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Status Assessment of Spice Resources in Nigeria

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Abstract
Spices and condiments are defined as "vegetable products or mixtures, free from extraneous matter, used for flavouring, seasoning or imparting aroma in foods". They are used for flavour, colour, aroma and preservation of food or beverages and may be derived from many parts of the plant: bark, buds, flowers, fruits, leaves, rhizomes, roots, seeds, stigmas and styles or the entire plant tops. The most important spices traditionally traded throughout the world are products of tropical environments. In terms of world trade value, the important spice crops from the tropical regions are pepper, capsicums, nutmeg/mace, cardamom, allspice/pimento, vanilla, cloves, ginger, turmeric, cinnamon and cassia. Coriander, cumin, mustard seeds, sage, oregano, thyme, bay and the mints are the most important spice crops from the non-tropical environment. Spices are popular among Nigerians, although most of the Nigerian spices grow in the wild. Spices are generally found in four agro ecological zones of the country namely: Forest (including mangrove and rainforest), Dried Savanna, Guinea Savanna and Sudan Savanna. The bulk of the spices identified in Nigeria are found in the Southern rainforest zone of the country, while others such as garlic and ginger are found predominantly in the dry Northern zone. This study was carried out to identify major spices indigenous to Nigeria, their level of domestication and utilization, processing methods and market potentials. The findings indicate that wild spices constitute about 48% of all the spices of local origin and they face threat of extinction because of human activities. The yield of the wild spices is unreliable, unpredictable, has low quality and therefore, does not presently encourage commercialization. Domesticated spices in Nigeria are cultivated mostly as mixed crops with most staple crops under rain-fed or irrigated conditions. The study identifies the challenges of developing Nigerian indigenous spices for the local and international markets to include lack of domestication and cultivation, influx of exotic spices into the country, destructive methods of harvesting, low quantity and quality of harvest, bush burning/deforestation, lack of appropriate processing technology and low level of investment in research and development. Strategies to achieve optimal exploitation and utilization of the spices were identified to include protection and maintenance of wild groves, domestication and cultivation of wild spices, establishment of research and market gardens, organizing spice farmers into cooperatives, establishment of processing clusters and marketing outlets.
Keywords: Spices, seasoning, indigenous, wild, domestication, utilization

1. Introduction

A spice is a dried seed, fruit, root, bark or vegetative substance primarily used for flavouring, colouring or preserving food (Parry 1969; Dziezak, 1989; Iwu, 1993 Manandhar, 1995). Plants used as spices and condiments are usually aromatic and pungent (Achinewu, *et al*, 1995). Spices can also be used to hide other flavors and many of them have antimicrobial properties. Spice may have other uses, including medicinal, religious ritual, cosmetics or perfume production (Iwu, 1993; Macmillan, 1984 and Dziezak, 1989).

A spice may be available in several forms: fresh, whole dried, or pre-ground dried. Generally, spices are dried. The flavour of a spice is derived in part from compounds that oxidize or evaporate when exposed to air. Spices lose their colour, taste and aroma over time after harvesting. Processed spices lose flavour more easily than whole ones. This is because spices that have been cut or ground into powder have more surface area exposed to air and so lose flavour more rapidly than whole spices, therefore, all processed spices have shelf lives. Flavour is maximized by storing a spice whole and grinding when needed. A whole dried spice has the longest shelf life, so it can be purchased and stored in larger amounts, making it cheaper on a per-serving basis. The shelf life of a whole spice is roughly two years; of a ground spice roughly six months. However, the "flavor life" of a ground spice can be much shorter. A fresh spice, such as ginger, is usually more flavorful than its dried form, but fresh spices are more expensive. Nutmeg, in particular, is affected by grinding and the flavor degrades noticeably in a matter of days. In order to preserve optimal flavour and colour, spices and herbs should be stored in a cool, dry place, away from light, heat, moisture and air (Tainter and G.A.A, 2001; Marcelle, 1995).

Some flavor elements in spices are soluble in water; many are soluble in oil or fat. As a general rule, the flavors from a spice take time to infuse into the food so spices are added early in preparation. Because they tend to have strong flavors and are used in small quantities, spices tend to add few calories to food, even though many spices, especially those made from seeds, contain high portions of fat, protein, and carbohydrate by weight. Many spices, however, can contribute significant portions of micronutrients (e.g. Vitamin A, iron, magnesium, calcium, etc) to the diet. Most spices have substantial antioxidant activities. These antioxidants can also act as natural

preservatives, preventing or slowing the spoilage of food, leading to a higher nutritional content in stored food (Tainter and G.A.A., 2001; Marcelle, 1995).

