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Spices and herbs for home and market

FAO Diversification booklet 20

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Spices and herbs for home and market

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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 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 case export markets are considered as they can be a potential lucrative market for small-scale farmers.

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 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.

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Acknowledgements for the series

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Introduction

Spices and herbs

Spices can be defined as "vegetable products used for flavouring, seasoning and imparting aroma in foods" (FAO, 2005). Herbs are leafy spices, and some, like dill and coriander, can provide both spice seeds and leafy herbs. Many spice and culinary herb plants are widely regarded as having medicinal properties, and there is therefore some overlap between them and Medicinal Aromatic Plants (MAPs). Distinctions can be drawn based on the purposes for which plants are used (see FAO Diversification Booklet No. 17 *Health and wealth from medicinal aromatic plants*). There is also an overlap between spices and herbs, and plants normally classified as vegetables- some vegetables can also be used to spice up other foods- for example in the People's Republic of China, and in Pakistan, certain types of mushrooms are used as spices (see FAO Diversification booklet No.7 *Make money by growing mushrooms*).

Around fifty spice and herb plants are of global trade importance, but many other spices and herbs crops are used in traditional cooking, healthcare, or other applications, in particular regions and traded locally. Spices and herbs are grown as trees, shrubs, perennials, annuals, wild and cultivated. Spice and herb plants provide seeds and fruits, leaves and stems, flowers and buds, roots and rhizomes, bark and resins that can all be commercialized in various forms: sold fresh, frozen, dried, whole or ground, distilled into oils or solvent extracted into oleoresins.

There is good trade potential for small-scale farmers where growing conditions are favourable and there is a local market demand for spices and herbs. Farmers can benefit from spices and herbs as higher value, low volume cash crops, to enhance their income and thus improve their livelihoods. A large proportion of spices traded in both local and export markets are produced by small-scale farmers, and the worldwide trade provides multi-billion US dollar earnings for small-scale farmers.

World markets for spices and herbs, particularly in industrializing countries and in local markets,

are expanding and can offer good returns to small-scale farmers. Trade is dominated by dried products. In recent years fresh herbs have become popular and are perceived to be of higher quality. Spice and herb derived essential oils and oleoresins are sold in large and growing markets.

Contribution to livelihoods

Spice and herb plants do not require large land areas for profitable cultivation and can also be gathered from the wild. In the case of cultivation, growing can be achieved without excessive investments as many spice and herb plants can be produced with minimal inputs of cash, labour and land. They are often an ideal crop to be integrated into small-scale farming systems and are suitable for smaller garden production (see FAO Diversification Booklet No.2 *Livelihoods grow in gardens*).

Spices and herbs as an enterprise can offer additional opportunities for employment within the family and income earned can be used as a 'safety net' in times of need and/or used to pay for medical expenses that the family may require. Cultivations of suitable spice and herb crops can provide extra cash to supplement household income and improve livelihoods. There is also a good potential for small-scale processing on-farm that can provide value-adding activities and higher income from the sale of processed spices and herbs.

Spices and herbs are a particularly viable enterprise for women as they can conveniently be grown in gardens in and around the homestead,

FIGURE 1 Varieties of spices on sale at a market.
(Photo: FAO/24691_1163/ G. Napolitano)

as well as providing an opportunity for women to start a commercial enterprise and be able to participate in the local economy. The income can be of great support, especially in case of widowhood or abandonment, and the enterprise can have the potential to provide a greater role for women in the family and community.

Spices and herbs can be used in household and personal hygiene products. They also contribute to nutrition, can provide traditional medicinal benefits and can garnish foods making them more appetizing to eat. For example, many street foods the world over are garnished with herbs and spices (see FAO Diversification booklet No. 18 *Selling street and snack foods*). Spices and herbs can also be used to preserve food (see FAO Diversification booklet No. 5 *Processing for prosperity*).

Market potential

Local markets for fresh, dried and value added spice and herb products can be developed in competition with imports. Organic and Fair Trade certification is sometimes considered worthwhile for export markets only. However, many African and South American markets have a sizeable local demand for organic products.

FIGURE 2 A women, who is part of a women's group, packaging spices in Nepal (Photo: FAO/22559/ G. Diana)

This demand comes partly from upper-income local and expatriate consumers, but HIV programmes often recommend eating organic food and this has led to awareness among the general population and additional lower-income demand for organic food crops.

Indigenous plants are now finding new uses given a renewed appreciation for natural products. Local processing can widen the variety of spice and herb crops that may find markets. Central processing plants for oleoresins have been set up in various countries-for example in India and Zimbabwe. Mobile stills operated by contractors allow small-scale farmers to grow essential oil crops without making an investment in distillation equipment.

The production of spices by small-scale farmers has been big business in many countries for centuries. The methods of finance, production, processing, quality control and marketing have been widely studied (for links to research on this see the *Selected further reading* section at the end of the booklet). Local demand in developing countries is largely for spices rather than herbs – taste varies regionally but pepper, curry spices and paprika are mainstay crops. In countries which are not traditional exporters, new production of such spices, where conditions are suitable, can often compete successfully with imports.

FIGURE 3 Local market sales in Mexico
(Photo: FAO/4182/ F. Botts)

Culinary herbs are less often traditionally produced by small-scale farmers than are spices, though Mediterranean North Africa is an exception to this. Herb production is often mechanized, and good quality is easier to achieve using forced air drying and machine cleaning than by small-scale sun drying and hand sorting methods, as used satisfactorily for many spices. Many culinary herbs originate in temperate/ Mediterranean climates, and perhaps

for this reason local markets trade fewer herbs than spices in many developing countries.

Purpose of the booklet

This publication aims to create awareness about the potential opportunities and advantages for spices and herbs as a viable diversification enterprise to enhance the livelihoods of small-scale farmers. The focus is on spice and herb enterprises being integrated into small-scale faming systems, alongside traditional crops and livestock, and/or harvested from wild plants. Opportunities for value addition are also highlighted.

Spices and herbs for improved livelihoods

Spices and herbs at household level

Spices and herbs can be integrated easily into the framework of many small-scale farmers' households. They can be cultivated in close proximity to the homestead, in either home or market gardens. Culinary spices and herbs require a relatively small area to produce marketable crops, and when added to traditional foods, will provide an appetising nutritional improvement.

Small-scale cultivation of spice and herb crops is particularly suitable for women as they can tend to herbs and spices close to the homestead. Post-harvest handling at small-scale level is fairly simple and does not require complex operations - fresh herbs can be sold in local retail markets and provide useful additional income for the farm family. Moreover value added processed products can also be developed at this level – condiments, pastes, etc.- with potential to enlarge the enterprise as skill levels and market knowledge develop.

FIGURE 4 A young man watering chilli pepper and onion plants in his home garden (Photo: FAO/22925/ G Bizzarri)

Health, nutrition and medicinal value

The medicinal attributes of herbs form the basis of traditional healthcare. Medicinal Aromatic Plants (MAP's) are widely documented to have a range of health benefits and cultivation can be beneficial to households and the wider community (see FAO Diversification booklet No. 17 *Health and wealth from medicinal aromatic plants*). For example, rosemary is used to treat headaches, poor circulation and as a natural breath freshener. Bay leaves can be made into an infusion to relieve flatulence and bloating and to help with arthritis. African basil (*Ocimum canum*) can be drunk as a refreshing tea and is used to treat diabetes, as an expectorant to clear throat and lungs, and as a mosquito repellent. Antioxidants are found in many spices and herbs which can contribute to the body's defence against cardiovascular disease and intestinal cancers. Examples include ginger, which is widely used for digestive problems; and fenugreek and garlic, which may help lower cholesterol levels.

Gender focused initiatives

Women play a very important role in farming households. In addition to domestic work they provide a high proportion of the farm labour. Many opportunities exist for women in spice and herb cultivation, in small household garden/kitchen processing enterprises, in further value addition and in selling. This enables women, in their own right, to earn income, to involve themselves in trade, create social networks, improve their status in the family and social status in their community and to provide added security to their household in case of abandonment by, or sickness or death of, the husband or other male household members.

FIGURE 5 A women and her spice crop: sun dried chilli peppers
(Photo: FAO/23072/ R. Grossman)

When organizing training it is important to include women as often their access is limited as preference is usually given to men when inviting participants for training sessions.

Opportunities for the disabled

Cultivation of plants can be a therapeutic exercise and enables mentally and physically challenged people to contribute to their household. Spice and herb cleaning is relatively light work compared to the labour involved in the cultivation of staple crops. For example, vanilla involves hand pollination and the pods are hand-picked, dried and conditioned before packing; hand cutting of lemongrass leaf into specified lengths for the EU continental loose tea market is another task that can be carried out by less mobile workers. Some seedlings can be grown in raised beds or trays on benches to make it easier for physically disabled or elderly less mobile people.

Where household members are weakened through suffering from HIV/Aids, diversifying into appropriate spice and herb crops can change the nature of the workload and enable them to still contribute to the household. In Rwanda, for example, an NGO, Gardens for Health[1] has successfully initiated collective small-scale agriculture for groups of people with AIDS to improve their food security and income. The cooperatives operate labour sharing schemes to give rest days and share the burden of work.

Peri-urban and urban agriculture

Spices and herbs can be cultivated in small urban plots as well as in roof gardens, pots and other areas where cultivation medium may be available. When spice and herb crops are produced in peri-urban and urban areas there is a market on farmers' doorsteps and marketing of fresh spices and herbs to consumers becomes feasible.

The cost of urban land may be high, but often unused land is cultivated informally. Care needs to be taken in the selection of land cultivated, avoiding wetlands, stream banks and catchment areas, and measures taken to minimise erosion and the resultant siltation of municipal water supplies. Adequate planning and guidance is required at policy level to provide a suitable environment plus training and support to ensure good standards of cultivation and hygiene are met.

[1] See www.gardensforhealth.org

FIGURE 6 Urban agriculture: farmer cutting spearmint
(Photo: FAO/22435/ O. Thuillier)

Financial rewards

Small-scale farmers can benefit from spices and herbs in a garden or smallholding to generate income to improve their livelihoods beyond subsistence. The smallholder will be familiar with what types of spices and herbs are suitable for local tastes. Profits realised from the enterprises will depend on the viability of the crop selected, skill and care in producing a quality product, and expertise in the marketing of that product locally.

