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OPERATIONAL FRAMEWORK FOR USING MULTI-PURPOSE MEDICINAL PLANTS AS ENTRY-POINTS IN LAND REHABILITATION AND NATURAL RESOURCES MANAGEMENT PROJECTS

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GLOBAL ENVIRONMENT FACILITY PROGRAM
THE WORLD BANK



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INTRODUCTION

The accompanying paper *Capitalizing on the Bio-Economic Value of Multi-purpose Medicinal Plants for the Rehabilitation of Drylands in Sub-Saharan Africa* concluded that while drylands constitute a natural low-productivity environment, they have a production comparative advantage for endemic multipurpose medicinal plants (MMP). This local advantage can have greater multiple bio-economic benefits if the plants can be shown to have a global market comparative advantage.

Natural products (herbal medicines) have an estimated global market value of US\$65 billion. At present, there is no information to indicate Africa's percentage of that market. A market share of 1 percent (US\$650 million) would be a major boon to Africa's dryland poor, providing mechanisms could be put in place to ensure equitable sharing of such benefits. MMPs compare favorably with coffee, oil palm, cocoa and cotton as income generators and their value should no longer be

ignored. Furthermore, MMPs do not appear to be affected by OECD market and trade barriers that other commodities from developing countries face. They could present a significant niche and trade opportunity that should be captured and optimized by developing countries especially those in sub-Saharan Africa. The combination of important environmental uses and socio-economic values offers rural communities an opportunity to more effectively utilize their indigenous knowledge to become serious players in the global herbal medicine market.

At present there is no formal Bank process for incorporating MMPs in development projects, nor should there be such a process for all projects. But a business case can be made for including them in certain projects implemented by various agencies. This document provides a framework for project teams to determine whether MMPs should be included in future project development and implementation.



MMPs CAN ENHANCE DRYLAND PROJECTS

The loss of natural resources is a constant complaint of rural communities. Providing communities with the tools and materials as well as the training to manage these resource investments can help restore their resource base. This is especially true for the sustainable harvesting and cultivation of MMPs which can help rehabilitate degraded land, generate household income, provide local affordable healthcare, and help fill the demands of a rapidly expanding global market for natural health products.

There are few published reports of successful land rehabilitation programs in dryland regions.¹ However, those that exist offer important lessons to those considering the use of medicinal plants in land rehabilitation programs.² Appropriate indigenous knowledge in partnership with successful modern technological innovations offer every possibility of yielding even better results.



WHAT IS SPECIAL ABOUT MEDICINAL PLANTS?

Medicinal plants have special features that most rural communities recognize and appreciate. Governments and donors also need to formally acknowledge and consider these features when designing a supporting policy framework.

- Medicinal plants are an essential source of affordable healthcare for the rural and urban poor.
- Management of high-demand medicinal plants can yield important environmental benefits such as land rehabilitation, soil fertility, soil erosion control.
- Medicinal plants are a significant component of biodiversity.
- The collection and sale of medicinal plants are critical to many rural household economies.
- Medicinal plants are primarily collected, traded and used by women.
- Medicinal plants are well suited to local management and offer an alternative source of employment.
- Information regarding source and volumes of supply are generally unknown and incompatible with the demand and effective use of these resources.

Not one of these features is a barrier to developing and implementing effective conservation and management strategies to guarantee sustainability of supply and use. However, governments often confront such issues only when communities ask

for ownership rights to land they wish to develop. Considerable benefits can be obtained, both socioeconomic and environmental, if a proactive approach is taken. Failure to do so will increase the risk that the resource base will disappear and the long-term costs will be greater.

Specific risks include:

- loss of biodiversity and in particular of MMPs harvested in the wild;
- loss of a source of free/affordable healthcare;
- dependence on more expensive synthetic (imported) drugs- if affordable;
- reliance on government primary healthcare delivery — often absent in rural areas;
- overall decline in healthcare.

The interventions proposed primarily target women by acknowledging their roles in:

- home healthcare
- crop production
- livestock herding
- fuelwood collection
- income generation

The land rehabilitation programs proposed can make major contributions to sustainable natural resources management and offer remunerative employment opportunities for women and men, as well as linking rural peoples to urban markets.



HOW TO INCLUDE MMPs

A production comparative advantage for MMPs has been identified. Sustaining that advantage requires strengthening the applied technical capacity of rural communities. The following provides an outline for task team leaders to follow when identifying how, where, and to what degree MMPs can contribute to the development and implementation of successful biodiversity conservation, land rehabilitation and sustainable land management, and agriculture productivity projects. The process follows Bank development procedures for investment lending documentation.

The initial Project Concept Note (PCN) helps identify the level of seriousness the government places on land degradation/desertification, stakeholders who are affected, and their willingness to play a major sustainable role in reversing the process.

The PCN is followed by the Project Appraisal Document (PAD) that identifies how MMPs can contribute to attaining Rural Development and Environmental project objectives. To ensure that these objectives are achieved, two toolkits have been prepared that identify a series of steps communities, and particularly women, can follow to produce documented evidence of: (a) the socio-economic importance of medicinal plants to community well-being; and (b) good practices in nursery propagation, cultivation, and transplanting of MMP seedlings in degraded sites.

While the process focuses on drylands, similar actions could be carried out in any global climatic zones.

