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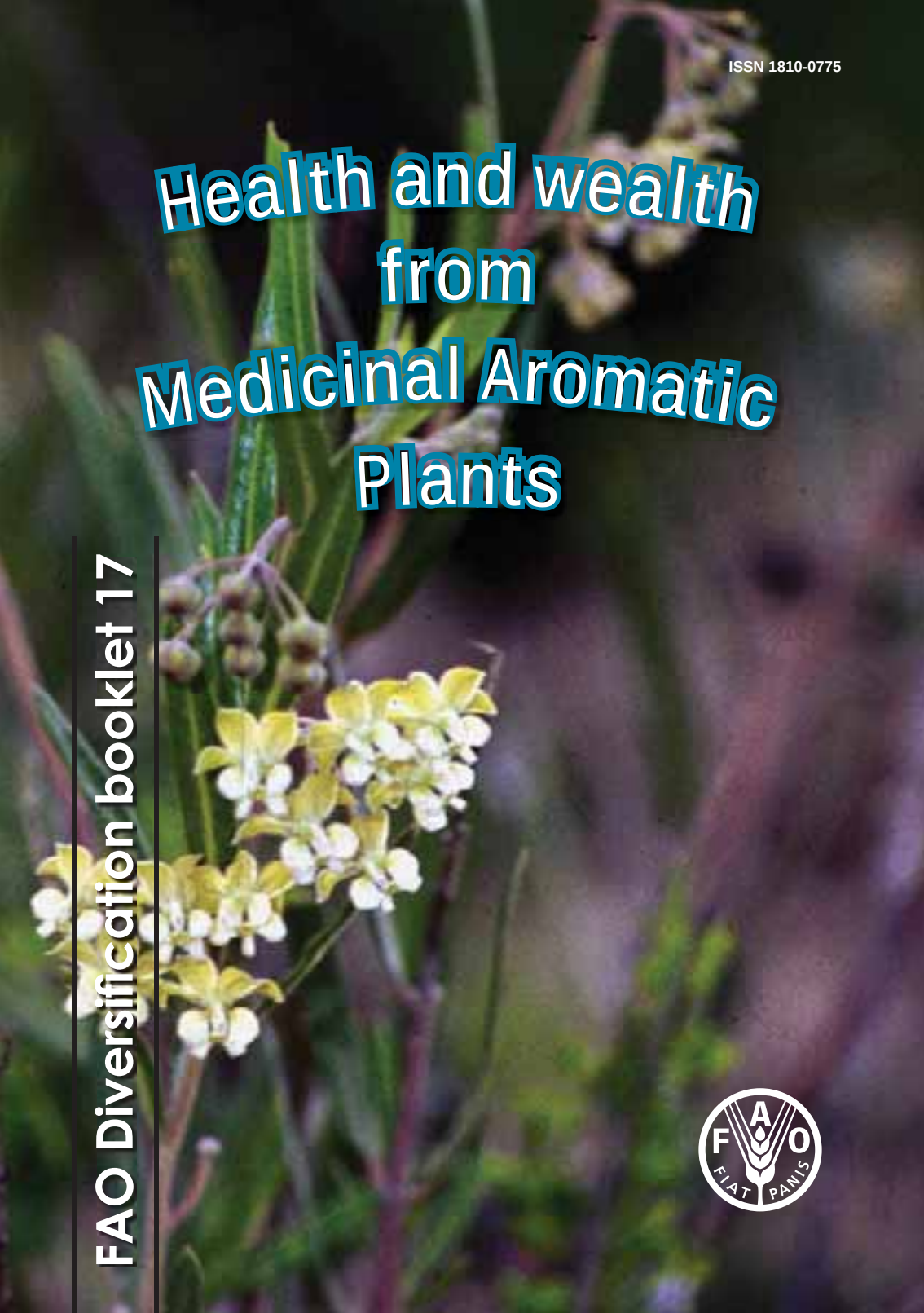
Health and wealth from Medicinal Aromatic Plants



FAO Diversification booklet 17

Diversification booklet number 17

Health and wealth from Medicinal Aromatic Plants

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Preface

The purpose of the FAO Diversification booklets is to raise awareness and provide decision support information about opportunities at farm and local community level to increase the incomes of small-scale farmers.

Each booklet focuses on a farm or non-farm enterprise that can be integrated into small farms to increase incomes and enhance livelihoods. The enterprises profiled in the FAO Diversification booklets selected are suitable for smallholder farmers in terms of resource requirements, additional costs, exposure to risk and complexity. The products or services generated by the enterprises are suitable for meeting demand on a growing, or already strong, local market and are not dependent on an export market. However in this particular booklet, export markets are considered. This is because local markets are influenced by international market demand for some Medicinal Aromatic Plants and there is a high demand in export markets for certain Medicinal Aromatic Plants.

The main target audience for these booklets are people and organizations that provide advisory, business and technical support services to resource-poor small-scale farmers and local communities in low- and middle-income countries. It is hoped that enough information is given to help these support service providers to consider new income-generating opportunities and how these might enable small-scale farmers to take action. What are the potential benefits? What are farmer requirements and constraints? What are critical 'success factors'?

The FAO Diversification booklets are also targeted to policy-makers and programme managers in government and non-governmental organizations. What actions might policy-makers take to create enabling environments for small-scale farmers to diversify into new income-generating activities?

The FAO Diversification booklets are not intended to be technical 'how to do it' guidelines. Readers will need to seek more information or technical

support, so as to provide farmer advisory and support activities relating to the introduction of new income-generating activities. To assist in this respect, each booklet identifies additional sources of information, technical support and website addresses.

A CD has been prepared with a full series of FAO Diversification booklets and relevant FAO technical guides, together with complementary guides on market research, financing, business planning, etc. Copies of the CD are available on request from FAO. FAO Diversification booklets can also be downloaded from the FAO Internet site.

If you find this booklet of value, we would like to hear from you. Tell your colleagues and friends about it. FAO would welcome suggestions about possible changes for enhancing our next edition or regarding relevant topics for other booklets. By sharing your views and ideas with us we can provide better services to you.

Acknowledgements

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Acknowledgements for the series

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Introduction

Medicinal Aromatic Plants

Medicinal Aromatic Plants (MAPs) play a valuable and important role in economic, social, cultural and ecological aspects of local communities the world over. Medicinal Aromatic Plants (MAPs) can be defined as botanicals that provide people with medicines - to prevent disease, maintain health or cure ailments. In one form or another, they benefit virtually everyone on Earth through nutrition, toiletry, bodily care, incense and ritual healing (Medicinal and Aromatic Plant Working Group, 2010). Medicinal Aromatic Plants (MAPs) grow in almost all terrestrial and some aquatic ecosystems around the world. However increasing demand on plants and their habitats are threatening many species harvested from the wild. Cultivation of MAPs is thus a feasible diversification enterprise for many small-scale farmers as demand is high, trade opportunities are increasing and the income generating potential is good (see Figure 1 and Case Study 1).

FIGURE 1 Medicinal products displayed for sale in a retail outlet
(Photo: FAO/FO-7222/ A.A. Ze)

Medicinal Aromatic Plants (MAPs) are an integral component of many local trade supply chains. They are part of traditional medicine systems found in numerous local communities around the world, and comprise a wide range of species which have different sources, characteristics and uses. Since time immemorial these products have made a significant contribution to human health and well-being as well as contributing to farm household income generation through trade. 'Traditional medicine' is defined by the World Health Organization (WHO) as the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness.

CASE STUDY 1 **Community-based cultivation of commercially used MAPs and their integration in home healthcare in Bunza village, MpigiDistrict, Uganda**

Bunza, a village in Kalamba, Mpigi district, central Uganda, is an impoverished community with low earnings and poor access to healthcare services such as clinics. The people rely mainly on MAPs to meet their healthcare needs, especially for common minor complaints and to treat malaria.

Some MAPs have become commercialized and are traded to Kampala, about 30 kilometres away, with the result that some have been over-harvested and are now locally endangered. An example is the small tree *Psorospermum febrifugum,* the trunk and root bark of which has gained a reputation for effectiveness in treating skin infections and for body nourishment. Today's market price in Kampala for dried *Psorospermum* bark is TSh5 000-10 000 (US$3-6) per kilo – providing an opportunity for collectors to make good money in the local context. Another example is *Albizia coriaria,* the trunk bark of which the active ingredient is found in many locally produced ointments used for skin infections. *Albizia coriaria* became increasingly the target of destructive exploitation as it replaced the dwindling *Psorospermum febrifugum*.

A project set up by Plantlife International in the village of Bunza sets out to conserve and promote sustainable access to MAPs in Bunza for the benefit of local healthcare and livelihoods. More specifically two of the primary objectives focus on i) the development of a village nursery for MAPs, including training for the community on the collection of seed from wild plants and the raising of seedlings and ii) importantly training local community members to plant out seedlings from the nursery into their farms or back into the wild in order to enrich wild populations.

Source: Adapted from Plantlife International. 2008. MAPs in conservation and development, case studies and lesson learnt, Salisbury, United Kingdom

Livelihoods and sustainable development

There are many situations where MAP activities can be especially valuable for livelihoods because they are an accessible option to most: harvest for subsistence or trade requires access to natural assets, basic species knowledge, and some willing labour. Medicinal Aromatic Plant (MAPs) trade is essentially the process of converting natural resources into income, drawing on social, physical and human assets to do so. The more sustainably managed the asset base, the greater the potential for a successful activity.

An estimated 400 000 tonnes of MAPs are traded annually and more than 70 percent of the plant species used in herbal medicines, cosmetics, and other plant-based products are harvested from the wild, and the demand for them is globally increasing (Leaman, 2008). Coupled with land conversion and habitat degradation in many regions, it means around a quarter of such species are under threat. In Europe, at least 2 000 MAP species are traded commercially and as many as 1 300 species being native to Europe. The increase in demand for MAPs is putting pressure on natural resources. The European Plant Conservation Strategy (EPCS) states that 90 percent of MAP species native to Europe are still collected from the wild. Approximately one quarter of plant species used for medicine, cosmetics or dietary supplements, are threatened with extinction (see Box 1).

BOX 1 **Recognised threats to wild harvested MAP species**

The Medicinal Plant Specialist Group of the World Conservation Union (IUCN) predicts that at least 15 000 plant species used in herbal products could be threatened, many as a direct result of unsustainable collection practices. This pattern is likely to continue into the future as a result of the costs (time, research, technology, land, and other agricultural inputs) of domestication and cultivation of species. Moreover, cultivation is not necessarily the most beneficial production system for many plant species. For many collectors, economic benefits and conservation incentives are derived from sustainable wild collection. Cultivation is unlikely to meet the demand for raw plant material, particularly for species that are slower growing, that are used in low volumes, that do not command sufficiently high and stable prices in the global market, or that are believed to be more potent in their wild form.

Source: Adapted from The Convention on Biological Diversity, 2010 (Available at http://www.cbd.int/)

The past 30 years have witnessed a rapid growth of interest in MAPs among both conservation and development organizations, in part as a result of the vital livelihood contribution these goods make to large numbers of rural communities for subsistence and trade, but also as a result of the negative impact that over harvesting has had on some species and ecosystems (see Box 2). Historically the major consumption of MAPs was related to local subsistence. The shift within many developing countries from subsistence to commercial usage (trade) has created an increase in the intensity and frequency of wild plant harvesting. In the presence of limited cultivation options, popularly traded species have become over-exploited or indeed commercially extinct, resulting in forced exploitation of alternative species, or a geographical shift to other areas (Diederichs, 2006).

BOX 2 Unsustainable wild harvesting of *Prunus Africana* trade from Madagascar and Cameroon

The bark of *Prunus Africana* - harvested exclusively from wild populations – was used in Europe to produce herbal remedies to treat prostrate problems. The product was traded in a variety of forms: unprocessed dry bark, bark extracts, brand-name capsules, a component hair tonic (used in Japan), and local trade in timber and furniture from the wood. Most of the processing of the bark occurs in the European Union. The annual export volume to Europe was about 3.3 tonnes in mid-1990s, and up to 72 percent of this raw product was harvested in Cameroon; 18 percent from Madagascar; 6 percent from Kenya, and 4 percent from the United Republic of Tanzania.