Where crops are grown for a larger scale domestic market, perhaps for a local spice processor or packer, the potential rewards may be greater but will carry a higher level of risk. Post-harvest operations will become more complex and quality critical – processors often require a high microbiological standard. Access to such markets will require more business and marketing skill.

Producing a specialist crop for an overseas export market can be a high risk venture. However, there are many successful cases where production is organized under a contract growing scheme with a minimum price guaranteed to the farmer and a well organized supply chain administered by a competent and well funded buying company.

The livelihood activity

Crop selection

Most culinary spice and herb crops grow well or adequately in the tropics. Some, like sage, moss curled parsley, tarragon, and thyme, grow better in temperate climates. Basil, coriander and rosemary can grow at least as well in the tropics as in temperate climates, given adequate irrigation and under the right conditions (higher altitudes and cooler temperatures). Lemongrass, ginger and the capsicums are not much grown outside the tropics and sub-tropics.

Often a region will have its own indigenous spice and herb plants which can offer opportunities for products with traditional local demand. These plants will be adapted to regional growing conditions and can be found growing wild. Other plants with suitable climatic requirements can often be successfully introduced to create new opportunities. However the individual climatic requirements of different spices and herbs are quite diverse and should be checked individually on a case by case basis with regard to local agronomic, environmental and climatic conditions. The selection of which spices and herbs may be suitable for a particular locality requires careful research.

A small selection of spice and herb crops that are successfully grown by small-scale farmers follows:

Paprika

Paprika is widely grown by small-scale farmers in Africa. Solvent extraction plants for paprika oleoresin have been established in a number of African countries. Paprika is a labour intensive crop and can provide high returns per hectare.

Chilli

Like its fellow capsicum, paprika, chillies are widely grown in Central America, Asia and Africa. As the chillies are small (particularly the hotter varieties like African Bird's Eye), reaping is even more labour intensive than paprika and consequently the crop is mainly grown by small-scale farmers.

FIGURE 7 Red chilli peppers for sale at a market
(Photo: FAO/ 24731_0952/ O. Asselin)

FIGURE 8 Women harvesting chillies in Thailand
(Photo: FAO/ FO 5974)

FIGURE 9 Clove tree in Zanzibar
(Photo by M. Jack)

Cloves

Cloves are grown by small-scale farmers in many low lying tropical areas including Indonesia, Madagascar and Zanzibar. Apart from the use of the bud as a spice, the leaf, stem and bud are distilled for essential oils, and the bud has medicinal uses- for example for the relief of toothache.

Pepper

Pepper is the most important world spice crop. It is grown by small-scale farmers in a number of South American, African, Indian sub-continental and Pacific Ocean countries, and does best with high rainfall or supplementary irrigation, and at lower elevations in the tropics. It is labour intensive, and

FIGURE 10 Mature organic pepper (Piper nigrum) in Zimbabwe (Photo by M. Jack)

can be grown in gardens using leguminous trees as living supports. With adequate fertility and good planting material, yields from mature vines, after seven or eight years, are two kilos of dried black pepper per vine, or three tonnes/ha are possible. The crop needs about 2.5 m of rain or irrigation well spaced over the year, and grows well in humid areas of the tropics up to about 800 m elevation.

Geranium

The leaf and flowering stems are distilled to produce one of the more expensive herbaceous essential oils. It grows well in higher and cooler areas of the tropics, as well as in temperate climates. Selection of high yielding plant material with a chemical composition acceptable to buyers is particularly important, as is the design of distillation plant, harvest times, and leaf moisture content prior to distillation. It is a relatively labour intensive crop where small-scale farmers may have a competitive advantage.

Lemongrass

This is grown widely in the tropics, often by small-scale farmers for small-scale distillation or for delivery to contracting distillery plants. The leaf is used dried in teas (the precise requirements for small pieces for the EU whole leaf tea market makes

labour intensive hand cutting a necessity) and the stems are used fresh and dried in Asian cookery. The lemongrass crop is mildly susceptible to fungal disease – a rust- but is relatively easy to grow.

FIGURE 11 Tending a geranium crop in Rwanda
(Photo by M. Jack)

FIGURE 12 Chopping lemongrass by hand into sizes specified for the export leaf tea market
(Photo by M. Jack)

Sesame

Sesame pods shatter easily when ready for harvest, making the reaping of this dehiscent crop very labour intensive. Local markets can be found for use in baking breads and buns, and cottage industry tahini is made in the same way as peanut butter, using a hand or mechanized grinder.

FIGURE 13 Sesame in flower, Bolivia
(Photo by M. Jack)

FIGURE 14 Extension worker taking a cutting from a vanilla plant
(Photo: FAO/22984/ J. Koelen)

Vanilla
Pollination is very labour intensive, and the crop needs to be cured after reaping. Plants can grow among trees near homesteads, making this a high value crop in low lying tropical environments.

Fenugreek
This is the only widely traded leguminous spice, and is useful in improving soil fertility by fixing nitrogen. The seed is used for its medicinal properties and as an ingredient in curry powders.

Commercialised indigenous plants
The South African Cape herb rooibos has been very successfully commercialized as a tea and is exported worldwide. Makoni tea in Zimbabwe and the Burkina Faso spice Soumbala are other examples of such enterprises.

Key steps in the enterprise

Detailed recommendations on crop production, post-harvest and processing of individual spices and herbs are outside the scope of this booklet, but key aspects are covered. More information can be obtained from references in the *Selected further reading* section at the end of the booklet. A section on organic and Fair Trade is included in this booklet, as these certifications are increasingly worthwhile for small-scale farmers, operating on contract farming schemes with medium and large processors, in many countries around the world.

Cultivation
Spices and herbs can often be successfully cultivated on a small-scale or sustainably gathered from the wild, and for many of these crops expensive machinery is not needed. Spice and herb production can easily be integrated into the small-scale farm crop mix and some are suitable for smaller garden production round the homestead. Methods of cultivation will vary for different spices and herbs, but similar issues arise when it comes to harvesting and post-harvest operations. Specific crop requirements should be checked for any crop being considered. Compared to cereal crops, fertilizer inputs for acceptable yields are lower and selling prices per tonne higher. Cultivation and harvesting is often labour intensive, which may allow small-scale farmers a competitive advantage.

Soil fertility is a key factor in sustaining yields and reducing soil erosion. Crop management

and rotation should be organized appropriately to minimise plant diseases. Approaches using low cost fertility inputs to substitute energy intensive fertilizer with locally available agro-mineral fertilizers such as phosphate rock, and the use of legume rotations or inter-planting, are effective. Legume use increases both soil organic matter and biological activity and reduces soil erosion and consequent loss of agro-nutrients. Placing fertilizers close to seeds rather than broadcasting, and the use of zero or minimum tillage, also assist in raising yields and reducing erosion.

Organic methods are often suitable for spices and herbs since they are not heavy users of plant nutrients compared to starch crops, and pests and diseases are not usually major problems. If permitted organic fertility inputs are used correctly, yield differentials between conventional and organic spice and herb cultivation are often small.

FIGURE 15 Farmers hoeing soil around chilli pepper plants that will then be mulched with plastic sheets
(Photo: FAO/23185/ C. Shanghua)

FIGURE 16 Harvesting organic pepper on a small-scale farm in India (Photo: FAO/23423/ J. Boethling)

Harvest

During harvest, good hygiene is needed to keep crop microbial loads as low as possible. Small-scale farmers should be properly trained in personal hygiene and appropriate harvest practices. Harvesting should be avoided in wet and high humidity conditions wherever possible. All harvesting equipment should be kept clean and dry. Preventing soil contact will also help keep microbial levels down. Clean sacking can be used to cover the ground. Soil should be removed as soon as possible from roots and rhizomes after harvesting. Any rotten or damaged material at harvest and during post-harvest processing needs to be discarded so as to prevent cross contamination.

Post-harvest

Good post-harvest handling is crucial in ensuring a quality product. This is often an area where small producers have difficulty as a result of low technical expertise and facilities. Depending on the crop and the end-product concerned this will involve some or all of the following operations:

- Transportation (field to processing area)

This needs to be done as quickly as possible after harvest in clean

dry baskets, sacks or crates. Over-stacking, which will cause crushing, will need to be avoided and containers should allow air circulation. All equipment should be dried and cleaned between loads.

- Threshing/cleaning

This can be done by hand winnowing with sieves or by using mechanical separation (see below).

- Washing

Washing may be needed for products where dirt and dust are to be removed i.e. pepper spikes or ginger rhizomes. The water used must be potable and changed regularly.

- Curing

In the case of vanilla beans, sun wilting promotes the required enzymatic development of flavour compounds. With turmeric, boiling or steaming the rhizome with lime or sodium bicarbonate is sometimes used to eliminate the raw odour and gives a more uniform colour.

- Drying

This is a critical process whereby moisture levels are reduced to prevent deterioration. Drying can be done by spreading the crop in the sun (direct solar), or in drying rooms, or tunnels, sometimes using solar or solar assisted drying systems (indirect solar). Direct sun-drying tends to reduce the green colour of herbs and so limits export potential, but sun-dried quality is often acceptable in local markets.

Enclosed fuel assisted electrically powered driers can produce higher quality with lower contamination but cost more to install and run. A central drying and cleaning plant is sometimes used to handle crop from small-scale farmers from surrounding areas, on the model often used for tea production. The aim is to dry the product as quickly as possible but not so quickly that the flavour is spoilt- as a rule of thumb, when forced air is used, air temperature should not be over 35° C. For high quality- appearance, taste and microbiological status- most culinary herbs are best dried using a heat source-generated from fuel or solar energy, or at least dried under shade.