Spices stimulate appetite, add flavour and texture to food and create visual appeal in meals. The world demand for organically produced food is growing rapidly in Europe, USA, Japan and Australia. Therefore, food professionals continually search for new and unique spice flavour because of the growing global demand for authentic ethnic and cross-cultural cuisines. Consumers are also seeking for foods with natural preservatives for healthy lifestyle (RMRDC, 2013).

The global market for spices is valued at USD2.3 billion and the import is growing at an average of 8.5% annually. The USA is the largest importer of spices, followed by Germany and other parts of Europe and Middle East. India exports spices to more than 150 countries worldwide. World major producers of spices include, India (1.6million tonnes/annum), China (99,000 tonnes/annum), Bangladesh (48,000 tonnes/annum), Pakistan (45,000 tonnes/annum), Nepal (15,000 tonnes/annum) (FAO, 2005). Major spice crops in world trade are pepper, chili peppers and paprika, nutmeg, cardamom, allspice, vanilla, clovers, ginger, cinnamon and cassia, turmeric, saffron, coriander, thyme, bay, mints, cumin and mustard seed (UNIDO and FAO, 2005, UNCTAD/WTO, I.T.C, 2002).

Spices are popular among Nigerians, although most of the Nigerian spices grow in the wild. The bulk of the spices identified in Nigeria are found in the Southern rainforest zone of the country, while others such as garlic and ginger are found predominantly in the dry Northern zone. Spices are generally found in four agro ecological zones of the country namely: Forest (including mangrove and rainforest), Dried Savanna, Guinea Savanna and Sudan Savanna (Adelaja, et al., 2008). Nigeria has several indigenous spices resources namely: *Aframonum longiscarpum (*K.Schum), *Allium cepa L* and *A. Sativum L, Anona senegalensis Pers, Arachis hypogeal L, Asystasia gagentica* (T. Anders), *Capiscum annum L* and *C. frutescens L, Cymbopogon critrates L, Diociecia reflexa, Gnetum africanum, Gongronema latifolium, Keayodendron brideliode, Mondora myristica, ocimum gratissimum L, Parkia biglobose L, Xylopia aethiopica,* among others (Adelaja, et al., 2008).

Nigerian farmers cultivate spices such as curry (*Murraya koenigii),* sweet basil (*Ocimum basilicum),* bushtea (*Ocimum gratissimum*), ginger (*Zingiber officinale*), guinea pepper (*Xylopia aethiopica*), African black pepper (*Piper guineense*) and turmeric (*Curcuma longa*). Ginger and African black pepper are the major Nigerian spices in international market, the rest are consumed locally (RMRDC, 2013). Black pepper is the largest traded spice worldwide, attracting the highest amount per tonne followed closely by chili pepper (Ravindran, 2000).

Nigeria, with a population of over 150 million people, has a huge potential market for spices. If the country is to take advantage of the ever expanding world spice market, attention should be given to domestication and processing of indigenous wild species that abound in Nigeria. Therefore, this study was carried out to identify major spices indigenous to Nigeria, their level of domestication and utilization, processing methods, market potentials, challenges and strategies for optimal production, exploitation and utilization.

2. Methodology

Questionnaires were administered to farmers, local processors and marketers of imported and local spices. Thirty six States of Nigeria and the Federal Capital Territory (FCT) were covered. Information was also gathered through interviews with stakeholders. A total of 200 questionnaires were distributed (100 farmers, 40 processors/marketers and 60 marketers of imported spices. Details can be found in RMRDC (2013). Secondary data were sourced from relevant literatures.

3. Results and Discussion

3.1 Production and processing of spices

The study revealed that domesticated spices in Nigeria are cultivated mostly as mixed crops with most staple crops under rain-fed or irrigated conditions. There is large scale farming of ginger, onions, pepper, chilies and garlic, while black pepper, guinea pepper, African nutmeg, turmeric, cumin, etc, are mostly in the wild. Table 1 shows a list of some domesticated spices in Nigeria. Most (48%) of the other indigenous spices have not been domesticated and are therefore harvested from the wild. With urbanization and depletion of forests for agriculture, the habitat for these wild plants is fast disappearing.