Source: Adapted from Diederichs, N (Ed.). 2006. Commercialising MAPs. A South African Guide, Sun Press, African Sun Media, Stellenbosch

In 1995, growing demand and unsustainable harvesting methods helped include this species in Appendix II of the Convention on International Trade in Endangered Species (CITES), and in 2006 CITES recommended that trade be banned until exporting countries could develop management plans, together with tree inventories, to ensure that the tree was sustainably grown and harvested, and as such, the European Union, the largest importing market for Cameroon, voluntarily suspended trade. However, the government of Cameroon has approved a national management plan for *Prunus africana,* which may see the trading of bark back on the international market.

Source: Adapted from http://www.cifor.cgiar.org/Headlines/prunus-africana.htm Accessed June, 2010.

If conserved, MAPs will continue to be available to provide continuing benefits for healthcare, income and support of cultural heritage. Issues for conservationists include:

- conservation of species and their genetic diversity;
- ensuring sustainability of both cultivation and wild collection by small-scale farmers and rural populations;
- motivating people's interest in MAPs to facilitate species and habitat conservation.

The livelihood issues include:

- making the health benefits of MAPs available at local, national and international levels;
- achieving responsible distribution of the benefits and the costs of managing and exploiting such resources.

Purpose of the booklet

This booklet is intended to promote and create awareness about MAPs as a feasible diversification enterprise for small-scale farmers. It highlights the challenges and opportunities associated with MAPs as a diversification enterprise, and presents small-scale cultivation options, processing, marketing and selling strategies to achieve a successful livelihood diversification option for small-scale farmers.

FIGURE 2 Traditional medicines on sale in a market
(Photo: FAO/CFU000742/ R. Faidutti)

Benefits of Medicinal Aromatic Plants

Medicinal Aromatic Plants (MAPs) can help small-scale farmers to strengthen their livelihoods directly through income generation from their trade as well as health care provision. With strengthened livelihoods comes greater access to a wider range of assets, and a capacity to build these into successful and sustainable activities, thereby reducing vulnerability to poverty in the longer term.

Contribution to sustainable livelihoods

For millennia, people have relied on nature – plants, insects, animals and fungi - for their healthcare. Communities, through time, have discovered innumerable plant species with various medicinal uses, and accumulated considerable ethno-botanical knowledge to enhance the quality of their lives. The origins of traditional herbal medicine predate all existing records, and this ancient knowledge, across different parts of the world, is enormous.

An estimated 50 000 – 70 000 species of higher plants - 1 in 6 of all species - are used in traditional and modern medicine throughout the world, and many more species are important to the growing market for plant-based cosmetics and other products, representing by far the biggest use of the natural world in terms of number of species (Leaman, 2008).

Today, in many developing and transition countries these species make an essential contribution to health care, providing the only effective medicine for the significant proportions of the population, where other forms of medication are either unavailable or unaffordable. An estimated 80 percent of the population in Africa and Asia rely largely on these plant-based drugs for their health care needs, and the WHO (2008) has estimated that in coming decades a similar percentage of the world population may well rely on plant-based medicines.

Most of these species are used only in folk medicine and the majority of the MAP trade occurs within countries at local level (FAO, 1997a; Hamilton, 2004; Diederichs, 2006). These local markets provide a potential lucrative trade opportunity for small-scale farmers to diversify into (see Case Study 2). However

approximately 3 000 of these plant species are traded internationally. The Secretariat of the Convention on Biological Diversity values the annual global export of MAPs at US$1.2 bn (based on customs value declarations — the real situation is likely to be higher, based on actual invoiced prices). Some 30 percent of the drugs sold worldwide contain compounds derived from plant material (FAO, 2005a).

Approximately 100 plant species have contributed significantly to modern drugs: the anti-cancer compound taxol is extracted from the Pacific Yew Tree (*Taxus brevifolia*), and phytochemicals from *Pterocarpus osum* are used in the treatment of sickle cell disease (FAO, 2009). Although phyto-pharmaceuticals are heavily regulated and mainly in the hands of large processing firms for medicines, there exists good potential for small-scale farmers to grow plants on a contract farming basis for such large firms.

CASE STUDY 2 **Medicinal Aromatic Plants and trade**

Plants were the first medicines and remain an important tool for treating illness in most cultures. Today the commercial demand for these medicines exceeds supply in many cases, and the unregulated collection of these plants has the potential to endanger plant species' survival in the wild. Given the expanding use of herbal remedies, coupled with the minimal practiced cultivation of medicinal herbs-it is reasonable to conclude that collection of plants is often unsustainable. For example:

- in Ecuador, Cascarilla cinchona pubescens - the original source of the potent anti-malarial drug Quinine-may be threatened as a result of overexploitation;
- in Eastern Europe, unsustainable collection of the wild herb Pheasant's eye, Adonis vernalis - which is used to treat cardiac ailments - has led to dramatic declines throughout the plant's range, and today the species is protected from collection in many countries;
- Orchids are an important ingredient in traditional Chinese medicines; yearly, tens of thousands of orchids (*genus Dendrobium*) are used to make products that are shipped to Hong Kong for consumption;
- in the United States of America, American ginseng (*Panax quinquefolius*) and Goldenseal (*Hydrastis Canadensis*) are collected in the wild in large quantities. Although much of the ginseng exported from the United States of America is now cultivated, enough collection of the wild plant occurs that trade in the species is now carefully regulated. Both ginseng and Goldenseal are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which regulates international trade through a permitting system.

CASE STUDY 2 **Medicinal Aromatic Plants and trade** *(Cont.)*

Much of MAP trade is within the informal sector and within borders, not between, so it is difficult to accurately estimate and regulate. International trade of about 20 plant species is regulated because of the pressures of herbal medicine, and an additional 200 plant species used in herbal remedies are regulated in trade, largely as a result of pressure from the herbal medicine market. In Europe many countries regulate or prohibit trade in species whose populations have evidenced decline in recent years, however, in many countries where endangered MAPs are found - particularly in Africa and Latin America - there is insufficient protective legislation and what laws exist are often inadequately enforced.

In the cases where MAP species are protected from trade, smuggling occurs if the plants are rare and valuable enough to risk the consequences. For example, wild Asian ginseng, which grows only in two provinces of far-eastern Russia and one province of the People's Republic of China, is protected from trade in these two countries. But the finest specimens of wild Asian ginseng sell for tens of thousands of dollars per kilogram, creating a tremendous incentive for poachers, and as many as 600 kilograms of wild ginseng are smuggled out of Russia every year.

Sustainable ethical wild harvesting of MAPs, and an increased supply of cultivated specimens, helps protect species. Historically and unfortunately cultivation has been attempted only when wild populations were already threatened by over-exploitation.

Source: Adapted from The World Wide Fund for Nature Conservation, 2010 (Available at http://www.worldwildlife.org/what/globalmarkets/wildlifetrade/faqs- medicinalplant.html)

As a result of the expanding interest in MAPs, new income-generating opportunities are opening up for rural populations and in particular for small-scale farmers (see Case Study 3). Medicinal Aromatic Plants (MAPs) can assist in supporting farm households with income generating activities, can provide a 'safety-net' if other anticipated incomes fail and overall can help the rural economy by contributing to subsistence medicine and health care provision. With many MAPs, cultivated and/or sustainably wild harvested, their marketing can provide a complementary source of much needed ready cash for small-scale farmers. Furthermore, activities related to the farming, collection and primary processing of MAPs represent primary opportunities for rural women to engage in income generating activities (see Figure 3 on the next page).

FIGURE 3 Women in India carrying out post-harvest operations on MAPs
(Photo: FAO Unasylva No. 230 Vol. 59, 2008/1)

However, despite the fact that the products cultivated and /or collected can have very high value in terms of final products, small-scale farmers and collectors typically receive a small share of the final value, either because they are unaware of the real value, are unable to market it in the form wanted by buyers or are unable to market to these buyers (FAO, 2005). The degree of processing and adding value varies greatly between plants, and rural context, and while the trade in some products is largely confined to local, national and regional markets, others are successfully internationally traded commodities.

CASE STUDY 3 **Domestication and cultivation of MAPs in India**

Farmers in different states in India have a tradition of practicing mixed farming systems that include different herbal plants; therefore, the cultivation of MAPs—especially applying organic and certified farming concepts—has considerable scope in different regions of India. The advantages of cultivating MAPs include the ease of their incorporation into existing cropping systems as a result of their availability in large numbers of various species and the ability to choose plant types based on their suitability to be grown under different eco-physical conditions. However, this requires an improved input and service delivery system including marketing and post-harvest technologies. Cultivation needs to be done on a business platform by a chain of small and micro-enterprise-based groups and individuals. In order to achieve economies of scale and the desired impact, it may be necessary to intensify production of specific crops within selected production areas and as clusters of micro-enterprises.

Source: Adapted from Singh, K. M. & Swanson, B.E. 2006. Development of supply chains for MAPs: A case study involving the production of Vinca Rosa by small farmers in the Patna District of Bihar, India (Available at http://www.neuchatelinitiative.net/englishdocuments/supplychainsformedicinalplants.pdf)

The livelihood activity

Essential elements of the activity

Plants are natural resources from which medicinal products can be extracted, and are often freely available and accessible to those living in even the most marginal of conditions. They are therefore important in establishing or restoring and maintaining livelihoods. Medicinal plant activities are often combinable and compatible with other natural resource uses, including agriculture and forestry activities.

Medicinal Aromatic Plants (MAPs) are diverse, and vary in terms of where they grow, their properties, and their use. Some species are found only in intact ecosystems, such as primary forest, and do not lend themselves to domestication. Establishing plant nurseries with locally collected germplasm and encouraging where possible cultivation and domestication of plants by small-scale farmers should be encouraged.

FIGURE 4 Community members preparing seed bed for Ocimum kilimandscharicum in Kenya
(Photo: Kakamega forest integrated conservation project)

Based on global figures, it is assumed that the number of MAP species currently in formal cultivation for commercial production, as opposed to those wild harvested, does not exceed a few hundred world-wide. Examples include poppy (*Papaver sp*), senna (*Senna alexandrine*), cinchona (*Rubiaceae sp*), belladonna (Solanaceae sp), chamomile (*Matricaria*, and *Anthemis sp*) and damask rose (*Rosa sp*).

Medicinal species are cultivated on a small-scale, either as home remedies or by herbalist or cultivation by local people can take place as enrichment planting (FAO, 2002). Many of these MAPs are grown in home gardens (see FAO Diversification booklet No.2 *Livelihoods grow in gardens*), cultivated as field crops, or in intercropping systems and rarely as plantation crops (FAO, 2002).

CASE STUDY 4 **Medicinal Aromatic Plant cultivation for conservation of biodiversity and poverty alleviation in South Africa**

In response to the combined impacts of dwindling supplies as a result of overexploitation of natural resources and increasing demands of growing populations and global markets, MAPs are increasingly being introduced into farming systems. Such cultivation often takes place in multiple cropping systems including agroforestry systems. For instance, MAPs may be planted in the lower strata of multistrata systems such as home gardens (Rao *et al.*, 2004).

Medicinal Aromatic Plants (locally called *muthi* in Zulu language and *amayeza* in Xhosa language) are still widely used in the health-care system of South Africa, particularly by the African population. According to Mander and Le Breton (2005) there are up to 100 million traditional-remedy consumers in southern Africa and as many as 500 000 traditional healers. Up to 700 000 tonnes of plant material is consumed annually with an estimated value of as much as US$150 million per annum.

Stimulated by high population growth rates, rapid urbanization and the important cultural value placed on traditional medicines this trade is now greater than at any time in the past. The use and trade of plants for medicine is no longer confined to traditional healers, but has entered both the informal and formal entrepreneurial sectors of the South African economy, resulting in an increase in the number of herbal gatherers and traders (Cunningham 1989; Dauskardt 1990; 1991;Cocks *et al.*, 2004). The intensive harvesting of wild MAPs as a result of the increasing use has in many places resulted in overexploitation, and forms a serious threat to biodiversity in the region.