There are numerous solar dryers available as kits or via 'do-it-yourself' plans. Most use a sloping air tunnel with black surfaces, with clear covers to limit heat losses from the tunnel. The heated air in the tunnel rises and is led over or through the plant material, which is laid out in racks. With simple driers

it is difficult to ensure the airflow and temperature are optimal- at high temperatures, volatile oils are lost, and if drying takes too long the crop may develop mould. Solar drying can be a useful source of additional heat in a conventional fuel-fed forced hot air system.

FIGURE 17 Sun-drying of ginger, Kerala, India
(Photo by M. Jack)

FIGURE 18 Nutmeg drying in racks, Grenada
(Photo by M. Matthews)

FIGURE 19 A woman sorting chillies by colour and size (grading) at a market before selling them
(Photo: FAO/ 24712_2503/C.Thomas)

- Cleaning

Threshing and winnowing of seed spices after drying can be done for most crops on farm by traditional methods. Herb crops are more difficult to process, as stalks need to be removed from the leaf, and this is much more easily done mechanically

- Grading

The end product needs to be visually inspected and graded according to recognised trade standards.

- Packaging

The selection of appropriate packaging is important to protect the product and maintain correct moisture levels to prevent mould growth and deterioration. Packaging specifications may need to be checked with buyers.

- Storage

Conditions must be cool with low humidity and suitable pest control. Some spices are very prone to storage pest infestation- such as coriander,

FIGURE 20 Packaging ground spices
(Photo: FAO/22718/ G. Diana)

paprika and chillies. Fumigation should be done after harvest or on delivery to a warehouse, and regularly thereafter. Storage facilities should be rodent and avian proofed, and kept clean. Any infested produce should be removed from the storage area.

- Further processing

There is some potential for small-scale processing on-farm, which can provide value-adding activities and higher income from the sale of the processed spices and herbs. For example, on-farm distillation of herbaceous material by small-scale farmers is common in places as diverse as Nepal and Reunion, often using very basic stills made from oil drums and hosepipes. Such stills find alternative use for distillation of traditional fermented starch based brews (see FAO Diversification booklet No.21 *Traditional fermented food and beverages for improved livelihoods*). Microbial and pesticide contamination of spices and herbs cropped for processing by steam distillation or oleoresin extraction is not as much of a problem as in those to be sold dried, as the processing will remove

FIGURE 21 Large scale clove distillation plant at ZTSC, Zanzibar. The state owned trading company has lost its former prominence in the global clove spice and oil market, which was based on a government monopoly on Tanzanian cloves, with small-scale farmers selling their cloves at prices set by ZTSC.
(Photo by M. Jack)

the problem or leave it in the residue, unless the contamination is volatile (some pesticide residues) or soluble in the oleoresin solvent, like mycotoxins. Crops such as paprika and chillies have been successfully grown in a number of countries by contracting small-scale farmers, with oleoresin extraction being done in the producer country, or with the baled dried spice exported by the contractor for processing.

- Grinding

Milling can be done by simple hammer or plate mills on farm to temperature controlled equipment used by some spice plants. Milling reduces volumes, and thus transport costs, and may be appropriate in some cases but care needs to be taken as once ground the spice will lose flavour and colour more quickly. Often buyers prefer whole spices since they are harder to adulterate.

- Oil extraction

Extraction of volatile oils from product by steam distillation results in product with a higher value/ weight ratio. As with wine, chemical

FIGURE 22 Removing geranium material from a small still following steam distillation of essential oil
(Photo by M. Jack)

composition of stored oils may change over time, but with good management, most essential oils store well.

- Formulation

The preparation of further processed products such as spice blends or pastes, herbal teas, etc., adds value to the product and can create a profitable agribusiness either on farm or as a separate enterprise.

- Visual and laboratory inspections

Access to laboratory testing, in addition to visual inspection, may be required to verify the quality of the product. Provision of such services will be necessary for any product intended for an export market and this is generally organized by the buying company where the product is grown under contract. Testing may also be required by larger domestic market customers.

Product quality and safety

Good practice in cultivation, harvest, and particularly post-harvest operations, is critical in ensuring a good quality and a safe end-product.

The main quality problems include:

- Contamination with pesticides/ herbicides
- Infestation by pests
- Contamination by foreign matter – stones, hair, etc.
- Microbiological quality
- Mechanical damage to the product – splits, bruising
- Rots and mouldy product
- Compaction caused by overfilling/over-stacking of containers

Adequate facilities and layout

Consideration needs to be given to the facilities to be used for the processing and storage of the crop. For small scale 'cottage' industry crops may be stored domestically, but for larger scale operations, in order to avoid cross-contamination, separate areas should be maintained for the processing of raw materials and storage of finished product. Attention must be given to the hygiene standards of the buildings, equipment and personnel. The Code of Hygiene Practice for Spice and Dried Aromatic Plants 1995 (Codex Alimentarius Commission) CAC/RCP42 gives detailed advice on production and harvesting, the design of facilities, personal hygiene of operatives, hygiene methods for processing and end-product specifications.

Best practice systems

The Hazard Analysis and Critical Control Point (HACCP) methodology is used to identify potential areas where quality and safety may be compromised and to ensure adequate controls are in place to prevent this. Records of the production of batches of product need to be maintained to facilitate traceability to enable any poor quality product to be clearly identified and segregated if required. Training and advice in HACCP should be included in extension training programmes. Information on the application of HACCP principles in spice production can be found in a handbook published by The American Spice Trade Association (ASTA). Further details can be found in the *Selected further reading* section of the booklet.

Preventing product contamination

Good practice in harvest and post-harvest operations is fundamental in

ensuring that contamination of the product is minimised:

Physical: All work areas should be clean and free of possible contaminants. Before personnel enter the processing areas, hands and fingernails should be scrubbed using antibacterial soap, hair covered, jewellery removed and clean overalls worn.

Pathogens: Good hygiene to prevent food poisoning pathogen contamination must be maintained, particularly where end products are not heat treated in processing or by subsequent cooking- e.g. in the industrial application of spice powders added to crisp/snack flavour blends. Toilets and hand-washing facilities should be provided both in the field and processing plant and adequate training and supervision of staff organized. Good hygiene at all stages of production should result in a product acceptable for local markets. However, microbiological standards set by importers or local branches of multinational companies (often large users of spices in developing counties where local manufacture of sauces and soups are undertaken) are high, and in practice it is difficult to meet these standards with untreated farm dried product. Steam treatment can be improvised using farm stills. Irradiation of spices and herbs is a proven solution but there is consumer resistance to the process. Steam treatment is effective and leads to little quality deterioration if purpose built equipment is used. High pressure treatment with carbon dioxide is a promising method of reduction of bacterial and fungal counts.

Fungal derived toxins: Avoidance of mycotoxin contamination, formed by aspergillus and penicillum fungi, such as aflatoxin and ochratoxin, is most important. In-field contamination is difficult to avoid when conditions favour it, though the use of competitive non-toxin producing *Aspergillus flavus* strains has been effective on maize and groundnut crops (both crops are susceptible to mycotoxin contamination) in the United States of America. Use of trichoderma is reported to be effective, and standard agronomic advice is to avoid moisture or nutrient stress in the crop. Mycotoxins are common in spice crops such as capsicums, pepper and nutmeg. Prevention of post-harvest contamination is easier when crops are dried under controlled conditions using forced air heating systems. Diseased, mouldy and otherwise

damaged product should be removed before drying.

Crop moisture levels in storage should be monitored. Simple oven drying of a weighed sample is often used to determine the amount of moisture removed and therefore the initial moisture content. With some spice crops moisture levels can be judged by experience- for example paprika pods when dried for milling should break rather than bend, and coriander is at a safe moisture level if a hand can be pushed to the bottom of a sack of the seed.

There is no practical way of completely removing mycotoxins from dried spices once they are contaminated, but various methods can reduce contamination. These methods include treatment with ammonia, ozone, and various essential oils, in combination with heat. Treatment with solvents such as hexane or supercritical carbon dioxide in the production of oleoresins leaves some contamination in the crop residue rather than the extract. Mycotoxins are not volatile and so will not steam distil from a crop into its essential oil.

Pesticides: Most spice and herb crops can be grown with little or no use of pesticides. Where these are used compliance with local and target market regulations on their use needs to be properly managed. In cultivation care must be taken not to contaminate product with pesticides used on neighbouring crops, and storage separation should be carefully maintained.

Allergens: In processing, inadvertent contamination by other crops should be prevented particularly by potential allergens such as nuts, sesame, soya or grain with gluten content such as wheat or barley. The market for allergen free produce is growing, but demands complete separation of crops as all stages of growth and production. Such rigid separation is normally applied to starch crops such as quinoa (which is gluten free).

Heavy metals: Checks need to be made to ensure that toxic metals are not naturally present in, or allowed to contaminate, soil, water, composts or fertilizers. Arsenic has been widely used as a dip for cattle against parasites, and if land previously used for cattle handling is to be cultivated, residue checks would be a sensible precaution.

Artificial colours: Care must be taken to avoid inadvertent adulteration such as with artificial colours. After some chilli shipments were found to be contaminated with Sudan Red colour, food safety agencies instituted border tests for this contaminant. Inadvertent contamination can come from, for instance:

- marking inks in plant protection products
- bag markings being put on jute sacks
- fuel contamination in water

Assets and inputs required

The inputs for different crops will vary, but the following should be considered when assessing the specific requirements for an enterprise:

Land: Area and on-site facilities available, soil attributes, climatic conditions, water sources and road infrastructure for access.

Collection from the wild: Sustainability, legality of access, drying and markets for indigenous plants need to be ascertained.

Seed and planting material: The availability of good quality seed or nursery plants of suitable varieties, and the plant material with potential customers need to be verified. Locally traded spice seed can often be grown successfully- e.g. chillies, paprika, coriander, but germination tests are advisable, and capsicum seed may be infected with viruses- heat treatment of seed can remove viruses. Contractors will generally provide seed. Buyers, especially in export markets are often a good source of seed varieties.

Agro-inputs: What fertilizers, pesticides, insecticides, fungicides will be required and in what quantities for traditional intensive cultivation. Is there local distribution of inputs, or will farmers need to organise supply from the main cities? What natural/ organic alternatives are there?

Skills and labour: Access to appropriate training and adequate labour for cultivation and processing requirements need to be ascertained.