Various methods are used in spice processing depending on the type of spice and the desired form of the product. The study identified processing unit operations for indigenous spices to include cleaning, dehulling, nut cracking, shelling, dehusking, milling, grating, slicing, boiling, toasting, roasting, etc. Table 2 shows list of spice processors and marketers in Nigeria and Tables 3 shows some imported spice brands into the country.

3.2 Challenges facing spice production

The findings indicate that a lot of factors militate against the optimal exploitation and utilization of Nigeria's indigenous spices. These factors include lack of domestication and cultivation, influx of exotic spices into the country, destructive methods of harvesting, low quantity and quality of harvest, bush burning/deforestation, lack

of appropriate processing technology and low level of investment in research and development. The wild spices constitute about 48% of all the spices of local origin but they face threat of extinction because of human activities. The depletion of these spices from their natural habitats has been accelerated by the annual clearing of forest for farming activities. The yield of the wild spices are also unreliable, unpredictable and of low quality and therefore, does not encourage commercialization presently.

3.3 Opportunities for investment in spices value chain

The global market for spices is large. However, more spices are being imported into Nigeria than is exported. This has lead to minimal development in the processing, packaging and marketing of Nigerian indigenous spices both locally and in the international market. Very few companies are currently involved in indigenous spice processing and trade in the country (Table 2). The wild spices constitute about 48% of all spices of local origin. The bulk of the spices identified were found in the Southern rainforest zone of Nigeria, however, others such as ginger and garlic were predominantly found in the dry Northern zone. The market prices vary depending on the time of the year.

The most traded and cultivated spices (pepper, ginger and onions) are grown in the Savanna regions of the Northern zone where large scale irrigation farming take place. The unique but lesser known spices occurring in the forest belt of the Southern zone are traded locally in small quantities. Ginger and African black pepper are the only Nigerian spices in the international market, the rest are consumed locally.

This means that there are significant investment opportunities in the spices value chain (fig 1). Great opportunities exist in the various components of the chain including cultivation, handling, processing and packaging, marketing, exports and local utilization in restaurants and for medicinal use.

3.4 Interventions of RMRDC in Spice Development in Nigeria

In order to address the challenges identified above and maximize the opportunities, the Raw Materials Research and Development Council (RMRDC) has been working in partnership with entrepreneurs and researchers to improve spice production, processing and marketing in Nigeria. To increase indigenous processing, RMRDC entered into a joint venture agreement with Ireyeeorise Dry Spices FSP Multipurpose Co-operative Society limited (IDS), Warri, Delta State and upgraded their packaging technology. RMRDC also provided a hammer mill for processing spices to Tripartite Farmers International Owerri, Imo State. The spice research laboratory at the Federal University of Technology Owerri was equipped with modern technology by RMRDC. RMRDC is also collaborating with Tiger Foods Ltd, Onitsha in local sourcing of raw materials.

Furthermore, under its crop boosting programme, RMRDC distributed ginger rhizomes to farmers associations in selected States of the Federation in the early 1990s, and in 2006, it further distributed improved varieties of pepper and onion to farmers associations in all the Local Government Areas of Plateau State in Nigeria. RMRDC also sponsored the development and fabrication of ginger splitting machine at National Root Crops Research Institute (NRCRI), Umudike to add value to local ginger farmers. Ginger drying equipment was also fabricated in collaboration with Farm Industries, Owerri. These machines have been installed for Mbaitoli Local Government Area Ginger Growers Association in Imo Sate.

Three Small and Medium Enterprises (SMEs) involved in production of various spices from the Moringa crop were also empowered with packing machines and skills. The SMEs are Life Builders International, Ibadan, Grace Fellowship, Biu, Borno State and Avuco Nigeria Ltd, Kaduna; their products are now in the market. The Council also hosted a number of training workshops for operators in the value chain for spices in various locations in Nigeria. Prominent among these include the workshop on “Enhancing the Revival, Propagation and Utilization of Disappearing Food and Medicinal plants for Healthy Living” hosted in collaboration with Centre for Igbo Arts and Culture (CIAC) at Enugu (RMRDC, 2012) and the seminar hosted by RMRDC, Imo State Office on Ginger.