CASE STUDY 4 **Medicinal Aromatic Plant cultivation for conservation of biodiversity and poverty alleviation in South Africa** *(Cont.)*

Until recently, biodiversity conservation was based on law enforcement approach, but it has become increasingly evident that this approach has failed and that new, participatory methods are required. In response to the overexploitation of natural populations of MAPs, several efforts have recently been attempted to conserve the diversity of MAPs. Two new approaches are gaining increasing attention, i.e. conservation of biodiversity by local community groups (Fabricius *et al.*, 2004) and stimulation of cultivation as a means to relieve the over-exploitation of natural populations (Mander *et al.*,1996;Cunningham 1991a).

Source: Adapted from Wiersum, K.F.,Dold,A.P. Husselman, M. & Cocks, M. 2006. Cultivation of medicinal plants as a tool for bioversity conservation and poverty alleviation in the Amatola region, South Africa, In R.J. Boegers, L.E. Craker & D. Lange (Eds.) Medicinal and aromatic plants, Springer, the Netherlands pp.43-57

Plants can be cultivated from wild harvested seedlings, collected seeds germinated in the homestead, and vegetative propagation, taking and putting on cuttings from live mature plants. Some general good practice procedures include:

- Ensuring the material is correctly identified before starting;
- Selecting good healthy plants to take cuttings and/or seeds from;
- Only harvesting mature and viable seeds;
- Record methods used, and mistakes made to help increase horticultural know how;
- Usage of clean tools to minimise transferring infections - which may be caused by bacteria, viruses, and/or fungi – sterilising in one part domestic bleach to nine parts water;
- Ensure continuity in plant care, observing sun exposure throughout the day;
- Manage watering and avoid doing so in direct sunlight, and preferably early in the morning;
- Weeding regularly, especially while plants are young to avoid competition for nutrients, and consider letting some smaller weeds grow to provide a green mulch for soil cover and improved water retention;
- Seedling in a basic nursery – a protected area which is warm and moist to facilitate germination and prevent browsing by birds and animals;

- Organic fertilizers, compost and mulches can be used to prepare a good fertile seedbed; application during the growing season can provide key nutrients for plant growth and result in improved yields.
- To help manage pests and diseases, badly infected or contaminated plants should be removed, and preferably burnt to control parasitic or other infection. Manual disease control is a proven safe method which can be effective when offending plants are removed early and regularly, and in addition, growing multiple species can help prevent a heavy burden of pests and disease. There are various local plant based remedies for pest control. Diederichs (2006) lists many relevant for southern Africa, but also states that there are currently no herbicides registered for the control of weeds in MAP farms.

FIGURE 5 Women in a training centre in Kerala, India, learn how to cultivate MAPs
(Photo: http://enchantingkerala.org/kerala-articles/cultivating-the-curing.php)

Depending on the species grown, cultivation and processing implements may include:

- Containers for planting – may include buckets, troughs, tyres, large plastic bags. This can help to control weed problems, help identify species, and help find any species which die back at the end of the year. Black colours can increase the temperature of the soil and retain moisture, to help speed up germination;
- It may be useful to place these containers in a nursery. Hip high wooden poles can be used to erect such an area for starting seedlings, and cultivating smaller plants and shrubs. This can be covered over with sacking, or thatch to protect from strong sunlight, heavy rain and browsers;
- A spade and a fork for soil preparation when planting out in a seed bed to break up the soil to aid root penetration. Lines of string can be used to indicate where seeds have been planted and where mixed plots are sown or multiple species seedlings are managed, some plastic tags for identification can be used. Some pieces of wood or other similar structure are useful to demarcate and provide a boundary for the planted area;
- Containers for collecting and carrying;
- Various harvesting implements, including knives, axes, spades, etc;
- A secure and clean area to store the products – fly free and dark and cool to help preserve the medicinal properties;
- Dependent on the type of processing required, containers for drying, or boiling, or crushing, etc, and decanting medicinal tinctures, ointments, teas, etc., into appropriate storing, transporting and selling containers (clean plastic bags, bottles, etc.). Effective drying can make the difference between a good quality product with high quantities of medicinal properties, and therefore which is easily sold (see 'processing and packaging' in the section on *Strategies for successful and sustainable marketing* for more details).

Finally, local activities can be more sustainable when they use locally available assets: maintaining equipment and tools locally can be more affordable while also contributing to other local livelihoods.

BOX 3 **Cultivated MAPs**

In a survey of companies involved in trade and production of herbal remedies by Rainforest Alliance, some 60 to 90 percent of material sourced was cultivated, with the remaining wild harvested, and when asked about species numbers rather than volume, the figures are generally inverted (Laird & Pierce, 2002). For example, of more than 400 plants species used for production of medicine by the Indian herbal industry, fewer than 20 species are currently under cultivation in different parts of the country (Uniyal *et al.*, 2000).

Medicinal Aromatic Plants: Varieties and their properties

Plants with medicinal properties are distributed throughout the world across, among others, tropical, temperate, humid, dry, and alpine regions. Many plant species naturally occur across entire regions, whereas others may be endemic to smaller ecological niches. There exist MAP species of significant importance to cultures throughout Asia, Africa and Latin America. Below are just a few examples of these:

- the following plants are of importance throughout **Asia:** *Alstonia scholaris, Aconitum heterophyllum, Aegle marmelos, Cinnamomum camphora, Aquilaria sp., Emblica officinalis, Panax sp.* (ginseng), *Rauwolfia serpentina* and *Tinospora crispa;*

- the following plants are of importance in some parts of **Africa,** *Prunus africana, Curtisia pentata, Cryptocarya myrtifolia, Gnetum africanum and Catharanthus roseus;*

- the following MAP species are associated with **Latin America:** *Pimentha spp., Tagetes glandulifera, Mauritia flexuosa, Pithecellobium avaremotemo, Chinchona sp.,* and *Hyptis pectinata.*

Across different regions where the same species exist, variations may be seen in their uses and consequently in their management and harvesting practices, because of the influence of different cultural, technological and/or economic factors. Indeed many species have multiple uses. For example, African vine (*Strophanthus hispidus*) is both an arrow poison and a cardiotonic.

FIGURE 6 Chopped leaves of Gnetum sp. offered for sale in a market (Photo: FAO/FO-7229/ J. Masuch)

Plant species with medicinal properties may not alone provide medicines, but in fact require traditional knowledge around their preparation, to unlock these properties (see Box 4). Rural communities, particularly, forest communities usually have experts who may or may not be willing to share their knowledge; their skills are often passed down orally from generation to generation, with people adopting and adapting new knowledge and techniques. Some local healers become famous over larger regions, and healing is often associated with religious and spiritual practices, such as divination and the appeasement of spirits (Colfor *et al.*, 2006).

FIGURE 7 A woman gathering medicinal plants (Combretum glutinosum). In many countries women are traditionally considered to be healers as their knowledge and use of MAPs is passed down from mother to daughter over the generations
(Photo: FAO/CFU000306/ R. Faidutti)

BOX 4 Harnessing traditional knowledge to release the potential of MAPs

There's a species of cinnamon tree only found on the small Micronesian island Pohnpei, not found anywhere else in the world, and the people use it to treat back pain. They make a tea out of it.

Researchers at the New York Botanical Garden were puzzled by the widespread use of this tea, given then Pohnpei's cinnamon contains a cancer-causing agent called saffrol, which is also found in Sassafras tea. They wondered why people were not getting tumours from drinking so much of this tea.

After further research, it was discovered that the heat of the tea removed the harmful chemical from the cinnamon. This optimal way of preparing this natural pain reliever had likely been discovered by island natives after generations of trial and error.

While numerous plants freely grow all over the island where there is a lot of traditional knowledge about how to use them, the elders who have this knowledge are not teaching it to, or able to pass it on, to the younger generations. Perhaps globalization and the draw of urban life are to blame for that, but in this scenario everyone loses out.

Source: Adapted from The Earthsky website, 2010 (Available at http://www.earthsky.org/interviewpost/health/michael-balick-ethnobotanist-on-using-medicinal-plants)

Many different kinds of wild plants - including epiphytes, herbs, lianas, and trees - and associated parts of these - including roots, leaves, bulbs, bark, and fruits and flowers - are used for traditional medicine. Such plants can provide a plethora of therapeutic properties including contraceptives; steroids; muscle relaxants for anaesthesia and surgery; digitalis derivatives for heart failure; antibacterial and anti-malarial compounds; immune strengthening properties such as echinacea, anti-cancer drugs including vinblastin, etoposide and taxol, and many more (see Box 5).

Table 1 on the next page illustrates the range of medical ailments which Nepali healers can treat, using a variety of locally available MAPs.

BOX 5 Examples of medicinal properties extracted from Medicinal Aromatic Plants

Cynarin is a plant chemical found in the common artichoke (*Cynara scolymus*), and in Germany, a cynarin drug is sold for liver problems and hypertension which is simply a chemical extracted from the artichoke plant or a plant extract which has been standardized to contain a specific milligram amount of this one chemical. These products are manufactured by pharmaceutical companies, sold in pharmacies in Germany and a doctor's prescription is required to purchase them.

Another example is silymarin which is a chemical found in the milk thistle plant and natural milk thistle extracts standarized to contain specific amounts of silymarin are found in just about every health food store in the United States of America.

Cephaelis ipecacuanha was discovered in a tropical plant and a drug was developed from this plant chemical called Ipecac which was used for many years to induce vomiting mostly if someone accidentally swallowed a poisonous or harmful substance. Ipecac can still be found in pharmacies in many third world countries but has been mostly replaced by other drugs in the United States of America.

Other plant chemicals have been copied or synthesized by laboratories such as Qinine which was discovered in a rainforest tree (*Cinchona ledgeriana*) over 100 years ago. For many years the Qinine chemical was extracted from the bark of this tree and processed into pills to treat malaria. Today all Qinine drugs sold are manufactured chemically without the use of any tree bark.

Source: Adapted from Taylor, L.2000. Plant based drugs and medicines, Raintree (Available at http://www.rain-tree.com/plantdrugs.htm)

TABLE 1 **Summary of Medicinal Aromatic Plants found in Kali Gandaki, Nepal with associated indigenous knowledge of their possible medicinal properties**

Disease category	Plants
Cardiovascular complaints and circulatory diseases	*Berberis asiatica, Capsella bursa–pastoris, Portulaca oleracea*
Cough, fever, headache and respiratory ailments	*Artemisia dubia, Datura stramonium, Ficus religiosa, Justicia adhatoda, Justicia procumbens, Taraxacum officinale, Terminalia bellerica, Vitex negundo*
Dermatological afflictions	*Achyranthes bidentata, Amaranthus spinosus, Artocarpus lakoocha, Cannabis sativa, Cassia tora, Cyperus rotundus, Ficus religiosa, Jatropha curcas, Melia azedarach, Ocimum basilicum, Terminalia chebula, Woodfordia fruticosa*
Dental problems	*Achyrathes bidentata, Jatropha curcas, Portulaca oleracea, Potentilla fulgens, Trichilia cannoroides*
Gastrointestinal disorders	*Acacia catechu, Aegle marmelos, Ageratum conyzoides, Bauhini avariegata, Cannabis sativa, Cassia tora, Centella asiatica, Chenopodium album, Cipadessa baccifera, Euphorbia hirta, Mangifera indica, Melia azedarach, Oxalis corniculata, Plantago major, Plumbago zeylanica, Scutellaria repens, Terminalia bellerica, Terminalia chebula, Trichilia connaroides, Urena lobata, Woodfordia fruticosa, Zanthoxylum armatum*
Genito-urinary complaints	*Asparagus filicinus, Ficus religiosa, Ocimum basilicum, Plantago major, Urtica dioica Skeleto-muscular affections Berberis asiatica, Justicia adhatoda, Urena lobata, Urtica dioica Opthalmological problems Colebrookea oppositifolia, Euphorbia hirta*
Other uses (cuts, wounds, etc.)	*Ageratum conyzoides, Bidens pilosa, Centella asiatica, Eupatorium adenophorum, Mangifera indica, Mimosa rubicaulis, Oxalis corniculata, Rumex nepalensis, Selaginella biformis, Taraxacum officinale, Vernonia cinerea, Woodfordia fruticosa.*

Source: Adapted from Colfor,C.J., Pierce,S.D. & Kishi, M. 2006. Forests and human health: assessing the evidence, CIFOR Occasional Paper No.45, Center for International Forestry Research, Bogor, Indonesia

There are many descriptions of MAPs, their uses, and their management. Diederichs (2006) prepared various fact sheets which can be used to grow MAP types commonly used in South Africa. An example of such an information source follows in Box 6.