Capital and equipment: Tools, containers and appropriate transport for harvesting to ensure the crop is handled correctly need to be ascertained.

Irrigation: Depending on the requirements of the crop against the average rainfall patterns for the area,

checks on what irrigation facilities might be feasible need to be carried out. Drip irrigation is the most water-efficient but is capital intensive. Hand and treadle pumps are effective if water is available from rivers or wells where the water table is high.

Packaging materials: Assessments of what packaging system will be most appropriate in preserving the product correctly and the quantities required, order batch sizes and lead times for delivery need to be ascertained.

Storage facilities: What facility will be required to adequately store all the equipment, packaging and the crop itself to ensure cleanliness and avoid pest contamination?

Transportation: What mode of transport will be required from farm to store and onward to market, and how will the crop be protected from contamination during transport?

Speciality spices and herbs: Organic and Fair Trade

Organic

Introduction

Organic farming in general, and spice and herb farming in particular, is not yet well supported by research and extension recommendations, in comparison with conventional field and vegetable crops. Consequently, as much experimentation as possible should be done with various promising treatments, and control areas always kept for comparison purposes. Records of trial results should be incorporated into the normal yield records required for organic certification to avoid the results being lost.

Organic standards and certification

Organic standards are much better understood by consumers now that organic standards have been long established, but misconceptions and controversy are still common. The three main sets of internationally recognised standards- EU, Japan, and United States of America - are broadly similar and many certification agencies are licensed to inspect and certify to all three. A comprehensive guide to organic certification is outside the scope of this booklet, but reference and downloadable information can be found in the *Selected further reading* section.

Briefly: for crops, organic standards specify periods required for transition to organic status; permitted fertilizer and pesticide inputs (if an

input is not listed, it is not permitted) and restrictions on their use. Ground agro-mineral rocks, legume rotations and inter-plants, and composts are used for fertility management. Insect pests can be controlled by naturally derived insecticides such as pyrethrum and derris, by predators and parasitic organisms (for example *Bacillus thuringensis*). Control of fungal diseases is permitted by using copper and sulphur sprays and organisms such as trichoderma – with restrictions specified by the certifier, and a requirement that inputs must be covered by supporting documentation showing they are GMO free, where applicable. Seeds and planting material must be organic certified, or covered by "derogation", where organic material is not available. Permitted post-harvest treatments to prevent infestation are specified, and may include the use of CO_2, and heat and cold treatments. Specialised arrangements for inspection and record keeping apply to smallholder certification.

Good record keeping is required for traceability and audit purposes. Management procedures are checked to ensure compliance with relevant standards covering hygiene, labelling requirements, packaging materials, etc.

Organic fertility management

Fertility management is arguably the most difficult element of successful high yield organic farming. Because deficiencies cannot be remedied quickly by the use of soluble chemical fertilizers, long term planning is even more necessary than in conventional farming. Fertility under organic rules is easier to maintain on heavier soils, as nutrients are often leached more easily in lighter soils. As for conventional farming, fertility management should be supported by the results of recent soil analysis.

Spice and herb crops generally grow well in a soil with a pH around 6, and a slightly acid soil helps in making rock phosphate available, particularly the so-called 'insoluble' igneous derived types. Many tropical soils are highly acid, unless they have been limed, and if so, some crop nutrients may be unavailable to plants.

Land to be converted to organic status should have high levels of phosphate (**P**) and potassium (**K**). Experience suggests that conversion to organic, even with the minimum two year conversion period (during which fertility building legume crops can be grown), is a more economical entry method into organics than certification of virgin or fallow land.

FIGURE 23 Large scale production of compost in Bhutan for use in organic farming (Photo: FAO/18658/G. Blaak)

The most expensive, and normally the limiting, nutrient in organic farming are nitrates (**N**). After **N**, the other main limiting nutrient is **P.** Most unimproved tropical soils are low in phosphates. Ideally, organic enterprises should be started on land with adequate phosphate level prior to conversion.

Organic fertility management for herbaceous essential oils is relatively easy, as distillation removes mainly carbon, hydrogen and oxygen molecules, and not agro-minerals such as N, P and K. Composted residues from distillation are very useful in building soil organic matter.

Variety selection

Non organic seed and planting materials need approval from the certification agency- derogation from the EU rules requires specific authority, which may be granted where growers can demonstrate that no organic seed is available and the seed to be used is not treated with non- approved chemicals.

Once the initial sourcing work has been done, seed and planting material should come from the organic crops – plant material should be kept for future sowings, and seeds kept from selected plants.

Sources of organic certified seed and planting material for spice and

herb crops are given in the *Selected further reading* section. Where land is in conversion or the spice will take several years to first harvest (e.g. vanilla or pepper), non-organic seed or planting material may be acceptable to the certification agency. Potential customers and other growers may help with seed supply, and specialist organic consultants should have sources of supply of acceptable varieties.

In the initial stages when imports of seeds and planting material are generally necessary, good relations with the local plant protection department are needed to avoid loss of material in quarantine or by delays in clearance on arrival.

Irrigation

Irrigation is an economic necessity for herb production in most tropical and sub-tropical climates. Drip irrigation tends to produce the highest yields at the lowest energy cost, and reduces problems with soil splash on leaves, and fungal diseases. Perennial crops like rosemary originate in climates with a long dry season, and will survive with limited moisture for a period if it is necessary to economise on water, but irrigation or rain is needed to generate new growth for fresh herb sales. Overall, total water input in the growing season of 20 mm per week net on herb crops in general is a reasonable compromise between yield and water use/cost.

Crop establishment

Transplanted crops generally take more easily when planted out in cooler weather with cloud cover, and if they can be planted with the rains, the initial heavy demand on irrigation is reduced. Most herbs take better when transplanted from seedbeds as rooted cuttings. Only a small amount of leaf should be left above the ground for most herbs, on about 50 mm of stem- this reduces desiccation through transpiration.

Transplanting into a hole filled with at least a litre of compost or compost soil mix will increase the moisture retention ability of the soil and make a good stand much more likely. A hole for transplanting into the compost can be made by a pointed stick or dibber, and care taken to ensure roots on cuttings are not compacted in the planting hole. Close supervision of transplanting is a good investment.

Direct sown crops like coriander and parsley (both tap rooted *umbelliferae*) should be sown if possible in cooler weather to reduce weed competition problems during and after germination. Flame

weeding of beds where broadleaf weeds have been germinated (stale seedbed technique) can be used before drilling the crop.

Weed control

Weed control (along with **N** management) is the main problem for organic farming, and especially so for spice and herb production- where crops generally do not canopy heavily and so do not shade out weeds. Farmers should aim for zero tolerance of weeds at all times. The sayings "one year's seeds means seven years weeds" and "a stitch in time saves nine" need to be emphasised continually to cultivators. Weeds should be removed the same day to avoid seeding or re-growth – a particular problem with grass weeds.

Hand weeding should be carefully supervised to avoid damage to crops and a resultant requirement for subsequent infilling. Flowering and perennial weeds should be removed from the land on the day of cultivation. Perennial weeds should be lifted with forks, rather than hoed.

If land has been farmed conventionally prior to conversion to organic, weed control before and during conversion should be meticulous, and care taken to ensure the land is free of perennial weeds using either cultivation or herbicides or both. Mechanical cultivation and hand weeding should be continued through the conversion period with zero tolerance for seeding or perennial weeds. If fallow land goes directly into organic status, perennial weed roots should be desiccated by ploughing and fallowing in a dry period- hand weeding of perennial weeds once they are established is difficult and expensive.

Pest and disease control

General

Under competent organic management, pests are, perhaps surprisingly, often much less of a problem than under traditional conventional farming where crops are sprayed routinely with pesticides- where predator populations may be reduced. When compost and legume residues are used rather than fertiliser nitrates, crops may be more pest and disease resistant. Once established, herbs are not generally subject to major insect pest problems, particularly if habitats for predators are maintained, and the temptation to spray against outbreaks of pests is resisted. Organic permitted sprays are non-specific, and so tend to reduce predator populations which have to build after pest numbers

have been re-established. Predators will generally keep problem pests such as spider mite and whitefly under control if they are allowed to. These two can be serious pests when spices are grown conventionally and sprayed routinely, but after conversion to organic they are generally observed to have become virtually absent.

Plant diseases are a problem on lemongrass and mint- both of which can suffer attacks of rust, but after reaping, new growth is usually acceptably clean. Anti-fungal sprays permitted under organic certification rules, such as sulphur, and copper salts, are broad spectrum and can interfere with beneficial fungi.

Organic pest control sprays

Spraying should be avoided if at all possible. To make this practical, some re-training of farmers may be necessary. They should be taught not to spray prophylactically or at the first sign of pest presence. Most organic permitted sprays are broad spectrum and will damage predator populations.

For insect pest control, pyrethrum and rotenone sprays are easily made or purchased, and are effective between them against most insect pests. BT and Nuclear Polyhedrosis virus (NPV) sprays are effective against caterpillars- though moth/ caterpillar problems are rare with herbs.

Compost

The beneficial effects of compost on plant nutrition and disease resistance are well known- and there is never enough compost. Material that can be brought in for composting- distillation residues, pack house waste, manure from local livestock enterprises- whatever is available should be secured and the certifier's permission obtained. Oilseed cake from non edible crops such as castor and jatopha are the most economical bought in NPK as there is no competition from the livestock feed industry.

Organic nematode control

A few herb crops are very susceptible to nematode attack. Some *Umbelifferae* such as angelica and lovage can show extensive galling. Some spices, like capsicums and pepper, can be seriously affected when grown in lighter soils. The best defence is high organic matter and the resultant soil borne predator populations. *Pasteuria penetrans*, an effective predator on some nematode species, can become evident in soils once conversion to organic status has shifted emphasis from NPK

figures to achievement of higher soil organic matter content.

Beneficial insects and bug banks
Establish rows a metre or so wide at convenient intervals- at land boundaries or on contour ridges- of suitable predator host plants, preferably perennials for ease of management. Fennel, pigeon pea, citronella are all useful. Avoid killing predators by accepting some crop damage and resisting the impulse to spray outbreaks- when possible. There is usually enough for everyone, and in the long term spraying is likely to be counterproductive.