3.5 Strategies for optimal exploitation and utilization of spices in Nigeria

Nigeria, with a population of over 150 million people, has a huge potential market for spices. If the country is to take advantage of the ever expanding world spice market, the following strategies have to be implemented:

Protection and maintenance of wild grooves

Wild species should be protected in their natural habitat. This can be achieved by applying cultural methods that promote plant growth. This involves clearing bushes around wild spices to reduce competition from other wild plants, weeding, cutting off diseased branches, tilling, adding fertilizers or manure and staking vines and creepers.

Domestication and cultivation of wild spices

Efforts should be made to domesticate wild spices through research and development of modern propagation techniques. Also, awareness campaign is necessary for the conservation of natural spice populations by the local communities for future exploration.

Discouraging over exploitation of wild species and bush burning

This involves harvesting spices at a rate that does not jeopardize the wild population. This can be achieved by

harvesting only the matured and consumable parts without killing the plants. Bush burning should also be discouraged.

Establishment of research and market gardens

This should be monitored by relevant government agencies like the Raw Materials Research and Development Council (RMRDC), National Horticultural Research Institute (NIHORT) and National Root Crops Research Institute (NRCRI).

Organization of spice farmers into cooperatives

Spice farmers should be encouraged and organized into cooperatives to ensure efficient and cost-effective delivery of support. If spice farmers can aggregate their products through cooperatives, spice traders and processors will find it gainful to do business with cooperatives. This will facilitate provision of support services and input supply to farmers and ultimately increase their income.

Supply of improved spice varieties to farmers

Farmers should be supplied with early maturing, disease-resistant and high-yielding varieties to improve the quality and yield of the spices.

Establishment of processing clusters

Public Private Partnership should be explored to establish spice processing clusters. This will not only generate more revenue for the farmers but also generate employment for the teaming population of Nigeria. A platform for promotion of raw materials processing clusters is currently being implemented by RMRDC. The programme, called the Ward Based Cluster Programme (WBCP) is aimed at establishing SME based industrial cluster of processors in each of the 9,555 wards in Nigeria (Onwualu, 2011; Onwualu and Obasi, 2008).

Maintenance of standards

Best practices for handling and processing of spices should be employed so that spices produced in Nigeria can meet international standards and compete favourably with products from the developed countries. The standards should be monitored by Standards Organization of Nigeria (SON) and National Agency for Food and Drugs Administration and Control (NAFDAC).

Funding of research and development

Research and development of Nigerian indigenous spices should be well funded with special emphasis on domestication of wild species and product development from available spices.

4. Conclusions

The wild spices constitute about 48% of all spices of local origin. The process of domesticating these wild spices will involve a shift from extraction of the spices from the natural forest under common property regimes to domestication on private lands. The progressive phases include: Controlled utilization of the wild species (harvesting the produce at a rate that will not jeopardize the wild population and discouraging destructive harvest and over exploitation); Protection and maintenance of the wild strands (the wild plants should be protected in their natural habitat); Propagation of the wild species in a modified habitat (research and development into these wild spices should be taken seriously); and Establishment of domestication research garden.

Nigeria is among the most naturally endowed nations in the world, with an estimated population of about 150 million people, a land mass of 937,000km^2 and vast agricultural resources. The country with land mass spanning from rainforest through the Savannas to some high land with temperate climate can grow more spices than the current output.

For Nigeria to take advantage of the ever expanding world spice market, more entrepreneurs should be encouraged to invest in indigenous spice processing and marketing. Spice farmers should be organized into Cooperatives to facilitate access to funds and technology. Public Private Partnership (PPP) is necessary to develop local spices in Nigeria through the formation of indigenous spices processing clusters.