BOX 6 **Medicinal plant: Fact sheet**

Bulbine species *(Asphodelaceae).* Common name: Bulbine. Zulu name: *iBhucu / iNgcelwane*

Description & diagnostic features:
A number of bulbine sp. found through southern Africa are commonly used for medicinal purposes. Plants most often found in grasslands, thriving in both full sun and shade. The stems branch at the base and the leaves are green and (either) long and narrow filled with gel, or thick and fleshy with a narrow tip, and clusters of yellow or orange flowers are produced on stalks throughout the year.

Traditional uses:
The leaves are crushed and the gel used topically to treat eczema, cracked skin, ringworm, rashes, boils, burns, wounds and cuts, as well as an antidote to poison. The gel can be taken orally to treat vomiting, diarrhoea, convulsions, venereal diseases, diabetes, blood disorders, rheumatism, and urinary complaints. The plant is also used to treat livestock.

Status:
Fairly common and quick growing. Localised populations and species varieties may be threatened by harvesting pressure.

Propagation:
By seed: Seed heads are cut and as they ripen they fall out and the ripe seeds are sown into a sandy compost, and kept moist and partially shaded. Commonly about 80 percent of the seeds germinate over a three week period.
Vegetative: In older plants fleshy leaves divide where the roots and stem merge. Plants can be lifted and separated by a sharp, clean blade, and provided each portion has roots, they can be directly replanted into the ground. This is preferable to leaf cuttings which have a tendency to rot.

Farming method:
Bulbine is most suited to cooler frost free regions with well drained soil. Watering needs to occur daily until established and can decrease as growth occurs. After establishment plants tolerate full sun and will seed within a year. Cutting dead heads will encourage flowering.

Source: Adapted from Diederichs, N. (Ed.).2006. Commercializing MAPs. A South African Guide, Sun Press, African Sun Media, Stellenbosch

Strategies for successful and sustainable marketing

Medicinal Aromatic Plants supply chain

Different MAP species have varying requirements for their cultivation, resource management in the wild, harvesting, processing and importantly marketing. The generic activities common to most MAP supply chains are highlighted in Box 7, while the people and organizations who may commonly be involved in MAP supply chains are highlighted in Box 8.

BOX 7 Activities associated with Medicinal Aromatic Plant supply chains

Market-oriented MAP activities may include:

- domestication of the resource and on-farm cultivation;
- collection of the wild resource;
- management of the wild resource;
- processing, ranging from cleaning or simple air-drying to more complex processing requiring specialist skills (for example, oven drying or distilling), purchased inputs (for example, different substrates to carry the medicinal properties, for example an oil in a lotion, or alcohol in a tincture) or technologies (for example, fermentation, solvent extraction);
- storage, including accumulating the raw product and/or the processed product at different points of trade;
- transport, from collection site to home, or sale to traditional healers where further processing takes place;
- marketing and sale – identifying informal and formal options, including rural farmers markets, directly to healers, small shops, etc.

There are also less obvious but important activities, such as information gathering on such things as market trends in pricing or consumer preferences, and capacity building of the different actors associated with trade.

Source: Marshall, E., Schreckenberg,K. & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Boliva: factors infleucning success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge, United Kingdom

In local MAP enterprises where the market channel is short, the same people (small-scale farmers, collectors) often harvest, process, and sell the product to the final consumer (see Figure 8). In longer chains

it is more common for different activities to be carried out by different individuals, groups or organizations. For trade to be equitable, individuals or groups should be reasonably compensated for their contributions (labour, technical expertise, marketing skills, etc.), and level of risk taken.

FIGURE 8 Women selling MAPs in Peru
(Photo: http://blog.adventure-life.com/2009/07/16/cusco-witches-market-from-charms-to-chicha/)

BOX 8 Examples of people and organizations who may be involved in Medicinal Aromatic Plant supply chains

- Individual or group cultivators, collectors, or processors.
- Private or community owners of the MAP resources.
- Community-based traders, who harvest and transport MAPs to market, or external traders from outside the community, who may establish new trading networks. In southern Africa, it is estimated that 80 to 90 percent of traders are women, some of whom are permanently located in street markets.
- Community-owned enterprises, or cooperatives, which may act to negotiate quantities, qualities and prices of product sold to end consumers, or wholesalers, or specialist processors, private companies, etc.
- Government departments, which may have a regulatory role in issuing and monitoring permits, providing grants, and promoting natural products, including MAPs.
- NGOs which may play a role in information provision and technical and business support.
- Consumers.

Source: Marshall, E., Schreckenberg,K. & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Boliva: factors infleucning success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge, United Kingdom

The variation in MAPs, from raw fruits and food to aroma chemicals and phyto-pharmaceuticals, is reflected in a wide range of different types of markets, from bulk to niche, informal and seasonal, to formal and regulated. Most plants are traded regionally and in small quantities, in rural, peri-urban and urban settings. For example, it is estimated that informal trade in MAPs in southern Africa is dominated by 500 000 traditional healers that dispense crude remedies and herbal medicines from more than 1 000 plant species, to between 50 and 100 million consumers (Diederichs, 2006).

As such, for small-scale farmers and/or collectors to move from subsistence to trade, or small informal traders to move into more regulated small-scale businesses, various barriers to entry into trade are often encountered, for example access to seedling for planting, to the resource in the wild and market information. And, as activities become more specialized further along the supply chain, there are greater opportunities for single traders or small groups of traders to exert their market power and establish mechanisms to prevent others entering the business (Marshall, Schreckenberg & Newton, 2006). In addition, export-oriented marketing is particularly demanding, requiring detailed information about specific markets, product specifications and standards. A key challenge for people involved in MAP activities is to identify these barriers and, where possible and legal, identify ways to remove them.

Supply chain analysis can improve understanding of how trade networks operate, who the main actors and organizations are and what their specific activities are, the different routes for trading the MAP (which exist and could potentially be developed), and the skills, capacity and experience available for successfully engaging in trade (see also FAO Diversification booklet No.12 *Non-farm income from non-wood forest products*). Figure 9 shows an example of a MAPs supply chain in Indonesia and Case Study 5 provides an example of MAPs supply chain development, while Box 9 summarises some conditions identified as important for appropriate functioning of supply chains.

BOX 9 Some important conditions to enable supply chains to work

Supply driven – identification of a product which could be traded creates the search for a market

- Recognition of market potential, possibly located away from the community, for a product available in the community.
- Existence of an effective intermediary to establish links between the community and the market, particularly with respect to communicating consumer quality and quantity requirements to producers.
- Community organization enabling it to adapt production and/or processing to meet the demands of the new market while maintaining the resource.

Demand driven – marketing is established on the basis of demand for MAPs

- Good flow of information from the consumer back to the producer, often moderated by an intermediary and/or community organization.
- An understanding of demand trends to enable producers to determine the appropriate levels of investment in production and processing.
- Effective communication ensures that producers are able to respond quickly to changes in demand, whether for a greater quantity or a different quality of product.

Source: Marshall, E., Schreckenberg,K. & Newton, A. 2006.Commercilization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge, United Kingdom

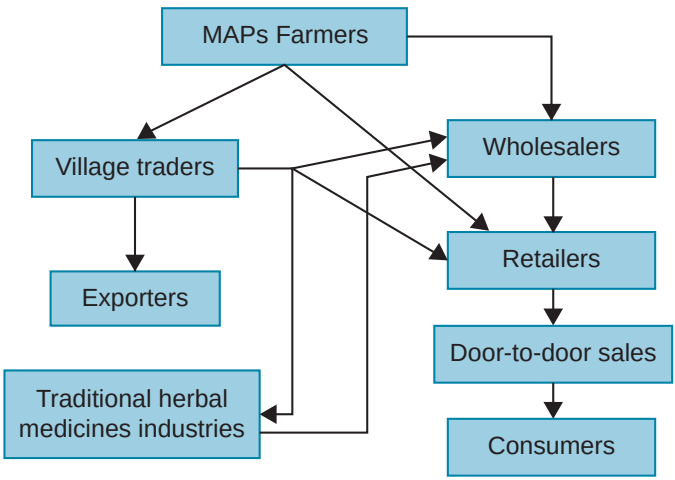

FIGURE 9 A Medicinal Aromatic Plants supply chain in Indonesia
Adapted from Bank of Indonesia. Integrated information system for small-scale enterprise development. Accessed 2011 (Available at http://www.bi.go.id/sipuk/en/index.asp)

CASE STUDY 5 **Vinca Rosa (*Catharanthus roseus*): Developing the supply chain in India**

Vinca Rosa (*Catharanthus roseus*), also known as Periwinkle, is the most common flowering plant in India and is found in abundance almost everywhere. Though it is mostly grown in Bihar for its beautiful magenta and white flowers, few people are aware of the plant's medicinal importance. Studies have shown that this plant contains about 65 alkaloids, of which Indol, Robesin and Serpentine are most prominent. The leaves of Vinca Rosa contain alkaloids, like Vincristine and Vinblastine, which are used to treat certain types of cancers.

In the Patna district of Bihar, the primary cash crop was sugarcane. However, sugarcane production was declining in and around Patna as a result of falling prices. In addition to sugarcane, farmers were using traditional cropping technologies to grow cereals, vegetables, oil seeds, and pulses, primarily for self-consumption. Farmers who produced traditional crops like wheat, paddy, maize, potatoes and onions for sale were dissatisfied since production expenses were increasing but revenues remained constant or were declining as a result of falling prices because of increased production across the country.

Most of the production by small-farm households was either consumed or allocated to money lenders to repay debt, further exacerbating the economic condition of the rural poor. Because farmers had little to spare in the form of marketable surplus, it was very difficult to introduce any new cropping systems.

To help farmers escape this vicious debt trap, the Agricultural Technology Management Agency (ATMA) pursued a strategy that would help farmers diversify into higher-value commodities and products. Three criteria were used to evaluate alternative crops and products within the district. First, there had to be a continuing market demand for the crop or product. Second, the crop must be well suited to the existing agro-climatic conditions. And, third, the production technology to be used must be relatively low-cost to reduce the farmer's risk.

The steps followed by the ATMA in the Patna District to assess and then develop a financially sustainable supply chain for the production and post-harvesting handling of Vinca Rosa and other medicinal and aromatic plants by groups of farmers in the district were as follows:

1. Conduct a Participatory Rural Appraisal (PRA) to assess local conditions and potential markets;
2. Organize producers into Farmer Interest Groups (FIGs) and farmer associations;
3. Assess market demand for specific medicinal and aromatic crops;
4. Assess potential for producing and trading Vinca Rosa in Patna District, Bihar;
5. Train FIG members to produce and manage Vinca Rosa;
6. Monitor the production, post-harvest handling, and processing of raw material into the final product;
7. Assess the potential for increasing the number of farmers involved through exposure visits, and support expansion accordingly.

CASE STUDY 5 **Vinca Rosa (*Catharanthus roseus*): Developing the supply chain in India** *(Cont.)*

When this activity was launched in the year 2000, there were five FIGs with a combined membership of about 60 farmers who began with the cultivation of Vinca Rosa in Patna district. Within one year, 10 more FIGs had organized and were interested in participating in this new MAP programme. By April 2003, the ATMA had established a network of 50 FIGs who were pursuing MAP cultivation. The number of new members and FIGs in this network is expected to increase rapidly as more and more farmers become interested in MAP cultivation. At the state level, there is already a farmers' association that is promoting MAP cultivation as a means to increase farm income and to enhance rural livelihoods.