Beneficial Fungi
In much the same way as broad spectrum insecticides like pyrethrum and rotenone damage control through killing predators, the main fungicides allowed in organic systems- sulphur and copper salts- can kill beneficial fungi.

Trichoderma harzianum TH (and other T varieties) are widely used in seedbeds to control soil borne fungal diseases (e.g. in tobacco seedbeds). Selected strains are effective against a wide range of plant pathogenic fungi including *Pythium* spp., *Rhizoctonia solani, Fusarium* spp., *Botrytis cinerea, Sclerotium rolfsii,* and *Sclerotinia homoeocarpa,* and *Gliocladium virens.* Root zone protection from fungal pathogens is taken from seedbed soil with transplants. The root structure of treated plants is generally better developed, and yields higher. Seedbeds should be treated with TH following manufacturer's recommendations, and direct sown seeds can benefit from TH-including rotation legumes such as sunnhemp.

Harvesting
For distillation and drying, reaping on a larger scale is done with a side bar mower or forage harvester. For fresh produce and smaller scale dry and distillation production, sharp sickles or knives are used. Field hygiene - hand and implement washing, avoidance of contact of crop with soil, and storage protected from contamination by rodent and avian droppings, etc. – must be properly managed

Organic wild harvesting
It is important that any enterprise utilising plant material from the wild ensures there is no over-harvesting of wild plant populations or environmental damage. Cultivation

may be a better option to avoid damage to bio-diversity. Wild harvesting is a major source for both organic and conventional spices and herbs.

Organic certification has been obtained for wild collection of plants including, for example, material for herbaceous essential oils (buchu in South Africa), MAPs (Devil's Claw in Namibia), herbal teas (honeybush and rooibos in South Africa), and spices (cinnamon in Madagascar).

Storage management

Good hygiene – processing as soon as possible after reaping, avoidance of contaminated material, rodent and avian entry into stores, and rigorous enforcement of cleaning procedures on machinery after use- will avoid most infestation problems.

Fair Trade

Fair trade has been a very successful multi-billion dollar development and marketing concept- best known for coffee, cocoa, bananas and tea. There is a variety of different Fair trade and ethical trade standards (for example from Ecocert or IMO) but the best recognised certification agency in most markets is probably the Fairtrade Foundation which uses the trademark shown in Figure 24. Their standards for a range of spices and herbs have been published since 2005.

Fair trade producer standards cover both organic and conventional production. For some crops production both by smallholder groups and by employers of labour can be certified. Minimum prices and premiums over market price (generally roughly 15 percent) are specified. Pay and conditions for employed labour is audited. Most Fair traded goods are shipped in bulk, to be packed in importing markets, rather than value added at source.

FIGURE 24 Fairtrade logo

CASE STUDY 1 **Organic hibiscus production, Senegal**

Agriculture in Senegal's dry tropical savannah relies on fragile soils and sporadic seasonal rains. Unlike other crops such as millet or peanut that require heavy doses of chemical fertilizers and pesticides, hibiscus is a low input crop and is hardy, requiring little water.

Hibiscus flowers are a vibrant red colour with floral berry-like aroma and a pleasantly tart taste used in teas and cool drinks. Fresh hibiscus can be used to make wine, jelly, syrup, chutneys, beverages, puddings and cakes. When dried it is used in teas, jellies, ice cream and even to flavour butter.

Hibiscus production has been a part of the Senegalese economy for many years. However, drying methods were unhygienic and there were few quality controls in place. The crop was seen as secondary and low margin.

Since 2004 ASNAPP (Agribusiness in Sustainable Natural African Plant Products) has been working in conjunction with other local and international development agencies to improve standards and expand the export market. Yields have been improved via improved cultivation methods incorporating the use of organic compost.

Prices have improved by 40 percent and there are now over 5 000 resource limited farmers in cooperative groups, many of whom are marginalized women, growing hibiscus in various areas of Senegal producing over 700 tonnes. Contracts have been secured with soft drinks companies in South Africa, France and California.

ASNAPP have now also acquired organic certification for the growers and intends to gain Fair trade certification as well as continuing to develop and nurture the vital market linkages to sustain the enterprise.

A hibiscus production guide can be downloaded from
http://www.herbs.org/africa/hibiscus_production_manual.html

Source: ASNAPP (Agribusiness in Sustainable Natural African Plant Products). (Available at http://asnapp.org.za/index.php/component/images/stories/index.php?option=com_content&view=article&id=53:hibiscus-adds-colour-to-womens-group&catid=37:senegal&Itemid=64)

Developing the livelihood activity: Successful and sustainable strategies

For a spice and herb enterprise to have a good chance of success, and to survive as a business, strategies that support its commercialization process are needed. This process involves appraising the market, identifying suitable marketing channels, developing consistent quality in products, adding value to the products where opportunities arise, and the development of a realistic overall marketing plan. Since spices and herbs are relatively specialist products, an enterprise to be successful will require cooperation between all parties involved directly and indirectly in the supply chain – small-scale farmers, processors, traders, private enterprises, and NGO's, technical institutions and government departments.

Market appraisal

Developing and newly industrializing countries have an increasing demand for spices and herbs. They offer exciting potential for growth and there are and will be many opportunities to develop small-scale enterprises.

Developed country markets are now well established and further growth will be generated by the wider use of culinary spices and herbs in markets where once spice meant pepper and salt. Newly industrializing markets are providing new market opportunities. The increase in interest in new foods, natural organic products from sustainable sources and Fair Trade promotions, natural health remedies and pharmaceutical developments- all assist in providing new export market opportunities.

In deciding how to develop a spice and herb enterprise it will be necessary to carefully examine the market opportunities. The appraisal should consider the following aspects:

- *Demand*
  Establish what volumes and quality are currently required for any potential market. Is there an opportunity for growth in the markets identified?

- *Market Channels*
  Research whether there is demand for direct or indirect sales to local consumers, local or national
  processors, or any export buyers.
- *Traders/Wholesalers*
  Verify which traders and wholesalers are active in the area and their reputation.
- *Competition*
  Ascertain what competition there is.
- *Farmer groups/Cooperatives*
  Find out if there are any producer partnerships already operating? How effective and are they looking to expand their membership? If no groups presently exist, an assessment of whether creating one would be of benefit or not should be carried out.
- *Value addition opportunities*
  Understand if the product proposed be differentiated on better quality or by value addition, via, for example, on-farm processing.
- *Infrastructure*
  Determine where the local markets or delivery points are physically located. What distances are involved, what transportation will be required and is the road infrastructure adequate? Assess the quality and efficiency of the local public markets for sale of produce.
- *Profitability*
  Assess the potential returns for any targeted market opportunity. Gauge the price sensitivity of the product.

FIGURE 25 A women's group discusses selling prices prior to marketing their produce (Photo: FAO/ FO 7174)

Test planting of spice and herb crops

Initial trial planting is important to gauge the suitability of a crop for local conditions and the levels of input required for cultivation, harvesting, storage, processing and marketing on a larger scale. Mistakes made at the trial stage reduce the chance of expensive crop failure so often made by farmers going straight into full production. Using small areas of land in gardens or communal areas will enable potential growers to become familiar with the crop and its production techniques. Using a Farmer Field School (FFS) approach for potential growers is a viable manner of training. In the FFS approach small-scale farmers learn and obtain knowledge 'by doing.' They are involved directly in the field and actively participate in all aspects of growing spices and hebrs. Small-scale farmers are involved in tasks, observations, analysis and decision-making on what they are actually doing with the plants. The focus on such training is not only to consider the 'how', but more important, the 'why.'

FIGURE 26 An extension worker teaching planting techniques to the local indigenous community in Ecuador
(Photo: FAO/21570/G. Bizzarri)

Different varieties of plants can be assessed to check which is best suited for the purpose in terms of yield, disease resistance, drought tolerance, pest management and perishability of end product. Keeping detailed records of cultivation trials, including labour time and costs of inputs, enables a gross margin analysis to be calculated using market prices, and profit projections can then be made. Product samples harvested from the trial area can be test marketed to potential customers.

Marketing channels

Small-scale farmers can sell directly to final consumers, retailers, traders, and exporters. To develop an enterprise a short well organized supply chain is generally more effective. Membership of a farmer group or cooperative may enable access to more market opportunities with economies of scale and more support.

Retail

Herbs and spices are retailed by informal traders in open markets and kiosk both in bulk and in value added form. The lack of motorized transport means locational convenience is still of priority importance to the majority of consumers. Niche tourist and expatriate markets may exist in some regions for spices and herbs in

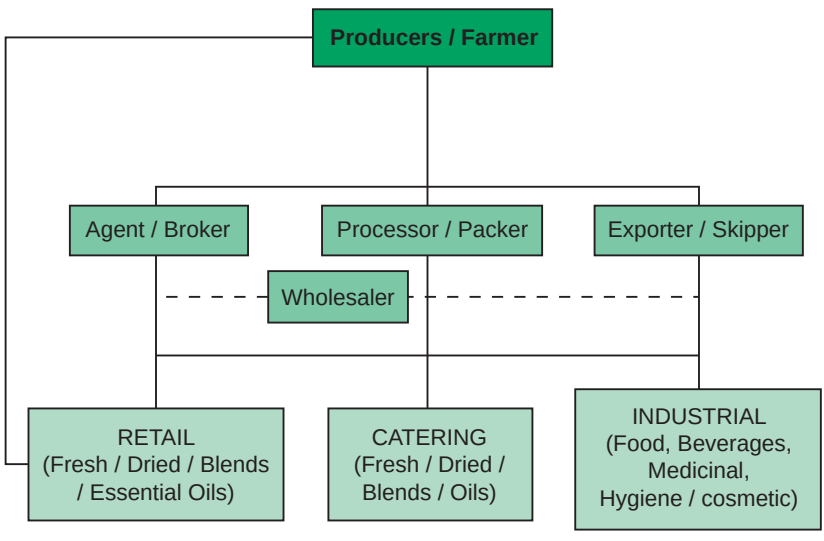

FIGURE 27 A herb and spice supply chain as commonly found in many countries

FIGURE 28 A market stall retailer selling traditional oils, creams, ointments and medicines (Photo: FAO/CFU000634)

dried, whole or ground form as well as further processed products such as jams, teas, condiments, etc., and for these markets requirements for appropriate packaging and correct labelling need to be considered for retail packs, and high standards of food safety need to be maintained.