THE PROJECT CONCEPT NOTE

In drafting the PCN, consideration should be given to how the proposed actions support the Country Assistance Strategy (CAS), Community Driven Development (CDD) and Poverty Reduction Strategy Paper (PRSP). Also, proposed actions should be closely aligned to national strategies and action plans to address the problems of land degradation, loss of biodiversity, soil fertility, agricultural productivity and income, as well as declining health. In addition, the concept note provides an opportunity to further the role of indigenous and community knowledge in identifying and implementing solutions to address local development problems and effect change. The following factors should be observed in developing the PCN.

COUNTRY CONTEXT AND RATIONALE

- Provide a general statement regarding the status of land degradation/desertification and its effect on: rural poverty, agricultural productivity, soil fertility, and biodiversity
- Promote consideration of an alternative project concept.

GOVERNMENT STRATEGY

- Is the government a signatory to the CBD, UNCCD?
- Has it accepted PRSP, CDD strategies?
- Does it support private sector development?
- Does it provide healthcare delivery systems?

ISSUES TO BE ADDRESSED

- Is there a need/demand for degraded land rehabilitation?
- Is there an ad hoc/informal medicinal plants/products 'industry'? Who are the key players/beneficiaries?

- Can MMPs play a rehabilitation role? Can locally known suitable species be identified?
- Is there community commitment and what are the training needs?
- Can a production comparative advantage be identified?
- Is there government commitment to support such community activities?
- Is the private sector committed to phytomedicine production and developing a market comparative advantage?

OBJECTIVE(S) – CAS GOAL

Ascertain that the CAS covers issues such as improvements in healthcare, the environment, and economic livelihoods in drylands.

KEY ACTIONS

A preparatory fact-finding and initial planning workshop should be organized to bring together all interested stakeholders to identify the baseline information required to develop a plan of action. This workshop should also address the root causes of locally identified land degradation/desertification and outline the initial step for the plan's implementation.

The workshop should address the following tasks:

- Verify whether there is community interest and support for land rehabilitation efforts that improve community and household health and income security using MMPs.
- Identify the level of local MMP knowledge-base and its potential use in land rehabilitation programs.
- Outline a strategic framework for rehabilitation, management and sustainable use of agro-forestry sites with a focus on MMPs.
- Identify knowledge management-based training needs.
- Consider a communication strategy that articulates the benefits of MMPs and sustainable resource management.

- Develop ways and means of ensuring private sector investment in MMP production and marketing with a view to competing in the regional and global markets.

OUTCOME

Guidelines for the development and implementation of a PAD (see below).

THE PROJECT APPRAISAL DOCUMENT

This section identifies key MMP performance indicators that are viewed as steps in the process of achieving objectives for a PAD. The intent is to provide teams with baseline MMP information to ensure a comprehensive project design and implementation to achieve CAS, CDD, PRSP objectives and MDGs.

If possible, funding should be sought to undertake preliminary studies and/or assessments, such as a community socioeconomic survey of medicinal plant use, and/or an assessment of community capacity and training needs to establish and maintain nurseries.

STRATEGIC CONTEXT

THE COUNTRY ASSISTANCE STRATEGY

The World Bank Country Assistance Strategy (CAS) for all SSA countries emphasizes a development agenda based on core themes. Specific project actions³ in which medicinal plants can support CAS goals are: (a) social and rural development through capacity building; (b) poverty reduction through income generating activities and better management of high-demand natural resources; (c) sustainable land management (SLM); (d) involvement of the private sector; (e) healthcare delivery; and (f) expand niche markets and trade opportunities.



Increasingly, governments are acknowledging the value of medicinal plants as components of biodiversity, sources of income generation in agricultural activities, and a major source of health-care for all levels of society. Such recognition is reflected in CDD, PRSP objectives and MDGs.

GLOBAL IMPORTANCE

Virtually every country is rich in medicinal plants, as well as aromatics, essential oils and spices. They are distributed all over and are adapted to all environmental conditions — arid to tropical. Global instruments such as the UNCCD, CBD and GEF all specifically identify medicinal plants as an important component of sustainable land management and global biodiversity, as well as recognizing the indigenous and traditional knowledge of their use in health care.

GOVERNMENT STRATEGY

In 2001 every African head of state declared the period 2001–2010 as the Decade of Traditional Medicine in Africa. Any action that makes the goal of health for all in Africa easier to achieve is one that also helps reduce poverty.

PROJECT DESCRIPTION SUMMARY

Proposed project components could include MMP activities at the site-specific (community) and national levels. For example:

COMPONENT 1. INSTITUTIONAL STRENGTHENING

Consideration should be given to organizational mechanisms for project implementation, developing community intellectual property rights (IPR), inter-sectoral links (Environment, Agriculture, Health, Trade and Development), establishing health and safety standards for MMP products, and capacity building through designing and implementing a training program.

COMPONENT 2. PRODUCT PRODUCTION AND MANAGEMENT

Based on the workshop recommendations and follow up community visits, villagers/healers will have identified MMPs for nursery propagation and cultivation trials.⁴ The identification must be supported by a detailed socio-economic questionnaire identifying use, collecting, marketing, and trade to be completed by each community (see Appendix A). The objective is to demonstrate cost-effective and reliable cultivation practices for the MMPs that can be successfully transplanted in degraded sites and sustainably managed at minimal cost. At the same time, such actions will establish a process for land rehabilitation and offer communities' opportunities to combine tree species with food crops thus further diversifying the use of their lands. Once these techniques have been thoroughly tested, the villagers/healers should be ready to undertake all future activities themselves, as well as assisting other communities to replicate their successes. Training will include establishing nurseries producing MMP seedlings from seeds or cuttings, and transplanting the seedlings to the rehabilitation area.