Source: Adapted from Singh, K. M. & Swanson, B.E. 2006. Development of supply chains for MAPs: A case study involving the production of Vinca Rosa by small farmers in the Patna District of Bihar, India (Available at http://www.neuchatelinitiative.net/english/documents/supplychainsformedicinalplants.pdf)

In local, medicinal markets, consumers mostly require fresh (with the exception of bark), undamaged and effective medicines. As most consumers are from low income brackets, the demand for value added products may be limited, and in southern Africa in particular, it is likely that the demand for crude traditional medicines will increase given the HIV/AIDS pandemic that is giving greater use for traditional medicines as an alternative to expensive and often unavailable Western drugs (Diederichs, 2006).

Successful marketing strategies

Managing cultivation and the natural asset base

The majority of MAPs exhibit different natural abundance and reproductive rates. Domestication, cultivation and resource management in the wild techniques need to be mastered by small-scale farmers and/or collectors. These improve quality and yield. (see Case Study 6, illustrating how MAPs can increase livelihoods, with some external support). Indeed, given the demand for a continuous and uniform supply of MAPs and the accelerating depletion of forest resources, increasing the number of MAPs species in cultivation is an important strategy for meeting a growing demand. Compared to the quantity of wild harvested MAPs, few species are currently cultivated, and one explanation for this may be that cultivated plants are sometimes perceived

BOX 10 **Wild harvested versus domesticated**

Wild ginseng root is five to ten times more valuable than artificially propagated roots, and the reason is primarily cultural. The Chinese community, which is the largest consumer group of wild ginseng, believes that the similarity in appearance of gnarled wild roots to the human body symbolizes the vitality and potency of the root. Cultivated roots lack the characteristic shape of wild roots and are therefore not as highly coveted by consumers.

In Botswana, traditional medicinal practitioners reported that cultivated material was unacceptable, as such plants lacked the potency compared to those plants collected from the wild.

Source: FAO. 2002. Impact of cultivation and gathering of Medicinal Plants on biodiversity: Global trends and issues, by U. Schippmann, D.J. Leaman & A.B. Cunningham, Rome

by consumers as being of inferior quality compared to slower growing wild specimens which can have higher rates of active ingredients (see Box 10). This is a challenge and requires support from both public and private institutions to change such perceptions. This can be carried out by informational and promotional campaigns in local communities to change consumers' perceptions on cultivated MAPs.

Domestication of a previously wild collected species requires both substantial investment of capital, know-how and also several years of investigations (for example 12 years for Alchemilla alpine, [FAO, 2002]).

Resource management plans

For harvesting of wild MAP resources to be sustainable, market demand must be balanced with the availability of the species in the wild, and its recovery rates after harvesting. Where commercial harvesting is proposed or already taking place, a species management plan is needed in order to accurately assess impact and establish sustainable harvesting rates (see Box 11). To effectively undertake many of the components of a harvesting management plan will require technical extension support. The most useful and practical guide available for the preparation of a management plan, detailing how to measure plant populations, distribution, harvesting yields, etc., written specifically for supporting communities to sustainably utilise non-timber forest product species, is found in Peters' Ecological Primer (1996).

BOX 11 **Standard components of a harvesting management plan for Medicinal Aromatic Plants**

- Undertake a resource inventory of population abundance and distribution;
- Make an assessment of regional and global threats based on available knowledge;
- Undertake biological studies (growth and regeneration rates, pollination system, seed dispersal, potential for confusion with similar species, etc.) and assess the impact of harvesting impact on individual plant viability;
- Assessment of annual sustained yield;
- Review local knowledge and harvest practices;
- Review historic harvest and trade levels and evaluate market trends;
- Revise national regulations for the utilization in source country;
- Assess tenure and access;
- Design and implement a management scheme including: annual harvesting quota, seasonal or regional restriction and on certain plant parts or size classes, domestication programmes;
- Practice adaptive management and undertake continuous monitoring and evaluation.

Source: FAO. 2002. Impact of cultivation and gathering of Medicinal Plants on biodiversity: Global trends and issues, by U. Schippmann, D.J. Leaman & A.B. Cunningham, Rome

Harvesting Techniques

The quality of MAPs and the sustainability of extraction are closely linked to how plants are harvested. Many MAPs can be harvested without harming or killing the individual tree or plant, but it largely depends on what parts are harvested as to the potential impact on the individual plant. For example, harvesting an entire individual plant to extract medicinal properties can have a detrimental impact upon a species. Likewise, bark is frequently collected for medicinal property extraction, and intense and frequent harvesting often results in ring barking of trees, which can subsequently die (Diederichs, 2006).

Furthermore, the time of harvesting, and other processing aspects such as the rate and temperature of drying, and storage conditions can influence the quantity and quality of yield. The season, time of the day harvested and technique adopted all vary depending on whether mature or tender parts are harvested, and some medicinal herbs are collected only at night. Roots are often harvested by digging 15 to 20 cm away from the plant and by levering the root. Exudates, such as resin, are tapped into small containers and transferred to plastic containers, or recycled tin cans. In many cases, the harvested products need to be field-dried for short periods to

remove excess moisture, whereas more perishable products such as flowers may need to be processed or transported without delay.

Processing and packaging

Processing MAPs to add value, stabilise properties for a longer shelf-life, and improve hygiene, occurs at different scales using a range of technology and equipment, from basic to very specialist. Production facilities may range from simple units which extract incense of essential oils, to highly sophisticated factories producing perfumes and medicinal preparations.

Processing for local use may simply involve preparation methods such as hot and cold water extraction, expressing the juice after crushing the plant, powdering dried plant material using water, oil or honey to transform a dried powder into pastes (see Figure 10), or even fermenting the plant matter, using a source of sugar (see Box 12 and also FAO Diversification booklet on No. 21 *Traditional fermented foods and beverages for improved livelihoods*). As such, preparing doses from extracts can be a suitable activity for a small-scale enterprise, thereby helping meet the healthcare demands of local populations. As medicinal compounds often naturally occur in small quantities in a plant, processing can require large volumes of raw material, and therefore scaling up or expanding an activity can have natural resource and infrastructural implications.

FIGURE 10 The roots of the Borassus aethiopum that have been crushed and are being prepared as a traditional medicine in Senegal
(Photo: FAO/CFU000354/R. Faidutti)

BOX 12 **Preparation and processing of Medicinal Aromatic Plant**

- **Herbs:** crude plant material such as leaves, flowers, fruit, seed, stems, wood, bark, roots, rhizomes or other plant parts, which may be entire, fragmented or powdered.

- **Herbal materials:** in addition to herbs, fresh juices, gums, fixed and essential oils, and resins. In some countries, these materials may be processed by various local procedures, such as steaming, roasting, or stir-baking with honey, alcoholic beverages or other materials.

- **Active ingredients:** active ingredients refer to the medicinal properties of herbs. In herbal medicines where the active ingredients have been identified, the preparation of these medicines should be standardized to contain a defined amount of the active ingredients, if adequate analytical methods are available. In cases where it is not possible to identify the active ingredients, the whole herbal medicine may be considered as one active ingredient.

- **Herbal preparations:** the basis for finished herbal products and may include:

- powdered herbal materials – can be shade, oven, or freeze dried, depending on the required moisture content, and in small-scale production systems, packaged into plastic bags to keep fresh. Sun-drying should be avoided as the UV can destroy the medicinal properties. Sophisticated processing by pharmaceuticals can compress into pills or capsules to prolong shelf-life and facilitate dosing. These should then be stored in tamper proof containers;
- suspensions – mixture of powder and water, with some form of preservative, requires no specialist equipment, and can be mixed directly before use;
- creams and gels –blended or liquidised plant parts combine with aqueous cream or gel. This can then be packaged into plastic tubes or containers, facilitating application onto the skin, where medicinal properties are then easily absorbed;
- teas – simple processing dries leaves ready for adding to boiling water. When loose tea is put into bags it ensures an even dosage, but the equipment required is specialised and expensive, so best left to products traded in large quantities;
- tinctures, syrups and fatty oils – tinctures are alcohol based herbal extracts, and syrups are tinctures with a lower alcohol content. As with oil extraction, they are produced by extraction, fractionation, purification, cold processing, or other physical or biological processes, and preserved with alcohol. In the most simple of processed forms, they can include preparations made by steeping or heating herbal materials in alcoholic beverages and/or honey, or in other materials. They are stable and convenient to administer, and being liquid makes their dosage regulation simple. They are best packaged in brown tinted glass bottles to protect from the light, and preferably with dropper tops to help measure out small doses.

BOX 12 **Preparation and processing of Medicinal Aromatic Plant** *(Cont.)*

- Product **labelling:** both useful for branding the product and providing information about the product, its use, any warnings, expiry dates, and dosing. The branding and colouring on a label are important marketing tools.

- Defining **dosages:** Most processing technologies produce products which are a concentrated form of the MAP, which can mean there is a risk of overdose. It is therefore important to calculate appropriate dosages of processed product relative to the unprocessed form. Basic dosage recommendations – amount to take and how often - vary with a number of variables: body weight, severity of condition, nature of herbs and rate of absorption. There may be circumstances where it is not advisable to take some MAPs, including pregnancy, if there is a known allergic response, or if already taking medication which may interact or interfere.

It is thus of critical importance that MAPs be processed and administered by a knowledgeable and experienced practitioner

Source: Adapted from i) WHO. 2008. Traditional Medicine: Fact sheet N°134, Vienna ; ii) Diederichs, N. (Ed.). 2006. Commercialising MAPs. A South African Guide, Sun press, African Sun Media, Stellenbosch

CASE STUDY 6 **Medicinal Aromatic Plants improve livelihoods in Kenya**

A project developing medicinal products from plants found in Kakamega forest, western Kenya, has transformed the livelihoods of nearby communities over the past few years. A powder developed from one of the plants is used as a revitalizer, appetizer and clearer of hangovers. A group of farmers who have domesticated the highly threatened MAP, known locally as mkombela (*mondia whytei*), used to collect and sell the roots locally.

Another group of farmers are involved in the domestication of the MAP *ocimum kilimandscharicum*. A leaf extract from the plant is used in the manufacture of a balm and an ointment used to treat flu, cold, chest congestion, aches, pain and insect bites.

"We believe the project has a major role to play as a model for conservation or biodiversity and in the improvement of the livelihoods of communities living near the forest," Wilber Lwande, International Centre of Insect Physiology and Ecology (ICIPE) leader of the applied bioprospecting programme, and *"it is also one of the ways of enabling indigenous traditional knowledge to be useful to humankind before [that knowledge] is entirely lost."*

CASE STUDY 6 **Medicinal Aromatic Plants improve livelihoods in Kenya** *(Cont.)*

Communities living near the forest relied on it for firewood, building materials and various herbs. However, since commercial cultivation and processing of the medicinal products began about eight years ago, reliance on the forest has decreased, allowing better forest conservation.

Community enterprise

James Ligare, assistant administrator of the Mondia community enterprise, said a group of 30 farmers, known as the Muliro Farmers, were involved in the initial domestication of the mondia plant, which takes six months to mature. These farmers have since encouraged outgrowers to cultivate the plant, which is processed in a factory built with financial assistance from international donors. "The farmers harvest the plant three times a year and most say they earn more from mondia than they did cultivating crops like maize and tea," Ligare said. *"On average, a farmer makes TSh35 000-40 000 [US$437-500] when they cultivate the plant on a small plot, ranging from an eighth to half an acre."*

Bioprospecting

Furthermore, the bioprospecting programme had raised the status of the communities involved. Those who previously lived in grass-thatched houses now have better homes; and awareness about environmental conservation has improved and many of the local people are seeking computer and business management skills in efforts to improve production. Bioprospecting was increasingly being recognised for its potential to uplift economies. Effective bioprospecting, he said, would allow African nations to have a stake in the global industry of naturally derived products.

Other projects are helping communities living near coastal forests to undertake the commercial collection and processing of seeds from the Neem tree and the Aloe plant. Neem (*azadirachta indica*) thrives in the semi-arid region of Kwale, while the Aloe plant is cultivated by communities near Shimba hills forest. Neem oil and other Neem plant-based products are used in the manufacture of medical, cosmetic, pesticidal and agricultural products. The Aloe plant is used in making soap. Lwande estimated that up to 30 000 Kenyans benefit from the bioprospecting and conservation projects undertaken with ICIPE's help in Kenya's western and coastal provinces.