Catering

Food service outlets (institutions, hospitals, restaurants, etc.) offer the potential for larger bulk sales of fresh and dried products. It is unlikely that small-scale farmers will have the ability to access these markets directly but this may be achieved through a trader or wholesaler. To shorten the supply chain and access this type of market directly small-scale farmers may have more success in well managed groups in order to be able to deliver the quantity and quality required with adequate reliability and continuity.

Industrial

This market is large and encompasses food and beverage manufacture, personal hygiene products, cosmetics, medicinal and household fragrance products. Customers may range in size from small household processors, local agribusinesses

to large national producers and multinational processors. However as in catering markets small-scale farmers will have difficulty in access if they are alone and joining a farmers' marketing association may be a viable option for accessing such markets. However, these markets may have stringent quality controls, and small-scale farmers will require support and training which can be either provided by the buying company, under contract farming agreements, or may need to be provided by extension services.

Exports

A product intended for export is usually produced in a more formal and shorter supply chain organized by marketing companies with links in export markets. The farmer will grow the crop under contract and is generally assured a minimum return and is given technical support and training in cultivation of the required product.

Spice and herb products

Product types can be fresh, dried whole or ground, oleoresins and steam distilled oils. This variety allows the small-scale farmer to potentially have a diverse portfolio of products that derive from the same crop and so not only have more marketing flexibility, but also more chances of earning income from the diverse products.

Fresh herbs

Fresh cut herbs are popular at the upper end of the retail and catering markets in many developing countries. Fresh herbs require less post-harvest processing and can be washed by customers to reduce microbial contamination. Exporting of fresh herbs demands a high standard of cold-chain management. Popular fresh herbs include basil, chives, cilantro/coriander, dill, mint, parsley, rosemary, and lemongrass. Fresh herbs and spices are also processed into paste/pesto- basil, coriander, garlic and ginger, for example- where less flavour and aroma is lost than during drying, and the product should be commercially sterile.

Oils and oleoresins

Steam distilled essential oils from aromatic herbaceous and spice crops are used in a multitude of products - in foods, healthcare, personal hygiene, household fragrances and perfumes. Essential oil production can be achieved with reasonable levels of investment and simple technologies that are easy to use and install in rural settings with

appropriate technical training and support. The use of mobile stills by a contractor is a useful way of processing small-scale farmers' crops.

Oleoresins are produced by solvent extraction of flavour compounds, which are macerated in a solvent (for example hexane or for organic oleoresins, liquid carbon dioxide), and the solvent evaporated under vacuum, leaving a flavour concentrate. The process is much more capital intensive – and dangerous if not managed very carefully – than distillation.

Laboratory testing may be required if the product is to be exported to show it meets the required standards. Small-scale producers will need assistance in this and will need to monitor market trends carefully and build client contacts and ensure they receive consistent supplies.

Local and regional markets offer many opportunities for value adding. Local cosmetic companies in many developing countries market anti-mosquito preparations based on citronella (*Cymbopogon nardus*) and in Papua New Guinea, for example, pharmacies sell Waria Waria oil containing cineole distilled from *Asteromyrtus symphyocarpa*. Tea tree oil grown in Zimbabwe is used in a range of locally made cosmetics and antiseptics.

The following case study illustrates how diversification into distillation of herbaceous materials can lead to improved livelihoods, for a community owned business in Rwanda.

CASE STUDY 2 **Ikerezi – Rwanda**

The Ikirezi Natural Plant Products Company is a community driven enterprise which has been successful in developing an essential oil industry in Rwanda. The focus is to produce high quality products and to assist farmers in shifting from purely subsistence agriculture by adding profitable cash crops. Geranium (*Pelargonium graveolens*) has been found to provide higher financial returns than more commonly farmed crops such as tea and coffee and can be grown and harvested without degrading the soil.

The essential oil project has increased income in rural areas and drastically improved the lives of many in Rwanda creating access to better education and healthcare. As a community orientated business Ikirezi encompasses vulnerable groups left following the war including widows and orphans. This has been achieved through cooperation with farmers as well as public stakeholders and development organizations.

CASE STUDY 2 **Ikerezi – Rwanda** *(Cont.)*

Known for its rose scent, essential oil of geranium is commonly used in cosmetics, fragrances, and aromatherapy products. The product is organic and ECOCERT certified. Following a Chemonics consultancy study, funded by ASNAPP and USAID, trials for possible diversification crops started in 2003, and geranium production was initiated in 2006. Geranium is cultivated by over five hundred small-scale farmers grouped into three cooperatives and the essential oil is extracted and sold to local, national and international markets.

Key lessons identified which are useful in developing rural-based and community driven projects:

1. Give ownership to the community groups and link each farmer' revenue to own production.

2. Foster Strategic partnerships with institutions..Ikirezi partnered several institutions including World Relief (WR), the Rwanda Investment and Export Promotion Authority (RIEPA), the Ministere de l'Agriculture et de l'Elevage (MINAGRI), and the National Forestry Authority (NAFA).These partnerships were invaluable in the success of the venture.

3. Ensure a high quality product. ASNAPP, Ikirezi and the partners in Rwanda identified some weaknesses in the local geranium germplasm and arranged for the importation of quality planting material via C L Teubes Pty Ltd in South Africa. The right planting material ensures that Ikirezi produces top quality products for subsequent oil extraction. Ikirezi trained its farmers in the rudiments of geranium production using organic principles. The company acquired and installed three distillation units where oil of international standards is extracted by well-trained technicians. Obtaining Organic certification with ECOCERT for the oil opened up a niche and quality-based marketplace accessible only to a select few geranium oil producers worldwide.

4. Deliver real improvements in livelihoods to sustain the enterprise. Ikirezi extended further employment opportunities from processing to the farmers and their dependants. About half of the farmers are now investing in housing, livestock and able to provide healthcare and education of their children. All of the farmers have now opened savings accounts with their local banks.

5. Continue market research and appraisal - the company investigated other potential plants for oil extraction and has recently added lemongrass and eucalyptus oils to its range, and trials of patchouli have started. Price fluctuations in the geranium essential oil market are common and the addition of other oil crops will allow Ikirezi flexibility in its production mix to sustain profitability.

Source: Adapted from ASNAPP (Agribusiness in Sustainable Natural African Plant Products) www.asnapp.org and Ikirezi - www.ikirezi.com

Product diversification options: Adding value

Opportunities for further processing and value adding include:

- Food flavours, powdered blends, pastes such as garlic puree or as oils
- Condiments - basil pesto, mustards
- Cosmetics
- Herbal teas
- Personal hygiene products such as scented soaps or mint mouthwash
- Medicinal
- Aromatherapy oils

CASE STUDY 3 **Value Adding**

Tulimara (Speciality Foods of Africa Ltd) branded goods have been sold, for a number of years, in food retail outlets in Zimbabwe. Value added products include herbal teas from an indigenous herb, Makoni, jams, canned nyimo beans, and fruit bars. Produce is sourced in conjunction with an environmental Southern African NGO, Safire from small-scale farmers.

FIGURE 29 Value added spices, herbs, etc in Zimbabwe
(Photo by M. Jack)

Marketing strategies

Value addition

Secondary processing enterprise opportunities can assist in stabilising values by creating a non commodity product. The ability to innovate, produce new or enhanced products will improve the sustainability of the business.

Good buyer – producer relationships

Where there is trust and a long term business relationship this will help maintain market linkages and provide producers with market information and ongoing support. Producers must be able to supply potential buyers with representative samples of the crop and avoid giving over optimistic supply quantities and delivery schedules.

Product distinctions

Key selling features to raise the profile of a product can include accreditation for organic production, Fair trade and various quality standards. Assessing the best certifications and certifying agency to work with is an important aspect to consider, especially for the fit with the longer term marketing plan and to minimise the costs and time required for inspections.

Organization

Farmer groups

Farmer groups, community villages or cooperatives may improve small-scale farmers' returns and market access. They also can provide a sufficient quantity of product to create more formal, stable market cash crop arrangements. Where small-scale farmers are selling through brokers/middlemen they are vulnerable to realising low prices for their produce. Membership of a group, which may comprise up to three hundred households, can increase earnings dramatically by collective buying and selling in bulk.

Farmer groups can also enable small-scale farmers to gain access to be suppliers to both higher value retail supermarkets but also larger volume catering customers such as hospitals, schools, institutions. Links between buyers and farmer groups reduces the number of levels in the supply chain giving better prices to the producers.

Collaborative partnerships

Organizations such as PhytoTrade Africa, ASNAPP and HARC work to build market linkages and develop new products and markets. They provide technical support, training,

and financial assistance for grower cooperatives and agribusinesses. Financial help may also include assistance for investment in crop driers, storage facilities and other processing equipment. By working with many institutions in the country they aim to foster enabling environments for agribusinesses to prosper.

Case study 4 demonstrates how the sustainability of supply of a wild harvested plant, bay leaf, and its marketing has been improved by better organization and cooperation between parties.

CASE STUDY 4 **Improved Organization of Bay Leaf Wild Harvesting, Uttarakhand State, Nepal**

Bay leaves ("tejpat" locally) are harvested from wild aromatic laurel which grows on poor, degraded soils on steep slopes in the Himalayan foothills. Uttarakhand State has a wide biodiversity including many medicinal and aromatic plants. It has declared itself a 'herbal' State and is keen to promote bay leaf as a means of income generation for the poor and landless.

Previously the Forestry Department granted permits to traders for collection of the bay on a five year rotation. The traders hired local people to harvest and whole branches were being stripped to gain as much product as possible. No grading was done and the product had to be delivered to the collection/auction site 300 km away.