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Table1. List of some domesticated spices in Nigeria

Common name	Scientific name	Hausa	Igbo	Yoruba
Scent leaf (Basil)	*Ocimum basilicum*	Daidoya	Nchanwu	Efirin
Ginger	*Zingiber officinale*	Citta	Jinja	Ataile/Ataile pupa
Small chili pepper	*Capsicum annum*	Borkwono	Ose nkiri	Atawewe
Bird chilies	*Capsicum frutescens*	Borkwono	Ose	Tatase/ Atarodo
Curry leaf	*Ocimum canum*	Doodaya	Nchanwu	Efirin oso
Alligator pepper	*Aframomum melegueta*	Kanin fari	Ose oji	Atare
Ethiopian pepper	*Xylopia aethiopica*	Kimba	Uda	Eeru
Black pepper	*Piper nigrum*	Mosoro	Uziza	Iyere
Locust bean	*Parkia clappertoniana*	Dawadawa	Ogiri-igala	Iru/Tokoro
Garlic	*Allium sativum*	Tarfanuwa	Galiki	Aayu
Onions	*Allium cepa*	Alibasa	Yabasi	Alubosa
Benth	*Gongronema latifolium*	Daniya	Utazi	Madumaro/ Arokeke
Pepper fruit	*Dennettia tripetala*	Daniya	Mmimi	Ata igbere
Welw	*Gnetum africanum*	-	Okazi	Ajakobale
Moringa	*Moringa oleifera*	Zogale	Odudu oyibo	Ewe ile

Table 2. List of Spices Processors and Marketers in Nigeria

Company	Products	Business
Tiger Foods Ltd, Onitsha	Garlic powder, Ginger powder, Nutmeg powder, Thyme, Dried onion, Euroma herbs & spices, Curry powder, Bay leaves, Mixed spices, Ehuru (African nutmeg), Pepper soup seasoning,	Processing/Packaging/ Marketing
Sosaco Nigeria Ltd, Sango Ota	Gino Curry powder, Turmeric, Ginger, Fennel, Coriander, Salt, Cumin, Fenugreek, Nutmeg and Garlic	Packaging of imported spices/Marketing
Niven Foods Nigeria Ltd, Jos	Ginger, Salt, Nutmeg, Cayenne, Pepper, Cloves and Garlic	Processing/Marketing
Win Foods Ltd, Lagos	Turmeric, Cumin, Fenugreek, Iodized salt, Pepper, Ginger, Coriander	Processing/Marketing
Aisha Supermarket, Kano	Thyme, Curry, White ginger, Turmeric, Crayfish, Nutmeg	Marketing
Nestle Nigeria Plc, Lagos	Ginger, Garlic, Iodized salt, Onion, Clove, Pepper	Processing/Marketing
Unilever Nigeria Plc, Lagos	Curry powder, Thyme	Processing/Marketing
Ajinomoto Seasoning Co Ltd, Lagos	Curry powder, Red pepper, Garlic, Onion	Packaging of imported spices/ Marketing
Maritels Industries Ltd, Aba	Salt, Onion powder, Turmeric	Marketing
Ireyeesorise Dry Spices Multipurpose Cooperative Society Ltd, Warri	Chilies, Bitter leaf, African nutmeg, Pepper soup spices	Processing/Marketing
Zaki Foods Cottage Industry Technological Centre, Jos	Bitter leaf	Processing/Marketing
Tisco Industries Ltd, Akure	Curry powder, Coriander, Turmeric, Fenugreek, Cumin, Salt, Ginger, Cayenne, Pepper, Nutmeg, Fennel, Thyme	Packaging of imported spices/ Marketing
Elijayflow Ventures Ltd, Obosi	Coriander, Chili, Cumin, Fennel, Turmeric, Pepper, Cinnamon, Clove	Packaging of imported spices/ Marketing
Chi Ltd, Lagos	Coriander, Turmeric, Cumin, Paprika, Salt, Ginger, Pepper, Nutmeg, Fennel, Garlic	Packaging of imported spices/Maarketing
Gold Showers International Ltd, Aba	Curry powder, Nutmeg, Turmeric, Black pepper, Onion, Garlic, Cinnamon, Coriander, Clove	Marketer
New Comex Trading Company, Lagos	Pepper, Garlic, Onion, Caramel	Marketer
Tripartite Farmers International, Owerri	African nutmeg, Guinea pepper, Black pepper, Scent leaf, Ginger, Chili pepper	Processor
D & S Trading Co.ltd, Oshodi, Lagos	Rosa, Turmeric, Cloves	Processing
Super Spices Company, Kano	Dried thyme, Curry powder	Processing/Marketing
Trisure Industries Nig. Ltd, Lagos	Dried Thyme, Curry Powder	Marketer
Life Builders International, Ibadan	Moringa roots powder, Moringa leaves powder and Moringa seeds	Processing/Marketing
Grace Fellowship Biu, Borno State	Moringa roots powder, Moringa leaves powder and Moringa seeds	Processing/Marketing
Avuco Nigeria Ltd, Kaduna	Moringa roots powder, Moringa leaves powder and Moringa seeds	Processing/Marketing