To ensure that communities identify and maintain good practices in nursery propagation, cultivation and transplantation, a toolkit has been prepared (see Appendix B).

COMPONENT 3. PUBLIC AWARENESS AND EDUCATION

This component should include a subcomponent that identifies the cultural and bio-economic values of MMPs and tells how they are an integral part of the overall project. Subcomponents should include environmental education and public awareness actions that would be outlined prior to project implementation. An important component of education is organized farmer/producer exchange field visits so that communities can see and learn what their contemporaries are doing in other areas. These visits should be explicitly budgeted for and designed into project activities.

COMPONENT 4. INCOME GENERATION ACTIVITIES: MMP QUALITY ENHANCEMENT AND PRODUCT MARKETING

Using high-demand MMPs to rehabilitate degraded lands is an effective way to ensure their conservation. Villagers/healers will be encouraged to grow and manage them sustainably as cash crops. They should be seen as adding value for local use and export — regionally and globally.

Subcomponents could include:

- standardization of MMP raw materials, processing, packaging and transportation;
- promotion strategies that enhance national, regional and global market comparative advantages;
- access to micro-credit; and
- patenting and intellectual property rights (IPR).

(see Appendix B. Marketing Promotion)

PRACTICES AND IMPACTS TO CONSIDER

Traditionally, tribes and neighboring communities used their resources in an amicable and sustainable manner. Today, such is not always the case. Consequently the links between farmers/healers, pastoralists, extension agents, researchers and private sector must be strengthened and sustained to minimize any deleterious impacts for communities to fully benefit from the rehabilitated resource-base. In order to encourage the adoption of sound production and environmental practices the following should be considered.

MONITORING AND EVALUATION OF OUTCOMES AND RESULTS

Appendix C presents examples of the expected outcomes, results, indicators (intermediate, process and final), and the Bank's contribution for measuring project performance. These indicators and their intermediate and final targets could be consolidated in a monitoring and evaluation manual.

SUSTAINABLE CULTIVATION PRACTICES

Degraded land that can be rehabilitated requires that Sustainable Cultivation Practices (SCP)⁵ be followed in design and implementation. See Appendix B for general guidelines for description of general principles and technical details.

ENVIRONMENTAL IMPACTS

The primary objective is to ensure that no further vegetation and soil losses occur. Benefits will be determined by whether:

- Rehabilitation of degraded drylands has a positive environmental impact.
- Sustainability of rehabilitated sites minimizes soil and nutrient loss and will balance inputs with harvest.
- Established tree cover provides cooler temperatures and moderated wet and dry cycles that provide a favorable microclimate for soil micro-organisms.
- Sustainability and use of relevant, appropriate technologies fosters links between communities and research.
- No negative environmental impacts are envisaged with the planting of endemic MMPs.

CROP SPECIFIC IMPACTS

Planting MMPs will not only have a major impact on halting the land degradation process, it also offers communities opportunities to form new combinations of vegetation systems along with recognized local plant combinations.

HUMAN HEALTH AND SOCIAL IMPACTS

Human/livestock health and social impacts must be assumed to be positive if the project is accepted by the community. All the MMPs will be well-known to the users and collectors. Their renewed availability will mean that traditional phytomedicines used by healers and birth attendants ensures healthcare, at least as defined traditionally, is accessible and affordable. The protection and sustainable management of



reestablished plants can ensure a source of income assumed lost due to land degradation. Furthermore, it offers the community an opportunity to seek a market comparative advantage for the medicinal products it can sustainably grow and harvest.

RELATIONSHIP TO BANK INVESTMENTS

Reference in the CDD and PRSP to the importance of medicinal plants to national biodiversity conservation and management and to the role that traditional medicine plays in the provision of healthcare, indicates a country commitment to giving control of decisions and resources to community groups and local governments. Bank investments are designed according to the principles of environmentally sound and economically sustainable development.

PROJECT RATIONALE

Except for a few SSA countries (Ethiopia, Ghana, South Africa, Cameroon) there has been little or no concerted effort regarding MMPs to conserve, monitor, or regulate their harvest, local use, or export.

Development and investment in MMPs encourages wide and open participation of the private sector in helping to develop and sustain production and market comparative advantages.



APPENDIX A

SOCIOECONOMIC SURVEY QUESTIONNAIRE ON THE USE, COLLECTING, MARKETING, AND TRADE OF MMPs

Medicinal plants and knowledge of their use are an integral part of the daily lives of people in developing countries. Women especially play a major role in collecting, vending, and using them in the home. Unfortunately, there is little documented information regarding these activities. The documentation of such information would help highlight the importance of medicinal plants and to sustain them for future community use and trade.

Do neighbors come to you for assistance in treating illnesses?

Are you a traditional healer?

Are you a traditional birth attendant?

Would you be interested in cultivating medicinal plants for income?

How many years of schooling do you have?

QUESTIONS FOR MOTHERS IN THE HOME

What plants do you keep/protect around your home?

Do you use plants from your fields?

What illnesses are they used for?

Who taught you about these plants?

Have you taught your children about their values/uses?

Are they used by your neighbors?

Would you know where to find them in the wild?