The Uttarakhand Forestry Department in partnership with The Himalayan Action and Research Centre (HARC) has reformed the process for the benefit of the local community to improve the sustainability of the enterprise and ensure more regular income for the villagers. Six self-help groups have been established from the five villages in Nizmoola valley in the Chamoli District. Government Forestry Officers have trained harvesters to collect the leaves sustainably, not damaging the plants by taking whole branches or stripping, but by taking only small twigs and leaves.

The groups allow only one collector per household and they are permitted to collect only one head-load per day which they have been trained to dry, grade and pack before bringing it to the newly set up local storage depot to receive payment in two stages. An initial minimum payment is made, and the balance when the leaves are sold at the local auction. Organic certification has been gained for the leaves, which contributes to a higher sale price. The groups are also now involved in further grading and packaging post auction. The Forestry Department is also considering using this as a model for other products.

Source: The New Agriculturist; July 2009
(Available at http://www.new-ag.info/focus/focusItem.php?a=836)

Contract farming

A well run contract farming operation can, by providing inputs and extension advice, improve small-scale farming standards overall, and facilitate yields comparable to those achieved by well funded large-scale commercial farmers. The main difficulty with contract farming is side marketing of crops outside contract terms, generally when higher prices are offered, or where an obligation to repay loans or refund input costs can be avoided. There are many examples of contracting companies that have collapsed. Small-scale farmers who are generally not in a position to absorb losses, may then find themselves unpaid or with un-saleable crops. The contract farming business is vulnerable to market fluctuations, and contracting operations need to be well capitalised and run with diligence and prudence.

Promoting spices and herbs: Support services

Public policy

Governmental support should focus on the creation of a facilitative environment for small-scale producers and agribusinesses to prosper, and where possible should include:

- Support and funding for agricultural development including the provision of extension staff to offer technical advice and training. Research areas should include promotion of new spice and herb products and Medicinal Aromatic Plants(MAPs) suitable for the growing regions, and assessment of best suited plant varieties for the purpose.
- Provision of adequate infrastructure for enterprises to prosper –transport and communication systems, water and electricity supplies, well run local public markets that are clean and efficient. Public-private enterprises may be viable in enabling and supporting these improvements.
- Provision of healthcare services, education and skill development.
- Regulations to ensure food quality and safety. Licensing of traders to avoid unscrupulous exploitative practices.
- National trade promotion to assist in the development of export markets.
- Assistance in establishing and agreeing clear quality grades and specifications and to ensure all farmers and traders follow them.
- Enable and encourage access to financial services and credit for rural poor communities.

Technical support, training and skills development

This could cover the following areas:

- Good personal and product handling hygiene.
- Application of fertilizers and pesticides (agrochemicals) and knowledge of the environmental risks associated with their use. Methods of integrated pest management.
- Technical support in best practice for conventional and organic cultivation methods.

- Harvesting and post-harvest handling such as the correct assessment of crop maturity and minimising wastage and quality grading.
- Irrigation.
- Protection of the environment – overharvesting wild products, and reduction of soil erosion and pollution of waterways.
- Health and safety training to minimise accidents arising from the use of chemicals, powered equipment, etc.

Where structured supply chains are established for export markets, buyers generally invest in technical support for their contracted growers to assure the end product is of the required quality. However, for enterprises targeting local domestic markets entrepreneurs may require more NGO or governmental support for appropriate training.

Training is best delivered through Farmer Field Schools (FFSs) delivered on site to groups. This approach provides a practical 'hands on' participative learning process. Training should last a season of the crop giving full opportunity to observe and participate in the cultivation, harvest and post-harvest processes. The growers would ideally meet weekly to discuss problems and solutions and to learn new aspects. To meet demand for trainers, experienced agronomists can select and train local trainers to develop the required skills.

Business skills development

Initially, any small-scale farmer producing a cash crop should, as a minimum, be aware of how to keep records of production and costs, and have a good idea of the market for such crops. All training delivered should be tailored to the skill levels of the recipients. To develop beyond subsistence and informal local trade into a small business, further skills will be required to increase the likelihood of a successful, profitable outcome. These will include the following:

Bookkeeping

More formal supply chains require farmers to be able to issue invoices, delivery notes and keep other records. Farmer groups can often achieve this more easily than individual smallholders but it will be important for all to understand the basic administration requirements.

Market research

Monitoring of trends, understanding consumers, finding out quantities needed as well as quality factors

associated with spices and herbs are all important matters that are needed by small-scale farmers and others involved in the supply chain. Training in collecting data, carrying out rapid surveys, estimating demand and supply and so forth are needed.

Marketing methods

Small-scale farmers and others in the supply chain will benefit from knowledge of basic sales and marketing methods, negotiation skills, planning, etc.

Business planning

Cash flow planning, Profit and Loss analysis, assessment of investment suitability and pay back, creation of proposals to obtain credit will benefit small-scale farmers and others in the supply chain.

Market information

It is most important for producers to be well informed on market developments: new competitors, new technical information and price trends. Greater efficiencies can also be achieved through the supply chain by the effective dissemination of information. This can be achieved much more easily now that mobile phone ownership is spreading. Short Message Services (SMS) based systems are being developed in many instances; notably in Sri Lanka, where in fresh produce supply chains there is a system providing e-bulletins to give market prices and links with extension support services. Bulletins could also include input availability and prices, early warnings on pest outbreaks, etc. This information is also very effectively broadcast by local radio, simple notice boards at collection points and storage depots.

Financial services

The lack of access to capital and appropriate financial products constrain new entrants to a market and hinder the development of existing smaller enterprises. In a formalised supply chain buyers may support producers with credit and inputs for crops to be grown for them under contract. Other sources for finance can be 'not for profit' NGO's working to assist in the establishment of an enterprise or 'micro-finance' schemes and private banks.

In many successful cases it has been the cooperation between NGO's and for profit traders that have provided the overall support and finance for a venture. Where farmers collaborate in groups or as a cooperative they will have a better chance of securing finance.

Overall it is the public sector that needs to create a favourable

environment for the development of private financial services that have a particular focus on rural areas as well as the agricultural sector.

Organizational options

Individually, small-scale farmers will not have the time and resources to gain the training, technical support and marketing information they need to develop their business to best effect. The following organizational options show how a collaborative approach can give better support services for their enterprises.

Producer groups

Cooperatives, farmer groups, community groups all give support for smaller growers and also other associated parties such as transporters or post-harvest processors. This support may be minimal or extend to the sharing of knowledge, training opportunities, equipment, transport costs, bulk buying, credit provision, bookkeeping services, processing, storage, marketing and sales services.

Trade associations

A group of producers or businesses in a similar trade who cooperate to share knowledge and technical information, monitor market trends and developments, provide technical information and advice to assist all participants.

Private company – producer partnerships

These are generally formed with a company with links to an export or domestic market sourcing under contract. The company provides extra support for small-scale growers in the provision of input credit, field training, covering certification costs, and the provision of sales and marketing expertise.

Non- profit organizations

Small-scale farmers can join schemes initiated with an organization which provides support in training, technical assistance, and access to markets with the aim of empowering community groups to develop and take ownership of the enterprise. Schemes need to have clear objectives and exit strategies to ensure the enterprise are sustainable when any funding is withdrawn.

Role of the advisor

The key role will be in advising on how spice and herb enterprises and associated agribusinesses can improve livelihoods, and cover the following:

- *Current markets and production*
  Understanding how the current spice and herb industry functions within the country, including an appreciation of the demand for particular products, production and marketing costs, storage and processing facilities presently available, quality standards and sources of input supplies.

- *Potential crops*
  Awareness of the different geographical regions and climatic conditions and, in cooperation with research institutions, be able to determine which new spices or herbs might be introduced and which existing crops or indigenous plants offer potential for development. Assess market opportunities and demand and likely profitability of any selected products.

- *Best agricultural practice*
  Ability to coordinate pilot testing of potential new crops, new varieties or crops introduced into new regions and, in conjunction with experienced agronomists, ability to advise on alternative cultivation methods, production cycles, possible pests or diseases, post-harvest handling, input requirements and sources, and to advise on the appropriate quality standards for products and possible accreditations.

- *Capacity building*
  Capacity to facilitate the provision of regular training in spice and herb production and marketing, Farmer Field School (FSS) and business skills training, to advise on the formation of producer groups/ cooperatives, and to ensure on-going extension support for the spice and herb enterprise.

- *Processing enterprises*
  Research the possible opportunities for creating processing enterprises within the community or country by assessing market value addition opportunities and assess the feasibility of potential enterprises by enlisting expert technical and market advice.

- *Public policy*
  Gain cooperation from government departments for support to assist in the development of new enterprises.

- *Collaboration*
  Foster market linkages and the effective collaboration of all parties- small-scale farmers, buyers, traders, governments, entrepreneurs, research institutions, NGO's, extension training providers, etc.

Challenges

Many of the challenges facing spice and herb enterprises are also common and applicable to other small-scale agricultural crops. However, unlike many other crops, spice and herbs offer enormous potential for diversification to improve income generation in rural, peri-urban and urban farm households.

Supply chain and market linkages

Smallholders will be limited in their abilities to enter supply chains and become active players of these as well as fostering business relationships and linkages. Limited time, skills and resources may be a constraint on small-scale farmers' ability to become active players in supply chains. Initially this may require support from advisors to provide information on potential markets, supply chains and linkages.

Product quality and safety

Achieving the required quality of end product is often challenged by the following factors:

- Most spices are grown in tropical climates which are wet and humid providing difficulties with crop management. Drying the crop efficiently is critical to quality and safety to prevent mould growth and possible mycotoxin contamination.

- Harvest and post-harvest operations are most important in assuring good quality, safe products and minimising wastage. Access to the appropriate processing, storage and transport facilities for the purpose may be compromised by lack of investment. Effective training and ongoing supervision in hygiene for personnel and crop handling is crucial.

- Plant variety and quality planting material are very important to success in achieving the end product quality required. More research is required in producing appropriate varieties for the local conditions and the provision of technical horticultural expertise.

The lack of availability of clean potable water and suitable waste disposal facilities may compromise sanitation and hence product safety.

