agroforestry, a sustainable production system affordable by resource poor farmers so as to ensure food security and wood availability is part of the solution as is tree planting to establish woodlots and regeneration and management of natural forests.
There is a need to share information and experiences. Countries with similar problems need to share experiences and adapt approaches to local conditions. Within a country, relevant institutions should have the capacity to widely disseminate appropriate knowledge regarding natural resource management.
Participatory approaches emphasising the needs of local people and other stakeholders and use of traditional knowledge are essential.
Individuals and communities should be supported and trained in various aspects such as skills in organisation, management and accounting; capacity to prepare and implement simple management plans; diversification of income generating activities; techniques for value adding and increasing shelf life of non-wood forest products etc; and markets and marketing development for products.
Projects must be planned to ensure sustainability of the benefits of rehabilitation when project activities come to an end, to prevent the restored land reverting to its pre-project condition.

Research and Training Aspects:

- Research is needed on:

  (a) impacts of policies/legislations, sectoral policies, macroeconomic policies on deforestation and land degradation

(b) valuation and socio-economic aspects of rehabilitated areas

(c) nursery and field trials of single and mixed tree/shrub species for rehabilitation of degraded lands.

- Training and dissemination of improved technologies for rehabilitation of degraded lands should be implemented in close partnership with existing governmental and non-governmental agricultural extension services.