How many children do you have?

What are their ages?

How often do you have to use your medicinal plants?

Name the illnesses you treat and the frequency with which you use medicinal plants.

Are they always effective in treatment?

If not, where would you go for treatment:
Neighbor....., healer....., clinic.....,
hospital.....

QUESTIONS FOR HEALERS

Do you collect the medicinal plants you use from the wild...(if so what percent of your total use)?

Do you cultivate...(if so what percent of your total use)?

Do you buy from local markets...(if so, what percent of your total use)?

Are plants easy to find today?
If not, why not?

How many kilograms of plants do you use weekly....., monthly.....?

What diseases, infections, ailments do you treat?

How many patients do you treat weekly.....?

Would you use cultivated medicinal plants in your treatments?

If not, why not?

If yes, would you be interested in learning cultivation practices?

Do you have a young apprentice?

Is he/she eager to increase his/her medical knowledge?



QUESTIONS FOR COLLECTORS

How many different medicinal plants do you collect?

How far do you travel to collect?

How long does it take to collect each plant?

Is the collection time getting longer each year? If yes, why?

Can you collect plants year-round?

List the plant collecting times (months).

Can you identify the locations?

Are any locations protected?

Do other collectors harvest in the same locations? If yes, how many?

Have you any idea how many kilograms of plant material you collect: each trip....., week....., month.....s?

Can you identify the value of plants sold?

Are plants becoming more difficult to find? If yes, which ones? Why?

What can be done to increase availability of plants?

Would the Collectors work together? Or are they too independent?

Can collectors work together to identify sustainable harvesting guidelines?

How much do you earn each month?

QUESTIONS FOR VENDORS

How did you become a vendor?

How long have you been a vendor?

Are you training anyone; daughter/son, niece/nephew, other?

At which market do you sell medicinal plants?

How often is the market open?

How many different plants do you sell?

For which illnesses?

Do you collect all the plants you sell?

If you buy, who do you buy from?

How often?

What quantities do you buy?

What quantities do you collect?

Where do you store?

Can you protect from spoilage?

Do you ever visit other markets to buy?

If yes, what plants?

Is this a major source of income?

What is your monthly income?

Does it vary during the year?

If yes, what are the reasons?

Is there more demand for your plants now than 5 years ago?
If yes: why?

Is it more difficult for the collectors to obtain plants today?
If yes: why?

Do the vendors have an association that could lobby government for their interests?
If not, would you be interested in setting up an association?

APPENDIX B

TOOLKIT FOR PROPAGATION, CULTIVATION, AND MARKETING

MATERIALS PRODUCTION

See Component 2, page 12.

This toolkit identifies a series of steps that rural communities, and particularly women, can follow as best practices in nursery propagation, cultivation, and transplanting of multi-purpose medicinal plants (MMPs) in degraded sites. While the majority of MMPs may be well-known to the users and communities, and in some cases propagation and cultivation documented, community-based research will still be required. Indigenous species need to be evaluated and the best means of survival determined. Throughout this section, the WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants (WHO 2003) should be consulted and techniques applied where appropriate.

In the companion paper, *Capitalizing on the Bio-Economic Value of Multi-Purpose Medicinal Plants for the Rehabilitation of Drylands in Sub-Saharan Africa*, three categories of MMPs are described: those whose propagation/cultivation practices have been identified and some products have been commercialized; those whose propagation/cultivation practices have not been identified, but that have a local market; and less well-known species with medicinal value. This tool kit focuses on the species in the first category.

Initial actions include the need to:

- Map and identify the location of all degraded lands accessible to, and used by, the community;
- Identify the source(s) of plants for nursery propagation and cultivation.
- Secure outside assistance to start the process of land rehabilitation.

ESTABLISHING A NURSERY

PRIMARY STEPS

To ensure a ready supply of medicinal plants, techniques to establish successful land rehabilitation programs must be available and understood. This section outlines methods to help communities propagate and cultivate medicinal plants adapted to semi-arid conditions.

Emphasis is placed on propagation using both seeds and stem / root cuttings. The choice will depend upon indigenous knowledge of the plants and aim at beneficial, affordable techniques for propagating and cultivating a range of species. For example, if propagating from seeds is to be successful, soil type, rainfall and pests are important concerns.

Things to consider when propagating medicinal plants:

- Select successfully established individuals as seed and/or cutting source;
- Select a nursery site that can be protected and easily maintained;
- Avoid unnecessary stress on plants being propagated;
- Prepare the pots and ground well; and,
- Take care of plants until they are well established.

COMMUNITY SELECTION

Land degradation is best addressed at local levels. The central element of this initiative is empowering poor rural communities to take charge of their own development and thereby promote better



community-based integrated management of their resources. While the primary emphasis is placed on MMPs, it can be expected that communities will wish to include, at a later date, the cultivation of food crops. Such a diversity of activities comes under the concept of agroforestry and is both ecologically and economically advantageous. The intercropping of *Acacia albida*, an MMP, with millet and sorghum in the western Sahel is an example of a successful traditional agroforestry practice.

Communities will be selected on the basis of an initial response to calls to combat the debilitating effects of land degradation. In some instances the activities have led to effective controls and halting of degradation, in other cases they have had limited or no effect. There must be an acceptance of a regulatory role and future access to grazing in rehabilitated lands. Such an agro-sylvo-pastoral system, if well managed can bring benefits (i.e., grazing can stimulate growth; manure is a free fertilizer.) A voluntary adherence to the scheme by neighboring communities should be negotiated.