Source: ICIPE website, Accessed, 2010 (Available at http://www.icipe.org/)

Drying

Drying is the most commonly important processing technique for MAPs, since many more specialised processing technologies require dried MAP material. Options include shade, oven or freeze drying. Shade-drying is the lowest cost option: plant material should be chopped into small pieces and placed onto

permeable material that allows air flow from all directions, and dried away from air pollution and dust. Oven drying is faster and more effective than shade-drying and as such involves less risk of fungal contamination and "aflatoxin" infection (toxic compounds produced by certain moulds). However large drying ovens are an expensive investment for a small-scale producer/processor. Freeze drying is the most expensive and comprehensive drying technology, reducing plant material to very low moisture contents, and providing stable material with limited risk of infection and concentrated medicinal properties, for long periods of time (Diederichs, 2006).

Traditional knowledge and processing

In the informal markets of southern Africa, for example, MAPs are mostly sold in raw unprocessed forms, or in a basic processed form (chopped, ground, or boiled extracts). Collectors often sell plants to traditional healers who have the knowledge to undertake the necessary steps to prepare medicines suitable for administering. Packaging is usually simple, using locally available and free products such as newspaper wrappings, plastic packets, and recycled glass bottles (see Box 13). Commercial pharmaceutical operations, by contrast, produce medicines under strict regulations concerning processing and packaging.

BOX 13 Branding and labelling

Very few MAP traders or traditional healers operating through informal markets actually label or brand their products which can be disadvantageous for many reasons including:

- Unstable products are highly perishable, making the viability period between harvesting and use limited. This is particularly problematic for seasonal plants;
- Boiled extracts vary in strength posing a risk of overdose with MAPs containing chemicals which are toxic in high doses;
- Poor quality packaging can affect safety and limit market value;
- Lack of branding and labelling also limits value, and can pose a risk for use.

Source: Adapted from Diederichs, N. (Ed.). 2006. Commercialising MAPs. A South African guide, Sun Press, Sun press, African Sun Media, Stellenbosch

Traditional knowledge is closely tied to processing as healers can both identify plants with medicinal properties, and understand what mixtures and doses of plants can be used to treat particular ailments. Often specific mixtures are the speciality of individual healers. The traditional manner of application of a MAP should inform the type of processed product to be manufactured from it, for example *Bulbine* (iBhucu) leaves are traditionally administered topically to treat skin complaints, making a cream from them, and have never been taken orally (Diederichs, 2006). Processing can be adjusted in many cases to suit different consumer groups, and it can be advantageous to process a range of types of the same product, such as the *echinacea* herb used as an immune booster which is available as a tea, tincture, capsule, pills, and specifically dosed syrups for children.

Safety

Based on the long history of MAP usage, users of traditional medicines accept that they are safe for human consumption. However, the absence of regulation of the MAP trade in aspects such as collection, processing and storage provides no such guarantee, and environmental pollution, misidentification and adulteration can provide further grounds for concern. As such, in the absence of regulatory controls, the safety and quality of MAPs can vary considerably.

Storage

The shelf-life may vary for different MAPs, and different MAPs should be stored separately. Recommended storage areas should be well ventilated and designed to prevent contamination by insects, rodents, etc., and good attention should be paid to the cleanliness and good maintenance of such areas. Humid shady conditions are required for roots and tubers for evaporative cooling, and sawdust and straw can be used for fruits and other more perishable products to avoid skin damage. Spreading over ventilated trays can be a useful way to store dried MAPs. Storing plants, extracts, tinctures and other preparations may require controlled temperature and humidity conditions or protection from light.

Packaging

Packaging to avoid damage during transport is different from packaging to produce a final product, grade it, or improve its presentation and shelf-appearance. An overview of processing technologies was presented in Box 12. Some products are sensitive to compression or impact damage and bruising, and others to contamination, and as such require

individual wrapping with appropriate mediums, such as straw, bubble paper, corrugating medium, wooden or plastic trays.

Organization

Good organization can increase resiliency to external shocks, and access to new markets, and is about making the most of social assets and personal skills for successful marketing. This can have a positive impact on:

- Improving product quality and making supply consistent, and being able to diversify through different processing methods;
- Overcoming large distances to the point of sale and achieving more cost-effective means of transport and marketing;
- Being able to access and acting upon market information and in doing so increase the ability to negotiate with other 'actors' in the supply chain;
- Promoting the product to potential traditional healers, consumers, pharmaceuticals, etc.
- Improving levels of transparency between collectors, processors and traders to avoid the concentration of market power in a few hands.

The ability of a group of people or a community to organize itself to have a positive and sustained impact is influenced by a number of factors including social cohesion, the existence of other forms of organizations, and the presence of charismatic individuals able to motivate people to action. There is a tendency, when MAPs are collected

FIGURE 11 Farmers and community members meeting to discuss marketing issues (Photo: FAO/15110/L. Callerholm)

from private land, for the organization to take the form of a cooperative, and where the resource is collectively-owned, to lead to the development of communal organizations (Marshall, Schreckenberg & Newton, 2006). Sources of external support can be helpful in establishing and strengthening community organization.

Marketing and market information

Successful marketing can result in improved income, status, and confidence for those involved in MAP activities, and some general approaches include:

- Awareness of market demand by talking to different traders and healers about volume and price, what consumers are purchasing, etc.;
- Exploring different marketing options depending on resource access and transport infrastructure, selling unprocessed or processed, directly or indirectly to customers, traders, traditional healers, regional wholesalers, etc.;
- Adding value where possible, and prolonging shelf-life of the more perishable medicinal products through grading or processing into simple products, including dried leaves, oil extracts, etc;
- Good organization to collaborate with other collectors, processors, traders, etc., and pooling stocks to attract traders who prefer to buy bulk quantities;
- Sharing knowledge and experiences with other collectors or traders and, where necessary, the cost of seeking external advice;
- Where possible, share resources with other collectors, processors or traders, and re-use and recycle equipment, to reduce capital investment;
- Gain familiarity of existing markets and trading routes, to help identify new types of products, or niches for existing products, which could be filled.

Successful marketing strategies are all subject to local and transport differences, and consumer preferences. They may differ for MAPs which are traded fresh, or processed, or in bulk or as high value low volume products. Establishing a good relationship with traditional healers and other buyers comes

from delivering reliable qualities and quantities of MAPs, and it can be advisable to start modestly, securing a small network of buyers to whom a reliable supply can be delivered.

Niche marketing

In recent years green consumerism, coupled with a concern for environmental conservation and a preference for organic products, has provided a new impetus for MAPs. However, green marketing is a competitive and heavily regulated industry, and requires both specialist knowledge and considerable financial investment to become certified. Requirements for any credible certification, with which a price premium can be placed on the marketed product, include meeting sustainable management criteria (see Box 14). Aspects of this are inaccessible, both financially and technically to small-scale producer communities or organizations, and would require external support to undertake.

Niche marketing is therefore relatively inaccessible to small-scale producers, unless they are able to bulk up the supply of their product through some type of formal organization, directly to a wholesaler who will pay them a premium for their product. In most cases it is almost certain that producers would require both investment and external expertise in order to achieve recognized certification, including Fair Trade status, guaranteeing them access to a premium paying niche market (see Case Study 7).

CASE STUDY 7 **Opportunities for niche marking in Southern Africa**

A niche exists for small-scale growers, with cultivation of alternative crops with a higher value per hectare than agricultural crops. Alternative crops are usually medicinal, cosmetic and specialty foods which receive a higher price in the market if grown in an environmentally friendly manner or as certified organic. Fair Trade and organic certification is another option for small-scale growers, where farmers receive a premium for products sold overseas. Additionally farmers have the opportunity to cultivate alternative crops through partnership creation with local communities thereby accessing indigenous knowledge, potentially realizing economic potential of plants long before they are commercialized.

Source: Adapted from Makunga, N.P., Philander,L.E & Smith, M. 2008. Current perspectives on an emerging formal natural products sector in South Africa, Journal of Ethnopharmacology, Vol. 119, pp. 365–375

Accessing market information

Market information is varied but generally related to quantity, quality and price characteristics of particular products in different markets, and is essential to enter new markets and hold onto existing ones. Good organization can help develop social assets and contacts with a variety of traders and healers, and help access more market opportunities.

Market information is only part of the picture, and those involved in MAP trade also need to have the capacity to be able to act upon it (Marshall, Schreckenberg, & Newton, 2006). Market information and contacts can be less crucial when marketing a product with high demand, or marketing very locally. It does however often become more important for trade when investments are made in processing and grading to sell different products at different prices. Medicinal plant collectors can be vulnerable to market concentration in the hands of only one or a few traders, traditional healers, or organizations, because of often low formal education levels, and remoteness from information sources. Community organizations and other forms of external support can enable collectors to negotiate improved working relationships with existing traders, or even seek new opportunities.

Education, business skills and a willingness to take risks

Level of education can be an important factor in determining people's capacity to engage in income-generating activities. At collector level it appears the informal education and learning on the job may be more important in ensuring a household's success, but for trading beyond a local level, basic bookkeeping and numeracy skills are often required (Marshall, Schreckenberg & Newton, 2006). Personal characteristics, such as self-confidence, a willingness and ability to experiment, innovate, and take risks, and in particular, attention to detail, are all often as equally useful qualities to have for MAP collectors and traders. Furthermore, culture and tradition and a community's indigenous knowledge can be very important in determining success, both in terms of MAP resource management, and the customary procedures for working with, and supplying, traditional healers.

Diversification options to reduce vulnerability

Diversified MAP activities, through access to a range of products available

for collection or trade is generally associated with reducing vulnerability and risk and enhancing sustainability. Alternatively, processing the same product can provide a range of goods to cater for different consumer preferences, and in turn diversifies the market. Other ways to diversify small-scale enterprises can include incorporating useful by-products, perhaps from processing raw material, into other activities. An example might be to use branches of suitable species, once the leaves containing medicinal properties have been extracted, in agricultural mulches.

Support services for Medicinal Aromatic Plants

There are many interventions which have the potential to improve conditions for small-scale farmers and other people involved in small-scale MAP activities, and some are easily delivered by extension organizations directly working with communities and small-scale enterprises, and others are more overarching, and rely on continued policy level work by local, regional and national organizations.

Support for community based MAP activities can come from national or regional government, the private sector and NGOs. Often successful interventions have positive knock-on effects for other sectors, and often small changes - encouraging sustainable development based on local activities - result in large outcomes. Building capacity, improving technical skills, and encouraging innovation and resourcefulness, can all guide small-scale producers into the business world.

It is important to recognise that MAPs are associated activities and people will rarely want to invest all their efforts in one livelihood activity. Projects should be encouraged to go beyond a narrow focus on one product or product area, and look at strategies to trade different complementary products, including other agricultural, forest, horticultural, textile, etc. This is particularly important when many MAPs are often only available seasonally, and through encouraging diversification, it helps communities and households manage risk.

Any and all interventions to promote livelihood activities should be planned carefully, agreeing at the outset what small-scale farmer, collector, processor and trader objectives are, exploring any potential trade-offs which may need to be made. Then, asses the skills, assets and resources available, and what market opportunities exist for initiating or expanding trade. Working in joint ventures or partnerships with regional NGOs, and other relevant plant research groups and private organizations working in the area, can help reduce vulnerability and risk for small-scale farmers and/or collectors, and provide them with access to training and other forms of support.

Setting goals and planning

Where to start? Setting goals and objectives

At the outset of an initiative, or at the beginning of an intervention to support an ongoing initiative, it is important to discuss the aspirations of different stakeholders. How households and communities perceive a successful outcome can help in establishing objectives to work towards, and allow for the various trade-offs that might be needed to achieve them. These 'definitions of success' may be dynamic however and will likely change in response to variations in socio-economic circumstances, market behaviour, etc.