Table 3. List of some imported spice brands in the Nigerian Market

Brand Name	Company	Products
Spice supreme	GEL Spice Co. Inc Bayonna, USA	Jollof rice spices,
Nora spices	Nora Foods, South Africa	Mixed spices, Spice for fried rice, Curry powder, Thyme, Red chili
Napa Valley	Anhui Qiang Wang Flavouring Food Co. Ltd, Jieshou City, Anhui	Jollof rice spice, Chicken flavour seasoning
Ducros	McCormick and Company Inc., Sparks, Maryland, USA/ France	Dried Thyme, Curry powder
McCormick	Walmart Foods Ltd, Arkansas, USA	Minced onion, Onion powder, Garlic powder, Chili powder, Curry powder, Thyme
Dynasty	Jining Dynasty Int'l Trade Co., Ltd Shandong, China	White garlic
Rochana Royal	A V Thomas and Co Ltd, Cochin, India	Black pepper, Turmeric
My Hanoi	Hanoi Food Farm Ltd, Vietnam	Dried Kaempferia galangal powder
ZTY	Qingdoa Zhengtianyu Foods Company, Ltd, China	Sweet Paprika powder
Omni	Omni Export Inc. Pallimuku, Kochi, India	Cumin seeds powder, Chili powder, White pepper, Ginger powder, Turmeric powder
Sure	Malabar Spices Company, Ltd, Kerala, India	Dried thyme, Curry powder, Garlic powder

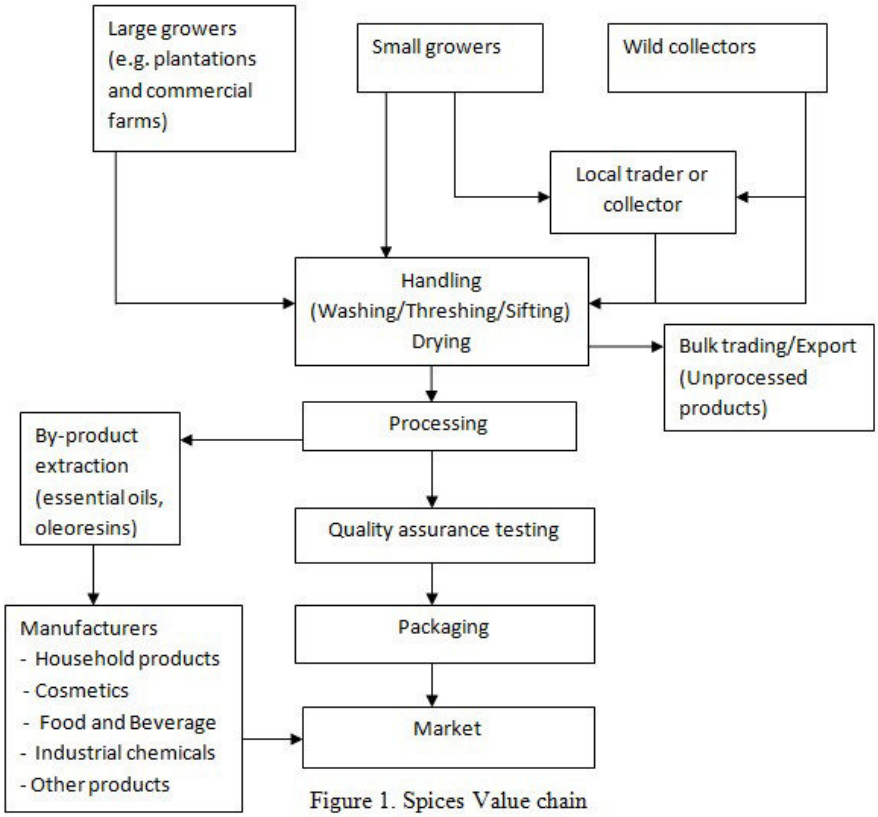

Figure 1. Spices Value chain

Source: Adapted from UNIDO and FAO (2005)