MEDICINAL PLANT SELECTION

In selecting the types of MMPs to be used, consider the following factors:

- endemic trees, shrubs, herbs and grasses that are, or were, commonly found on lands before becoming degraded;⁶
- potential for propagation;
- species identified according to their environment, health and socio-economic values;
- how well they address immediate environmental and human problems;
- reintroduction risks and uncertainty relative to the land degradation status and the drought preparedness;
- species combinations for specific degraded habitats; and
- nursery site selection.

PLANT COLLECTION

Data on reliable collecting practices for medicinal plants are minimal. The Healers/collectors, who have the best knowledge regarding flowering and fruiting seasons for drylands trees and shrubs, should lead collection trips. The location of the best trees/shrubs must be identified and the dates noted when seeds or cuttings are ready for collection. The temptation may be to collect from the most heavily seeding individuals. However, heavy seeding is often related to reduced vegetative growth and not necessarily to efficacy. The number of trees collected from must be recorded. Normally seed should be collected as needed and sown soon after being brought to the nursery. If this is not possible, then the seed should be stored in a cool, dry place away from insect attack.

SETTING UP THE NURSERY

SITE SELECTION

The following factors should be taken into consideration. The site should:

- be easily protected, flat and if possible near a source of water;
- benefit, where possible, from natural shade;
- be within, or close proximity to the community;
- be easily protected from livestock and humans; and,
- have ensured to the future use of the landrights.

NURSERY PREPARATION AND MANAGEMENT

The purpose of the nursery is to provide material from which to propagate medicinal plants. These materials should be manageable within the nursery. Seedling beds should be no wider than 10 pots (120 centimeters) and as long as is convenient. The bed should be raised to ensure that excess rain drains away at the sides, but does not damage or destroy the pots. A path should be left between beds to allow easy access. Polyethylene bags are the cheapest and most convenient “pots” to propagate plants. The soil in the bags should be finely graded, without stones or debris to ensure even germination and growth.

Water must be available during the initial stages of germination and growth. Plants require even moisture. The stock plants should be of the kind that can establish rapidly under low soil moisture conditions. The consequence of poor watering is that roots will remain close to the surface making transplanting less successful and susceptible to drought. Mulching, using cut plant materials and/or dung will provide needed nutrients to ensure growth.

PROPAGATION AND CULTIVATION METHODS

Seeds, if they germinate, can produce many plants at once and they can be collected and transported easily. The main problem is failure to germinate or loss through transplanting. The seeds of many species require special pretreatment before satisfactory germination — soaking in water (hot or cold) or scarification. Others will require a dormancy period after they have been released. Generally, germination will be enhanced at the start of the rainy season.

The following actions need to be applied:

- Investigate appropriate pre-germination treatments in advance and apply just before sowing.
- Sow enough seed for your use.
- Ensure that each nursery bed is labeled so there is no confusion as to which species you sow.
- Keep records of all plantings made — successes as well as failures.

GERMINATION FROM SEED

There are several ways that seeds can become plants. Seeds may be spread evenly over the prepared seedbed. After sowing, lightly rake over the soil to ensure good seed-soil contact. Or, if the seeds are large (e.g., *Acacia* spp.) plant them individually in polyethylene bags.

Use moist soil when planting seeds in polyethylene bags. Seeds should be planted at a depth of 2 centimeters or more. They can be planted by making a

hole and dropping one or two seeds into it. Cover the holes with soil.

VEGETATIVE PROPAGATION

Vegetative propagation of plants is preferable when seed production or germination is very low, or when viable seed is unavailable. Vegetative (non-reproductive) propagation uses part of the plant stem or a piece of root that can grow directly into a new plant. It is a common practice in horticulture for propagating plants with particularly desirable characteristics. It is used extensively with some species in forestry, and is particularly appropriate for certain MMPs.

Jatropha curcas branches will take root quickly when placed on ground, but care is needed to ensure they are protected from livestock.

PROPAGATION FROM STEM CUTTINGS

The stem is commonly used for propagation. Collect small branches of vigorous growth, preferably with leaf buds, that show no signs of pest or disease. Prevent them from wilting by not collecting in the heat of the day or if there will be a long time until planting. At the nursery, cuttings should be trimmed to a length of 3–12 centimeters depending on the space between leaves. Insert two thirds of the stem into the prepared bed or polyethylene bag of soil and press the soil down firmly. Water and keep shaded.

Bauhinia refuscens

Cuttings root in 2 weeks. Root better in sand or sand-gravel mixture

Commiphora africana

Cuttings from trees planted where needed, requires frequent watering until established.

Jatropha curcas

Cuttings strike easily so reproduction not a problem. Low drought and disease resistance.



PROPAGATION FROM ROOT CUTTINGS

Cuttings can be taken from the main part of the root system without destroying it. Make sure the source root system is re-covered with soil. Place the root cutting horizontally in the soil bed, cover lightly with soil, and firm down. Water as necessary. Roots develop between 4–8 weeks after planting.

Balanites aegyptiaca

Root suckers viable. Root pruning can be detrimental to growth.

Harpagophytum procumbens

Vegetative propagation by the primary root. Care must be taken not to cut the parent tuber

UNDERCUTTING SEED BEDS

Drawing the machete blade at ground level under a raised bed of young plants is called undercutting. This is a useful technique to help young plants develop a fibrous root system, resulting in good plant establishment when they are transplanted to their final site.