Attributes such as transparency, equitability and social, economic, and ecological sustainability are all important components of successful initiatives to support livelihoods. A useful starting point can be identifying the livelihood aspects which are directly affected by MAP activities, and establish if the stakeholders (household, community, etc), want to:

- Improve trade of an existing initiative or start on a new one;
- Improve the livelihoods of a few active stakeholders, or establish an initiative which has the potential to allow everyone to benefit;
- Achieve their objectives through community organization or on an individual basis.

From these a series of culturally appropriate indicators, based on local perceptions of success, can form the basis for a monitoring system to enable the impact of a new activity to be assessed. A few examples of stakeholder perceptions or definitions of success, which could be used to set the goals or objectives of an activity or project, are presented in Box 14.

It is helpful during initial planning and subsequent monitoring stages of all initiatives or activities, to evaluate current standing i.e. where one is, identify what opportunities and challenges are present, and to decide which direction needs to be taken i.e. where one wants to go. This enables evaluation of what strengths, skills and resources are available to draw on, either as a household, community, or small enterprise. It may be helpful to have more formal public endorsement of traditional health care, given how important it is for so many who have no access to conventional primary health care.

BOX 14 **How local stakeholders might measure how successful Medicinal Aromatic Plant activities are**

Household level

Economic
- Provides employment and generates enough income to meet the basic needs of the family.

Social
- The income generated makes an important contribution to food, education and health.
- The work involved is agreeable and provides women with greater self-confidence and improved household status.

Community level

Economic
- A high proportion of people within the community is involved and benefit directly.

Social
- There is a fair distribution of profit margins along the market chain, in relation to investment made.
- It strengthens local culture, helps preserve spiritual values, and improves community organization.

Environmental
- The resource base is productive and in good health.
- The rate of trade is consistent with biological sustainability and will help conserve the forest resource.

Source: Marshall, E., Schreckenberg,K. & Newton, A. 2006.Commercilization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge, United Kingdom

Public policy support

Public investments have an impact on people's capabilities to carry out an activity or business, whatever the sector, and many fundamental aspects for supporting MAP activities are public goods, including roads, electricity, telecommunications, rural markets and other infrastructure.

Broad policy based government interventions to support successful MAP activities include:

- Implementing multi-sectoral rural livelihood support policies which engage the forestry, agriculture, and health sectors, and by doing so support rural communities to diversify their livelihood base;

- Developing incentives for lending institutions to invest in small-scale local farms and businesses; make credit provision accessible to the rural poor and small-scale farmers and entrepreneurs; and provide technical assistance, through processing and other activities, to achieve the required regulatory standards for MAP materials;
- Developing standards for MAP production and provide the technical and financial support required to help small-scale producers manage and trade their natural resources and access niche markets;
- Developing specific policies to help promote secure community based resource access with responsible monitoring and management; to support domestication initiatives; to help establish small-scale enterprise marketing and trade in natural resources, including branding.

More specific recommendations cited as important in achieving sustainable MAP activities, but which require enabling public policy in order to achieve directly through policy change, or indirectly through technical assistance, are detailed in Box 15.

BOX 15 **Recommendations for sustainable Medicinal Aromatic Plant activities which require enabling public policy to facilitate technical support**

Cultivation surveys can help identify species cultivated, where, volumes produced and market values, as well as public domestication programmes, and in-situ and ex-situ conservation efforts for wild populations of species in cultivation.

Sustainable wild harvest management schemes supported by governments and authorities, necessitating management plans as standard for any wild harvesting with associated capacity building to improve monitoring and evaluation.

Small-scale cultivation enterprises need to be strengthened to enable primary producers and local communities to better compete with large-scale high-tech cultivation.

Gene banks need to be developed, particularly for habitat specific, slow-growing species with high susceptibility of being over-harvested.

Domestication programmes need to be expanded, taking fuller advantage of the genetic and chemical diversity within species over wide geographical areas.

Research to investigate the sustainability of production systems to be stimulated for a better understanding of the biological dynamics of the resource in the wild and in domestication.

BOX 15 **Recommendations for sustainable Medicinal Aromatic Plant activities which require enabling public policy to facilitate technical support** *(Cont.)*

User rights over the resource and access to it need to be clarified. This is particularly the case where MAPs are considered common property. This needs to be recognized as a crucial factor enabling or preventing a sustainable harvest from wild populations.

Certification standards including eco-labelling and other social and economic incentives to strengthen market credibility and competitiveness of biodiversity-friendly products promoted. The private sector should be encouraged to consider local livelihoods and biodiversity when setting up ethical and environmental standards.

Policies and legislation need to be adapted and implemented to recognize the value of and need for sustainable wild harvesting management regimes, to implement national and/or regional permit systems and make MAP conservation a priority for national health and economic policy.

Intellectual property rights need to be acknowledged so that local users or other entities can be adequately compensated for use of the resource by outsiders.

Source: Adapted from FAO. 2002. Impact of cultivation and gathering of MAPs on biodiversity: Global trends and issues, by U. Schippmann, D.J. Leaman & A.B. Cunningham, Rome

Marketing and business skills for successful trade

Many societies and cultures have considerable essential traditional knowledge and skills pertaining to the management, processing and use of MAPs. The more successful and sustainable ventures to establish such activities recognize the need to acknowledge and build on these existing skills. Local or regional trade in MAPs typically involves small-scale activities with low capital investment which combine well with traditional domestic roles. This can make them particularly accessible to women, and the skills required very much depends on what scale activities are undertaken. The more sophisticated processing and packaging MAPs becomes, and the more trade moves from local to regional or national, the more complex skills, resources and entrepreneurial expertise is needed.

Common types of support required by small-scale farmers, businesses and other entrepreneurial initiatives include:

- Assistance in developing basic business skills: administration; access to credit; cash flow

analysis; negotiation with creditors, clients and suppliers; development of strategies to maintain quality and quantity, and expand markets;

- Assistance in getting lending institutions to recognize the commercial potential of MAP activities, and furthermore, to make credit provision accessible to small-scale farmers and small-scale businesses;
- Support in obtaining funds from private and public, domestic and international, sources, for technical projects such as nurseries, processing and storage facilities, and other types of training;
- Information provision on trends in product price, quantity and quality, understanding how market chains work and how to identify key actors, and training/support to enable a community to use this information to its advantage;
- It can sometimes be helpful to initially facilitate an intermediary role between collectors and buyers, and other contacts, to help establish market channels, interpret and meet regulatory requirements, and develop recognized medicinal product brands, etc.

Role of advisor

When establishing or assisting MAP ventures, it is important to assess the available capacity for resource management, harvesting, processing, and marketing, and facilitate the development of skills to grow a new activity from subsistence into trade, or expand an existing one. Regardless of size, sustainability generally increases when waste is reduced, and value is added locally. It can be useful to assess human capacity to evaluate existing technical skills, know-how, and experience and identify the necessary interventions to support improved collection, processing and marketing.

Social aspects, including networks of collector, producer and marketing associations can help in establishing an activity, and then influence how successful it might be. Local associations can provide credit, and various marketing, legal, organizational and policy advice, to collectors and traders to increase their market power. Government, non-governmental organizations (NGOs) and private sector contacts can also provide the support needed to access and utilise wider networks, and tap into resources for capacity building.

Medicinal Aromatic Plants (MAPs) activities for local

consumption and trade need different levels of equipment and infrastructure than, for example, a small commercial enterprise. For example, shade drying can be undertaken when expensive equipment is not available. Many of the physical assets required to undertake MAP activities are not exclusive items, but rather assets which help to meet general livelihood needs, including transport and communication infrastructure, clean water, an energy source, and buildings for shelter and storage. The more developed a general infrastructure is, the easier it is to establish and carry out new or additional activities.

Information on physical infrastructure including the transport network of roads, rivers, railways, airports and their related costs, and the availability of energy, as water, electricity, fuelwood, etc., are all needed to evaluate how feasible it may be to collect, process, transport, market and sell MAPs. To this end, physical communication networks are also important and facilitate communication between people about price, product quality and quantity, or descriptions of how a MAP product should be presented or processed. It is important to consider a variety of factors both at collection, and early points of trade within and outside a community, as these may be the key determinants of successful marketing.

Cash, savings and access to credit or grants, are rarely essential for starting up small-scale MAP activities, when for subsistence or local trade. In fact, such activities often generate a valuable source of instant cash in times of need. Just as with 'physical infrastructure', financial resources become more important as MAP activities move from more informal to formal, i.e. from wild harvested to cultivated, perhaps in response to market demand, or become more complex in their processing or packaging to access more specialist markets. Different medicinal species will have different 'management' needs: more perishable products or higher value goods may require greater financial investment to secure specialist containers or packaging to facilitate their transport and marketing, and as such, are higher risk activities.

Credit may be necessary to undertake quality control, or product grading, and to bulk up supply to a level where traders are willing to purchase i.e. physically bringing MAPs together from different collectors or investing in some form of domestication or cultivation. Access to credit can enable the more

marginalised to improve their natural resource-based activities: money may be needed to make long-term investments in species management and/or cultivation, and purchase equipment, but access to financing is often problematic for those who live in rural and remote areas. In such circumstances, often land can be used as collateral for enterprise development, but requires that there are clear access and tenancy rights over such resources.

Technical advisors, from governments, NGOs or the private sector, can provide direct assistance to small-scale farmers, small-scale businesses and communities. Support and training identified as important includes:

- Facilitating organization between small-scale producers and processors, to reduce their vulnerability, increase their market power, and facilitate communication between them, other traders, and consumers.
- Enabling working partnerships including collaboration between pharmaceuticals and other organizations that may provide credit and technology, and communities who have access to MAP products.
- Supporting small-scale farmers, businesses and entrepreneurs to develop basic business skills: administration of sales out and cash in, negotiation skills for use with creditors, clients and suppliers; developing strategies to maintain quality and quantity, and expand markets.
- Providing market information on product price, quantity and quality, and training/support to small-scale farmers and community-based businesses in how to use this information to its advantage.
- Providing technical and organizational know-how for sustainable resource management, harvesting, and processing, and support to develop management plans and establish monitoring systems.
- Providing assistance to small-scale producers in being able to understand and fulfil legal and regulatory requirements, for resource management, harvesting, trade, etc.

Often the most effective way to provide direct assistance is via on site hands-on training, be it, resource management, or business oriented.

CASE STUDY 8 **Issues in the Medicinal Aromatic Plants supply chain in Brazil**

In a study conducted on the MAPs Brazilian supply chain, some of the following issues were found to exist:

- There was a lack of organized support for producers and also for other players in the supply chain.
- There was a need for information on technical and financial matters.
- There were issues on quality of MAPs.
- Producers complained that technical guidance, financial resources and marketing information were not promptly available.
- There was a need to coordinate activities along the supply chain.

Source: Adapted from dos Santos Doimo, A.M., de Lima, L.M. & de Miranda, S.H.G. 2009. A study case on the business chain of Brazilian medicinal plants, VII International PENSA Conference, Sao Paulo, Brazil

Training a few key individuals and empowering them to impart their knowledge can be a useful way of scaling up capacity building efforts. Participation at national and international medicinal events and trade fairs can also provide exposure to new ideas, and invaluable opportunities to exchange information about overcoming challenges and improving harvesting and processing techniques.

Opportunities and challenges for improved livelihoods

Opportunities

Medicinal Aromatic Plants (MAPs) can play an important role in contributing to the livelihoods of small-scale farmers and others in rural, peri-urban, and urban communities. The opportunities abound in terms of MAPs as they can contribute to:

- Small-scale farmers enhancing their knowledge, skills and capacity in terms of a new enterprise as well as enhancing their environmental awareness, especially in terms of wild harvests, and its importance to them;
- Enhancing small-scale farmers knowledge in terms of MAPs role in traditional healthcare systems;
- The variety of products that can be derived from a single MAP;
- Small-scale farmers having more varied farm products to trade;
- Having more farm products to sell enables a more balanced flow of cash income to the farm household throughout the year, especially in terms of processed MAPs;
- Increased incomes for small-scale farmers as well as other members of communities who participate in production/ gathering of MAPs;
- Improved living standards as a result of extra income as this can pay for such matters as school fees, for example, and access to traditional medicines and health care systems, etc.;
- Farm products that can possibly have a high market value, especially if processed;
- Adding value to farm products with primary and secondary processing operations on farm enabling small-scale farmers to move down the supply chain (see FAO Diversifications Booklets Nos. 4 and 5 on *Value from village processing and Processing for prosperity*);
- Linkages with processing enterprises and possibilities of providing pharmaceutical companies with ‘raw materials’;
- Participating in Fair Trade and organic MAPs distribution networks;

- Fostering organization among small-scale farmers and other people in local communities, especially in the case of wild harvests and provides for community social benefits;
- Activities that are highly combinable both with household duties, and other livelihood activities, and as such particularly suitable to women;
- Cultivation/wild harvest as well as processing of MAPs by women. This enabling them to enter the local economic system.