Farmer groups

A lack of accountable leadership, and inadequate knowledge and capabilities of members, can be a major limitation to a group's success. Groups need to be well organized with good administration, transparency in financial records and cooperative relations between its members. The institution should be viewed by members as a means to improve their business and not a social network. Lack of representation for women in the group, despite women being major contributors to farming enterprises, is often a problem.

Where the group lacks members with sufficient aptitude for monitoring projects, negotiating purchases and being proactive in gaining support for their needs at local and national government levels, the group's success will be seriously hampered. A lack of marketing skills and ability prevents access to potential markets and customers may be lost where there is inability to efficiently deliver the required volumes and quality required. Good effective training and careful selection of members to fulfil roles in the group are critical. The quality of a farmer group often depends on the relevance of its objectives to the members and the ability of the group to deliver visible improvements to overall household livelihoods.

On-farm processing: Investment and technology

Where the enterprise is small, adequate 'kitchen-style' processing may be possible without the requirement for credit. The opportunity to invest in appropriate technology and facilities will improve production efficiencies and help build the enterprise but often access to finance, equipment and processing expertise is difficult and will represent a constraint.

Access to quality plant materials

Often small-scale farmers cannot get good seed adapted to their conditions. Poor seed can affect productivity and encourage the spread of disease. Fake seed sold by unscrupulous traders is a major problem in many areas of Africa. Small-scale farmers often buy seed from informal uncertified sources. The commercial formal seed system may market a range of hybrid varieties not necessarily best suited to local conditions, at the expense of traditional varieties.

Hybrid seed is much more expensive, and while often higher yielding, is more dependent on high inputs and may be more susceptible to pests and diseases. Climate change causing shifts in agro-conditions adds further challenges for farmers and it is important to consider the best approach when sourcing seed

for a crop. There are many cases where community seed growing with the right support has been very successful.

Continuity of supply

Where many spice and herb crops are harvested annually continuity of supply is limited unless adequate processing and storage facilities are available. There will be high working capital costs associated with the storage of products between harvests and often equipment is left idle for long periods. Even where there is continuous harvesting of crops, buffer stocks of dried product will need to be maintained to ensure continuity of supply. Financing stocks is a major challenge facing the trade as it is necessary to cover the costs of the production, processing, storage and shipping prior to earning income months after.

Access to financial services

In regions where there have previously been high levels of debt default, lenders are understandably reluctant to extend credit with no asset security. The agricultural sector is regarded as high risk. Even where lending is agreed the interest rates may be prohibitive. Microfinance initiatives have sometimes been successful.

Enterprise sustainability

The main challenges which could affect the long term success of a venture are:

- Cash crop risk taking in poor communities. The community must have sufficient diversity to allow food security if a cash crop fails.
- Cultivation practices need to be sustainable and avoid degradation of the soil.
- Side buying practices of farmers already under contract makes profitability difficult for contract buyers and may drive them out of the market. A structured formal supply chain is required to sustain the enterprise.
- Failure to deliver good quality, reliable and on time products.
- Climate change affecting regional growing conditions.
- Inability to adapt to competition and market changes removing profitability from the enterprise.

Selected further reading

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FAO. 2011c. Value from village processing, Second edition, *FAO Diversification booklet* No. 4, Rome.

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FAO. 2009c. Growing mushrooms to make money, *FAO Diversification booklet* No. 9, Rome.

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FAO. 2005b. Appraisal of Diversification Opportunities: The Zambian Paprika Case Study, *AGSF Working Document* No.1, Rome.

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Sources of further information and support

The links and references below refer to only a small selection of the large number of organizations working in areas relating to agricultural development in general and spices and herbs in particular:

Development institutions

Agribusiness in Sustainable Natural African Plant Products (ASNAPP)
NGO with representation in Ghana, Senegal, Rwanda, South Africa and Zambia working to help create and develop successful African agribusinesses in the natural products sector, providing income, employment & development, through environmentally and socially conscious practices to produce high quality natural products for local, regional and overseas markets.
www.asnapp.org

IRD is involved in promoting market oriented food and agricultural development, including spices and herbs, via finance initiatives, assistance in finding markets, for small scale farmers and small to medium agribusinesses.
http://www.ird-dc.org

Botanic Gardens Conservation International (BGCI)
www.bgci.org

Farm Concern International, (FCI).
A Charitable Development Trust. A market development agency developing marketing models and strategic alliances to enhance economic growth among poor communities.
www.familyconcern.net

Food and Agriculture Organisation of the United Nations (FAO)
Information Network on Post-harvest Operations (INPhO) - web resource
www.inpho.org

International Council for Medicinal and Aromatic Plants
www.icmap.org

Practical Action

Technical briefs
http://practicalaction.org/practicalanswers/categories.php

Market information and guides

Commodity Online
Global commodities and India agricultural price information
www.commodityonline.com

Centre for the Promotion of Imports from Developing Countries (CBI)
CBI Market guides. Requires registration
http://www.cbi.eu/marketinfo/cbi/products/spices_and_herbs .

Foodnet
Marketing and Post-harvest research in Eastern and Central Africa.
www.foodnet.cgiar.org

Fresh Plaza
News on fresh produce markets worldwide
www.freshplaza.com

International Trade Centre (ITC)
Assists exporters in developing countries by providing trade development programmes to the private sector, trade support institutions and policymakers.
www.intracen.org

For periodic reports on prices *http://www.intracen.org/market-news*. Free via CBI to sub-Saharan organisations/enterprises. Organic and non organic prices for spices, herbs, essential oils and other commodities.

New Agriculturist
Online update on the latest news and developments in tropical agriculture globally.
www.new-ag.info

Spice Trade
Online Business to Business site providing information on Indian spice and herb suppliers
www.spice-trade.com

Spore
Information magazine for agricultural and rural development in African, Caribbean and Pacific countries; Published by the Technical Centre for Agricultural and Rural Cooperation (CTA)
www.spore.cta.int

Quality standards and food safety guidelines

American Spice Trade Association (ASTA)
Publisher of useful documents on quality issues including HACCP.
www.astaspice.org

Codex Alimentarius
FAO/WHO Global reference point for consumers, food producers and processors, national food control agencies and the international food trade on matters of food safety.
www.codexalimentarius.net/standard_list.asp

European Herbal Infusions Association
European Herbal Infusions Association production and hygiene guidelines.
http://www.ehia-online.org/documents/GAHP-EN_13-06-2008.pdf

European Spice Association (ESA)
ESA represents national associations within the European seasoning and spice trade. Useful source of quality control guidelines.
www.esa-spices.org

International Organisation of Spice Trade Associations.
A good guide to hygiene and product safety for spices.
www.astaspice.org/files/public/IOSTA_GAP_Final.pdf

International Pepper Community
www.ipcnet.org Pepper prices.

International Standards Organisation (ISO)
www.iso.org
Regulator of standards for spices

Trade Standards Practice Network (TSPN)
www.tradestandards.org
Support for developing countries in technical standards.

Low cost input agro-fertility and organic farming information

Alleviating poverty by low cost fertility inputs. FAO.
www.fao.org/fileadmin/user_upload/fsn/docs/Alleviating%

Introduction to low cost fertility inputs
http://organicconsultants.org/uploader/uploads/low%20cost%20inputs%20intro.pdf

Use of Rock Phosphate, FAO
ftp://ftp.fao.org/docrep/fao/007/y5053e/y5053e00.pdf

Rocks for Crops. Comprehensive survey of Agrominerals in Africa. Van Straaten.
http://www.uoguelph.ca/~geology/rocks_for_crops/

Results of an EU funded study on Quality Low Input Food (QLIF) designed to improve food production and hygiene using lower cost inputs.
http://www.qlif.org

Precision placement of inputs in small scale farming, Zambia.
http://www.ifpri.org/sites/default/files/publications/eptdp108.pdf

EU organic regulations.
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:189:0001:0023:EN:PDF

Herb, spice & essential oil crop production, processing and post-harvest guides

Organic Growing Guide for Selected Spices and Herbs
http://organicconsultants.org/uploader/uploads/Organic%20consultants%20spice%20and%20herb%20production%20guide.pdf

Publishers of *Organic Field Crop Production in Southern Africa. S Wren.*
www.oppaz.org.zm

South African guide to Paprika and Chilli production
http://www.kzndae.gov.za/LinkClick.aspx?fileticket=gXZw2lNk7no%3D&tabid=264&mid=727

Lemongrass production guide
http://www.grolink.se/epopa/publications/lemongrass.pdf

Guide to Organic crop storage
http://www.dpi.nsw.gov.au/agriculture/farm/organic/onfram-storage-grain.

Organic farming publications
http://www.dpi.nsw.gov.au/agriculture/farm/organic

Purdue University Guide to Medicinal and Aromatic Plants
http://www.hort.purdue.edu/newcrop/med-aro/default.html

American Spice Trade Association. Spices publications for sale including cleanliness specifications and *A Concise Guide to Spices, Herbs, Seeds, & Extracts.*
http://www.astaspice.org/i4a/pages/index.cfm?pageid=3607

Contract growing and small-scale farming commercialization Studies

Dr Julian Quan, Natural Resources Institute, University of Greenwich, London Comprehensive study of small scale farming in developing countries.
http://www.bis.gov.uk/assets/bispartners/foresight/docs/food-and-farming/science/11-570-sr25-future-for-small-scale-farming.pdf

Survey of Contract Farming Zimbabwe 2009 SNV:
http://www.snvworld.org/en/Documents/Inventory%20of%20Smallholder%20Contract%20Farming%20Practices%20in%20Zimbabwe.pdf

Survey of Zambia Small Scale Commercialisation
http://agrifoodconsulting.com/ACI/uploaded_files/briefs/brief_36_1676682668.pdf

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 opportunities associated with diversification into spices and herbs. It looks at practical ways in which small-scale farmers can improve the fertility of their soils, and help protect them from erosion. The booklet provides an insight into the complementary contribution that these crops can make to livelihoods through local and international trade, and provides advice as to how the right support and services can help promote spice and herb production as both a sustainable and successful diversification option.

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