TABLE 1. HARVESTING, STORAGE, PROPAGATION, AND CULTIVATION OF SELECTED SPECIES		
SPECIES	HARVESTING/STORAGE	PROPAGATION/CULTIVATION
<i>Acacia senegal</i>	seeds stored in air tight containers	water soaked, individual seeds planted, nursery time 3 months, protect from browsing reproduce by cuttings.
<i>Acacia albida</i>	Pods fed to cattle, seeds collected from droppings	scarify seeds, plant in deep pots, rapid growth, protect from browsing
<i>Acacia tortilis</i>	Pods dried in sun. seeds extracted by pounding pods. store in airtight containers	individual seeds planted, transplanted seedlings widely spaced, protect from browsing, early growth slow
<i>Bauhinia refuscens</i>	9– 10,000 seeds/kg, store well for 1 year	break dormancy by boiling, nursery time 4– 6 months
<i>Balanites aegyptiaca</i>		flesh removed from seed, soak in cold water, directly sow in pots
<i>Commifera africana</i>		
<i>Jatropha curcas</i>		grows readily from seed
<i>Prosopis africana</i>		seeds treated in tepid water for 24hr, slow growing transplant after 2– 3 months, weeding required
<i>Salvadora persica</i>	store no more than 1 month	no seed dormancy must remove germination inhibitors
<i>Sutherlandia frutescens</i>		seed readily germinates, do not over-water

PRODUCT MAINTENANCE

SHADE

Direct sunlight should be limited therefore shade may be necessary to protect nursery areas. Frequent watering is necessary, especially where rains are unpredictable, to produce vigorous planting stock. Heavy shade reduces moisture loss, but tends to result in weak seedlings. Because drylands receive minimal precipitation, planting and transplanting should take place just before or during the rainy season.

PEST CONTROL

Farmers, in their traditional wisdom, use a variety of plant products and extracts for pest control, especially in storage. A commonly used botanical readily available in West Africa is neem (*Azadirachta indica*). A neem seed extract (2–5 percent) is effective against a number of pest including aphids, mites, hoppers, cutworm, and backmoth. This species, introduced from India, is widely available throughout SSA and in itself offers an opportunity for rural women to process and market as an organic biocide.⁷ No doubt farmers will have knowledge of other local plant extracts as well as predators. Neem is easy to prepare and use, and is safe for humans, animals, and the environment.

ORGANIC PRODUCTION

The international market demands organically grown plant products. MMPs products that can be documented to be grown, stored, and/or processed without the use of synthetically-produced chemicals or fertilizers, herbicides, insecticides, fungicides, or any other pesticides, growth hormones or growth regulators will likely be more attractive to this market.

TRANSPLANTING SEEDLINGS AND FIELD PREPARATION

When seeds or cuttings have established an adequate root system that sustains them they should either be replanted in a larger pot or to the field site. The seedlings are ready for transplanting when true leaves have grown or when the roots are visible in the bottom of the pot. Replanting can be stressful to young plants. Plants must be watered the day before transplanting. Ensure to loosen the soil around the pot using a stick or small trowel before lifting. Do not bruise the stem as it is likely to rot.

Always carry out the operation in the cool of the day and in the shade. Do not handle the plant too often and keep the roots cool throughout. Prepare the new planting area before transplanting. Have the soil well mixed and moist. Make sure newly transplanted plants are watered well and if possible shaded for a few days.

Seedling spacing is crucial. It is determined by the space requirements of the adult plants of the species. Also space plants to minimize interference with other species' seedlings and possible crop cultivation. General guidelines may be drawn from examples. Density for *Acacia albida* ranges from 40–60 trees per hectare and *A. senegal* up to 300 per hectare. Transplanting seedlings for the two species would need the following spacing: 10 x 10 and 4 x 4 meters respectively. Some species, such as *Commiphora africana* can be planted very closely and act as fences to protect more widely spaced seedlings.

Maximum seedling establishment can be achieved by using, where appropriate, a number of different water management schemes that have been used effectively by different Sahelian communities. They include the following.



(a) *Zai/tassa* is a traditional planting pit used to rehabilitate crusted land with a hard-pan surface. They usually have a diameter of 20–30 cm and a depth of 10–15 cm, dimensions vary according to soil type. The number of *zai* per hectare can vary from 12,000 to 25,000. The larger the planting pit the more water can be confined. Digging 1 hectare of *zai* takes about 60 work days. Pits should be dug in the dry season to trap litter and fine earth particles which will attract termites and help increase soil fertility (Hassan, 1996; Wedum, *et. al.*, 1996; Ouedraogo and Kaboré, 1996).

(b) Terraces on sandy soils are characterized by ease of infiltration, as water erosion is not usually a problem. Trash lines are most commonly used to build terraces on sandy soils. For heavy clay soil infiltration is slow and terraces are needed to capture the water and allow time for infiltration. Stone bunds are best constructed along contours and reinforced with earth. They are effective against sheet erosion and gullyng (Kassogué *et. al.*, 1996).

(c) Liman low point catchment, natural retention basins, are used for catchment stabilization, oasis production, temperature modification and fodder or shelter production. This is a very successful technique for revegetating arid environments with tree species (Weeks, 1997).