Challenges

Many of the challenges facing MAP activities are not uncommon to many small-scale farmers. However, as MAPs represent the only source of healthcare to much of the world's rural poor, resource exploitation must be ecologically and socially sustainable to ensure the protection of millions of livelihoods. It would be wise for any development of MAP activities beyond a subsistence use, to proceed with much caution, even at local trade level, and with particular attention to sustainable harvesting. Promoting cultivation of MAPs with appropriate training and environmental sound practices is one step in the right direction.

Trading MAPs on a scale beyond local or regional level can be labour and management intensive and requires a good understanding of resource management and sustainable yields, and how markets work, and what phytosanitary and other legal requirements exist. As such, export markets remain largely the domain of pharmaceuticals, unless regional or national assistance can be secured to help niche marketing of products into wider domestic or even international markets. All production systems reliant largely upon wild harvest are vulnerable to sporadic yields, and indeed overharvesting leading to local, or even regional species decline. As such all natural resources must be closely monitored, and successful and sustainable trade will rely upon controls on the supply side, rather than being demand led. Where species traits make it possible, a shift from wild harvest to cultivated sources can provide a more secure supply, but moving from subsistence use to trade and marketing can be quite challenging to local harvesters and growers.

Although there are examples of highly organized supply chains associated with large scale phyto-

pharamaceutical companies, much of the global MAP industry is characterised and handicapped by fragmented and uncoordinated raw material supply, lack of communication and coordination relating to demand, and limited product diversity and institutional organization (Diederichs, 2006). Successful businesses should empower small-scale farmers, wild harvesters, traders and traditional healers through skills transfer, helping them to accumulate wealth and income through equitable trade; achieve consistently high quality products; and source investment capital from the private sector to finance new initiatives. Achieving these goals requires a mix of institutional arrangements that promote the sustainable and profitable use of resources by encouraging investment, efficiency, and fairness in the distribution of benefits (Diederichs, 2006).

As such, some key constraints facing small-scale MAP activities include the following:

- Cultivation know-how and unpredictable nature of plant availability and quality, unless it can be cultivated or in some way domesticated, and the limited technical knowledge, and/or suitable species and land tenure system, to facilitate this;
- Poor organizational capacity and lack of political influence coupled with an absence of support services which are well equipped and reliable in providing simple but effective technical know-how, business development advice, and or credit, to smallholders;
- Poor infrastructure which acts as a general constraint for equitable market access, and economic growth in rural areas, often resulting in seasonal failures;
- A lack of research and business opportunities directed towards small-scale development of MAP activities;
- Lack of enabling policies that favour access into or encourage responsible small-scale or community based trade, which may include social and financial incentives, such as tax breaks or ecologically oriented subsidies.

Finally, additional challenges associated with traditional medicine, and regulatory environment, safety, patient use and sustainability, as identified by WHO, are presented in Box 16.

BOX 16 Challenges associated with Traditional Medicine, as defined by the World Health Organization (WHO)

Traditional medicine has been used in some communities for thousands of years. As traditional medicine practices are adopted by new populations there are challenges.

International diversity: Traditional medicine practices have been adopted in different cultures and regions without the parallel advance of international standards and methods for evaluation.

National policy and regulation: Not many countries have national policies for traditional medicine. Regulating traditional medicine products, practices and practitioners is difficult as a result of variations in definitions and categorizations of traditional medicine therapies. A single herbal product could be defined as a food, a dietary supplement or a herbal medicine, depending on the country. This disparity in regulations at the national level has implications for international access and distribution of products.

Safety, effectiveness and quality: Scientific evidence from tests done to evaluate the safety and effectiveness of traditional medicine products and practices is limited. While evidence shows that acupuncture, some herbal medicines and some manual therapies (e.g. massage) are effective for specific conditions, further study of products and practices is needed. Requirements and methods for research and evaluation are complex. For example, it can be difficult to assess the quality of finished herbal products. The safety, effectiveness and quality of finished herbal medicine products depend on the quality of their source materials (which can include hundreds of natural constituents), and how elements are handled through production processes.

Knowledge and sustainability: Herbal materials for products are collected from wild plant populations and cultivated MAPs. The expanding herbal product market could drive over-harvesting of plants and threaten biodiversity. Poorly managed collection and cultivation practices could lead to the extinction of endangered plant species and the destruction of natural resources. Efforts to preserve both plant populations and knowledge on how to use them for medicinal purposes is needed to sustain traditional medicine.

Patient safety and use: Many people believe that because medicines are herbal (natural) or traditional they are safe (or carry no risk for harm). However, traditional medicines and practices can cause harmful, adverse reactions if the product or therapy is of poor quality, or it is taken inappropriately or in conjunction with other medicines. Increased patient awareness about safe usage is important, as well as more training, collaboration and communication among providers of traditional and other medicines.

Source: WHO. 2008. Traditional Medicine: Fact sheet N°134, Vienna (Available at http://www.who.int/mediacentre/factsheets/fs134/en/)

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Sources of further information and support

Botanical Gardens Conservation International (BGCI)
This is an international organization working to ensure global conservation of threatened plants, the continued existence of which are intrinsically linked: poverty, human well-being and climate change. Source for various publications and other information, of particular relevance is the MAPs Safety net:
http://www.bgci.org/ourwork/safety/

Centre for International Forestry Research (CIFOR)
Published materials on Non Timber Forest Products, with many references to MAPs. Global coverage.
http://www.cgiar.org/cifor

European Cooperative Programme for Plant Genetic Resources
Medicinal and Aromatic Plants Working Group
http://www.ecpgr.cgiar.org/Workgroups/Med_aromatic/med_aromatic.htm

Examples of sites linked to growers associations and which support small-scale trade:

Alabama Medicinal Plants Growers Association
http://ampga.htfplants.com/

Indian Medicinal Plants Growers' Consortium. Can search on "trade leads", "herb database", and "company directory".
http://www.impgc.com/

National Medicinal Plants Board, Assam, India
http://smpbassam.org/about.htm

The Ugandan Medicinal Plants Growers Association
http://umpgl.com/

Society for Medicinal Plant and Natural Product Research - with links to many other organizations, societies, journals, libraries and other information sites
http://www.ga-online.org/links_en.html

The medicinal and aromatic plant programme, Asia – information on traders and suppliers
http://www.mappa-asia.org/index.php?id=67

Internet portal for medicinal herbs
http://www.emedicinal.com/

Food and Agriculture Organization (FAO)
An important source of further information on MAPs and on validated production and trade data can be found in the vast range of publications.
Trade
ftp://ftp.fao.org/docrep/fao/008/af285e/af285e00.pdf

Ex-situ Conservation, Cultivation and Sustainable Use:
http://www.fao.org/DOCREP/ARTICLE/WFC/XII/0705-B3.HTM

Medicinal plant information databases
http://www.fao.org/docrep/W7261E/W7261e09.htm

The importance of MAPs
http://www.fao.org/docrep/q1460e/q1460e00.htm

International Standard for Sustainable Wild Collection of MAPs (ISSC-MAP)
IUCN, WWF, TRAFFIC and many other organizations have signed up to the "International Standard for Sustainable Wild Collection of MAPs"(ISSC-MAP), to promote the sustainable wild collection of wild plants. More information can be found at http://www.floraweb.de/proxy/floraweb/MAP-pro/
http://www.fairwild.org/news/2008/10/9/new-foundation-to-promote-sustainable-collection-of-wild-pla.html

International Union for Conservation of Nature (IUCN)
http://www.iucn.org

Within IUCN, The Medicinal Plant Specialist Group (MPSG) is a global network of specialists contributing within their own institutions and regions, as well as world-wide, to the conservation and sustainable use of MAPs. The MPSG was founded in 1994 to increase global awareness of conservation threats to MAPs and to promote sustainable use and conservation action.
http://www.iucn.org/about/work/programmes/species/about_ssc/specialist_groups/directory_specialist_groups/directory_sg_plants/ssc_medicinalplant_home/

People and Plants Initiative
http://www.rbgkew.org.uk/peopleplants

The People and Plants Initiative (created by WWF International, UNESCO and the Royal Botanic Gardens Kew) carries out applied research projects, community workshops, exchanges and training courses with young ethnobotanists from developing countries who are interested in conservation and community development.
http://www.peopleandplants.org/health/

http://www.plantlife.org.uk/international/plantlife-med-plants-what-are-med-plants.htm

Additional Conservation and Livelihoods papers:
http://www.plantlife.org.uk/international/assets/med-plants/what-are-med-plants/resource-assesment.pdf

http://www.plantlife.org.uk/international/assets/med-plants/what-are-med-plants/med-biocon-paper.pdf

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy.htm

Rainforest Alliance
www.rainforest-alliance.org

RECOFT: Regional Community Forestry Training Centre for Asia and The Pacific

Community forestry network, within which MAPs commonly feature. Specific Asian focus.

http://www.recoftc.org/site/

TRAFFIC

The joint wildlife trade monitoring network of IUCN and WWF.
Various publications on MAP trade, sustainability and conservation.

http://www.traffic.org/medicinal/

World Health Organization

Medicine, Health System Governance and Service Delivery:

http://www.who.int/medicines/areas/traditional/en/index.html

A digital repository in Herbal medicine:

http://herbalnet.healthrepository.org/

A list of WHO collaborating centres for Traditional Medicine are available from:

http://www.who.int/medicines/areas/traditional/collabcentres/en/index.html

The International Regulatory Cooperation for Herbal Medicines (IRCH) is a global network of authorities responsible for regulation of herbal medicines, established in 2006. Its mission is to protect and promote public health and safety through improved regulation for herbal medicines.

http://www.who.int/medicines/areas/traditional/irch/en/index.html

World Wildlife Fund (WWF)

http://www.wwf.org

http://www.worldwildlife.org/what/globalmarkets/wildlifetrade/faqs-medicinalplant.html

IUCN, WWF and WHO have collaborated to develop guidelines on the conservation of MAPs.
http://apps.who.int/medicinedocs/en/d/Js7150e/

WHO/IUCN/WWF Guidelines on the Conservation of MAPs.
http://apps.who.int/medicinedocs/en/d/Js7150e/

Additional case studies of good practice from Asia and Africa:

Tribal Folk Medicinal Plant Resources of Asia
http://www.idrc.ca/en/ev-21408-201-1-DO_TOPIC.html

People's Republic of China
http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-China-Ludian.htm

http://www.plantlife.org.uk/international/assets/med-plants/projects-case-studies/KIB%20Dialogue%20meeting/Dialogue-webpage.htm

Himalayas
http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-Himalayas.htm

India
http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-India-westHimalayas.htm

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-India-Darjeeling.htm

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-india-standard.htm

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-india-international-training.htm

Nepal

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-Nepal-Rasuwa.htm

Pakistan

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-pakistan-Miandam.htm

Kenya

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-Kenya.htm

Uganda

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-jera.htm

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-Uganda-Rwenzori.htm

http://www.plantlife.org.uk/international/plantlife-med-plants-projects-allachy-Uganda.htm

Notes

Notes

The aim of this diversification booklet is to raise awareness – among people and organizations that provide advisory, business and technical support services to resource poor small-scale farmers and local communities in low and middle income countries – about the potential livelihood opportunities associated with Medicinal Aromatic Plant (MAP) activities. It provides an insight into the complementary contribution that MAPs can make to livelihoods through trade, and provides advice as to how the right support and services can help promote MAPs trade as both a sustainable and successful livelihood option.

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