(d) Ditches may be dug to redirect rainwater into fields or to rehabilitated lands. Runoff is impounded by the use of earth bunds. The entire plot may be a hectare or more in size. The alignment of the bunds is by eye and by experience. To prevent waterlogging, the bund may be breached (Prinz, 1996. Water harvesting — history, techniques and trends).

(e) Savanization is the sparse planting of trees, and is currently considered to be an effective way to prevent land degradation in semi-arid ranges. Trees reduce soil erosion. Leguminous trees may add nutrients to the soil, and they furnish needed shade for small grazing animals. Such a combination of

uses comes under the term agro-sylvo-pastoral⁸ systems. Its application where MMPs are used needs to be further examined to determine appropriateness in land rehabilitation programs.

GENERATING INCOME: PRODUCT ENHANCEMENT AND MARKETING

See Component 4, page 13.

One of the best ways to conserve MMPs is to ensure that they have actual or potential economic value. Thus communities will look after them in the wild, and be encouraged to manage them sustainably and grow them *ex-situ* as a cash crop.

Advances in research techniques have allowed the conventional and natural products pharmaceutical industries to conduct large-scale natural products screening programs which have increased demand for natural products, many collected from developing countries. The bulk of these samples are collected by subcontracted collectors, most of whom are resident in developed countries. Simultaneously, there are an increasing number of small phytopharmaceutical companies being established in developing countries.

This informal subsector in Africa has immense potential as the sustainable commercialization of MMPs can benefit local communities by providing culturally acceptable, effective medicines at affordable prices. Products that can be regionally and globally traded will command higher prices that benefit both producers and processors. Local companies, in collaboration with communities, stand to benefit by ensuring a sustainable supply of quality raw products to build and sustain trade and an evolving industry. Together, they can build a partnership to provide locally affordable phyto-medicines and high-demand value-added products for developed countries.

Considering the low value of many medicinal plant species in the raw form, a strong case can be made for community-based enterprises to add value through simple, on site techniques such as, drying, cleaning, grinding, grading and packaging. This will increase the community's profit as well as its stake in conservation, management and sustainable utilization.

The purpose of this component is to add value to MMPs for local use and exports by producing organically-grown and certified plants, ensuring proper handling and grading of MMPs and using the correct procedures to ensure quality products. Communities and processors need market intelligence and assistance in searching for new markets and MMP-based products. In order to ensure that the disadvantaged, including women, can play an active role in the MMPs industry from start to finish, access to micro-credit schemes will be essential.

Activities may be considered under the following subcomponents:

STANDARDIZATION OF RAW MATERIALS

FIELD MANAGEMENT

Community cultivators of MMPs need to understand the costs and benefits regarding their investment in rehabilitation and cultivation programs. Costs and benefits may vary depending on the selection of species, the use of agrotechnology, the harvesting technology, post-harvest management, and lastly the marketing prospects. The diverse nature of successful factors means that proper monitoring is crucial. Proper selection of high-valued varieties/strains can ensure economically viable rehabilitation of degraded lands.

HARVESTING

Harvesting is an important operation in the production process as it largely determines the quality of the final product and thus its economic value. The job will most often be labor intensive and

carried out by unskilled workers. From the commercial aspect, harvesting must be performed by skilled workers. Therefore, optimal methods of harvesting must be adopted or worked out in the absence of a foolproof system. Each species will have specific harvesting needs (e.g. leaf, fruit, seed) as well as other needs, such as not removing more bark or root material than the plant can sustainably yield. Re-covering the bark and or roots after harvesting ensures future sustainable harvesting.

Many of these practices may already be documented, but more likely must be identified by the communities. Communication, training, and collaboration between communities will be beneficial.

DRYING

Once harvested, and before processing or exporting, the plant products need to be dried. Drying reduces the moisture content of the raw plant material so as to improve its quality and increase its resistance to micro-organisms and/or plant pathogens. Drying inhibits partial enzymatic reactions. Cutting or slicing enhances drying. Flowers should be dried in the shade to retain color and volatile content. Drying can facilitate grinding. The advantage that drylands communities have is the ability to benefit from natural drying by the sun and low humidity. The actual drying process for individual MMPs must be identified by each community.

STORAGE

Making sure that stored materials are free from dirt and foreign organic materials is important so as not to affect drug efficacy, safety and quality. Each community, healer and/or collector will have a method for packaging and storing products to minimize degradation and ensure highest prices. Such methods need to be documented, standardized, and followed.

Dried plant products can be successfully stored in drylands because there are few insect pests and because the low humidity retards mold and fungus. But precautions must be taken. If the moisture



content of stored materials increases, the plants may have to be discarded. To protect against insects and pathogens, most communities use natural biocides. It was suggested under Product Production that Neem is an effective biocide and its use in stored materials should also be considered. Care must be taken to ensure such biocides do not contaminate the active ingredients. Materials should not be stored in paper or plastic bags. If possible use air-tight, moisture-proof containers. Africa is inundated with discarded plastic bottles that could be cleared and used.

MARKETING PROMOTION AND ADDED-VALUE

Supplying demand-driven markets offers market opportunities to communities and businesses in developing countries

For the most part, providers of raw medicinal plant materials have limited opportunities to add value to their MMP products. Processes for extracting active ingredients, require a level of training not readily available or able to be efficiently practiced by rural communities. This does not mean that communities and the processors of raw materials should not seek to identify simple processes that can be carried out by communities to ensure added-value.

Commercial MMP farmers will need to master knowledge of medicinal plant growth and development, as well as techniques for appropriate production and collection with the objective of receiving a uniform, quality bioactive ingredient. Healers and collectors, in general select the time and seasons for collection depending on the plant parts used. But in cultivation they will be asked to handle larger quantities than they currently collect.

MMPs endemic to the drylands have a built-in production advantage in that they can not be grown economically in any other environmental zone. This benefit can be exploited and made sustainable by rural communities by developing a market advantage using the guidelines presented above. Assistance will be needed since most SSA governments have not invested in the development of a traditional medicine market that takes advantage of growing regional and global demands for natural products — medicines, cosmetics, essential oils, etc.

Developing a market advantage will also benefit from donor support in helping to identify what the market wants. Communities will need assistance to ensure that their products:

- have an identity that sets them apart from competitors;
- are better environmentally than competitors;
- provide an environmental claim or brand: i.e., rehabilitating degraded lands; organically grown; produced by women;
- have an indigenous “Green or Sustainable Harvesting Seal”;
- are safe, effective, and durable (shelf-life).

COSTS AND BENEFITS

It will be necessary to consider the nursery/cultivation costs, field management, yield of raw materials, and gain in financial terms of the plants grown and processed at the community. The expenditure figures are the average costs of cultivation processes (input costs), harvesting, storage, land lease costs, etc. Yield will be based on production of different species. Income will reflect selling prices of the plant products.

INFORMATION

Lack of information on aspects like propagation, harvesting methods, prices, marketing, and

research, policies is a challenge even at the best of times. When trying to provide rural communities with such information the problems are compounded. Business interests have an important role to play in ensuring that communities have up-to-date information. A process must be implemented that provides information on:

- geographical distribution and resource-base;
- market status of drylands medicinal plant products;
- policies that affect local, regional and international production and marketing activities;
- pricing patterns for equitable distribution of profits from community to consumer;
- coordination of collaborative research;
- government transparency regarding all activities related to MMP production and marketing.

FACILITATING ACCESS TO MICRO-CREDIT

Obtaining credit for income-generating activities is vital, especially for rural communities who have little, if any, collateral as loan security. Cooperative arrangements with on-going initiatives that provide micro-credit to the poor should be explored.

PATENTING AND INTELLECTUAL PROPERTY RIGHTS

Seek to ensure that such activities generate significant benefits while minimizing costs, such as higher priced medicines and plant materials (seeds, cuttings, etc.). See UK Commission on Intellectual Property Rights (DFID, 2002) for pointers on appropriate guidelines.



APPENDIX C

RESULTS FRAMEWORK

WHAT RESULTS ON THE GROUND ARE IMPORTANT COUNTRY OUTCOMES			
FINAL OUTCOMES	HOW DO WE MEASURE RESULTS? FINAL INDICATORS	INTERMEDIATE OUTCOMES	HOW DO WE MEASURE RESULTS? INTERMEDIATE INDICATORS
<p>Communities have restored vegetation and re-introduced profitable agro-forestry production system for the drylands</p> <p>Increased trade integration into the global economy to support growth</p> <p>Improved human and livestock healthcare</p>	<p>x communities and x population served and benefiting from rehabilitated lands that provide traditional sources of healthcare and new sources of employment and income</p> <p>Change in exports as a share of GDP</p>	<p>x communities established nurseries and rehabilitation sites</p> <p>High-demand phytomedicines and cultivation practices identified</p>	<p>x communities and x population benefiting from new employment opportunities.</p> <p>Evidence that land degradation halted</p> <p>Contribution to global market established</p> <p>Quality of Life (Gini) Index</p>

HOW DOES THE BANK CONTRIBUTE TO THESE RESULTS? BANK STRATEGY	HOW DO WE KNOW IF IMPLEMENTATION IS ON TRACK? PROCESS INDICATORS	
	COUNTRY	BANK
Investment in community facilities and capacity building	National investment in land rehabilitation	Alignment of regional business plans with Bank strategy
Technical assistance to develop and implement sound policies for sustainable production and marketing comparative advantages	National investment in phytomedicines Community healthcare improved	Prioritization of phytomedicine trade Satisfactory QAG of new trade-related options
Analytical Advisory Services	Improved trade logistics Country progress reports on implementation progress	

ENDNOTES

- ¹ International Workshop on the Dryland Land Degradation Assessment (LADA) initiative. Rome 5–7. December 2000.
- ² Communities involved in successful land rehabilitation programs have been identified in Keita, Tahoua Department, Tanout, Zinder Department, Niger; Gourga, Yatenga Province, 6 northern provinces Burkina Faso; Khwai Village, Botswana
- ³ These should reflect in greater detail actions identified in the PCN
- ⁴ A similar process identified in the Land Rehabilitation paper should be followed regarding the selection of endemic MMPs e.g. (i) propagation practices identified and products commercialized; (ii) propagation practices not identified, local market known.
- ⁵ In whatever country or region a community-based rural development project is proposed a number of MMPs can be identified as potential land rehabilitation species regardless of climatic zone.
- ⁶ Species identified in the Land Rehabilitation paper should be considered on the basis that they are, or were, present on community lands before being degraded.
- ⁷ Community-based production details are available from India.
- ⁸ Agro-sylvo-pastoral systems combine woody plants with grasses and other herbaceous fodder plants, an association that is both ecologically and economically advantageous.



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