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The Ginger Value Chain; Investment Opportunities Along the Value Chain

Ginger is well known in many human communities around the world. It is the underground rhizome of a perennial tropical crop called Ginger plant (Zingiber officinale). A mature ginger rhizome is fibrous and has a striated texture. The outer skin of the rhizome is brownish in colour while the inner flesh depending on the variety may be red, yellow or white. Nigeria is the third largest producer of ginger in the world with annual production of 345,895MT after India and China with annual production of 1,070,000MT and 583,126MT respectively (FAOSTAT, 2017). The Nigerian ginger is well known and in high demand in the international market because of its aroma and pungency. Kaduna State stands as the highest producer of the crop while states like Gombe, Bauchi, Benue, Nassarawa, Sokoto, Zamfara, Akwalbom, Oyo, Abia and Lagos state are major producers of the crop.

In the market, ginger is available in various forms, fresh ginger rhizome, powder ginger and dry ginger rhizome. The Ginger planting season starts from March / April and harvesting begins in October / November. Ginger takes about nine months from the time of planting to mature. The rhizome can be harvested at different times depending on its purpose. If fresh ginger is required, it is harvested about six month after planting. If a matured ginger rhizome is required, it is harvested nine months after planting. A number of other countries have since emerged as important ginger exporters amongst which Nigeria and more recently Australia are the most notable.

Nigeria ranks top in terms of the percentage of total hectares of ginger under cultivation but her contribution to total world output is too low compared to other countries because a larger volume of production is undertaken by smallholder and traditional farmers with rudimentary production techniques and low yields. Smallholder farmers are also plagued by many problems such as lack of improved (high yielding) varieties, high labor demand/ drudgery, high seed rate and cost, high cost of inputs, lack of mechanization of farm operations, lack of modern processing equipment, infrastructural deficits, lack of industrialization, inefficient marketing/ pricing, unfavorable trade terms, poor storage facilities, poor quality of produce for export, lack of/ or poor financing windows, lack of/ or poor funding of research and development (R&D) and farmers do not see it as a business enterprise, therefore are not adequately focused on profit maximizing.

Investment/Business Opportunities in the Ginger Value Chain

Production: Mechanization

Ginger is an important cash crop whose production and quality is on the decline in Nigeria in spite of our abundant human and land resources. The drudgery associated with ginger production is a disincentive to its production, therefore, removal drudgery in ginger production through mechanization of the production process is necessary in order to boast production, enhance quality and make production more attractive. Unfortunately, the bulk of ginger farmers are small scale farmers who do not have the capital required either to procure or hire the machinery required for mechanization. Even the few large-scale farmers are fast losing interest due to low market value occasioned by poor quality of produce. The low level of Ginger production in Nigeria is as a result of poor adaptable farm mechanization technologies, illiteracy and management practices

The absence of the type of equipment needed by this level of farmers has continued to encourage drudgery and low productivity with its attended poverty of most of the local peasant farmers. Mechanization of ginger production has received little attention in Nigeria. Most aspects of ginger production are not mechanized. Only a few large-scale farmers utilize tractors for field preparation consisting of ploughing, harrowing and ridging. Small scale and peasant farmers which form the bulk of ginger growers prepare their field manually. Other farm operations such as planting, weeding, rouging, fertilizer application, mulching, and harvesting are usually done manually. Machines for mechanization of most ginger production operations are available, these include tractor-driven machines and tractor implements such as organic manure spreader, double-row planter, inter-row cultivator and root digger harvester. These machines are not readily available here in Nigeria, if probably seen, will be costly making the immediate mechanization required by the small-scale farmers impossible.

Processing

Ginger Products

Ginger products, such as essential oil and oleoresin, are internationally commercialized for use in food and pharmaceutical processing. Essential oil is characterized by monoterpenes and sesquiterpenic compounds while the main 7 pungent compounds in the oleoresin are a series of homologues called gingerols and shogaols. In recent years, more and more pharmaceutical effects have been found on ginger. It can act as an aphrodisiac, a carminative, a rubifacient, an anti-asthmatic and as a stimulant to the gastrointestinal tract. Ginger is often used for the treatment of stomach aches, and cardiovascular and motor diseases.

It also possesses anti-inflammatory activity and regulates bacterial growth, as well as providing protection for immune-depressed patients, such as individuals who are HIV positive. Many active components have been found in ginger. The active component obtained from ginger is a high value-added product and due to such, there is continued research for improved extraction techniques that will lead to better quality extracts and greater yields.

Today, in food processing, the main use of spice oleoresins are in processed meat, fish, vegetables, soups, sauces, chutneys, dressings, cheeses as well as dairy products, baked foods, confectionery,

snacks and beverages. Ginger oleoresin is important for its volatile oil as well as its non-volatile pungent oils, there is a great demand for ginger oleoresins abroad, especially for the production of alcoholic beverages, as well as in the production of gingerbread and drinks like ginger ale. Ginger oleoresin also has a huge demand in the Ayurvedic and pharmaceutical industries.

The best harvest time for each end-use is:

- For fresh consumption: 5 months
- For preserved ginger: 5-7 months
- For dried ginger: 8-9 months, when leaves start yellowing
- For essential oil production: 8-9 months

Commercial Forms of Ginger

Until the processing of ginger was introduced ginger entered the international market in the form of its three primary products namely:

a) Fresh (green) ginger

b) Preserved ginger (preserved ginger in sugar syrup or Dry or crystallized ginger, this is, ginger that has been impregnated with sugar syrup, dried and crated with crystalline sugar).

c) Dried (split or pealed) ginger

Making Dried Ginger

Dried ginger is produced according to the following steps;

1. The fresh rhizome is harvested at between 8 and 9 months of age.

2. The roots and leaves are removed and the rhizomes are washed.

3. The rhizome is killed. This is done by peeling, rough scraping or chopping the rhizome into slices (either lengthwise or across the rhizome). Whole, unpeeled rhizomes can be killed by boiling in water for about 10 minutes.

4. The rhizome pieces are then dried either mechanically or sun-drying

Quality of dried ginger

The most important factors to control in the production of dried ginger are;

- The appearance of the final product - especially for whole roots for export (not so important if the product is to be ground or used for oil extraction)
- Content of volatile oil and fibre - especially for extraction of oils
- Level of pungency - especially for the extraction of oils
- Aroma and flavour - especially for the extraction of oils

Quality of the final product is determined by both pre-harvest and post-harvest factors

1. The most important factor is the cultivar of ginger grown. This determines the flavour, aroma, pungency and levels of essential oil and fibre.

2. The stage of maturity of the rhizome at harvest determines its end use. At 8-9 months of age rhizomes are most suitable for drying.

3. When the rhizomes are harvested they should be handled with care to prevent injury. They should be washed immediately after harvest to obtain a pale colour. The wet rhizomes should not be allowed to lie too long in heaps as they are liable to ferment.

4. Care should be taken when removing the outer cork skin. It is essential to remove the skin to reduce the fibre content, but if the peeling is too thick, it may reduce the content of volatile oil which is contained near the surface.

5. During drying, the rhizomes lose about 60-70% of their weight and achieve a moisture content of 7-12%. Care should be taken to prevent the growth of mould.

6. Dried ginger should be stored in a dry place to prevent the growth of mould. Storage for a long time results in the loss of flavour and pungency.

Ginger Oil

Ginger oil is prepared by steam distillation or grinds paste or dried powdered ginger which is used as a flavouring agent for soft drinks, ginger beer and in food preparation. For oil extraction, dried rhizomes are ground to a coarse 23 slurry, paste or powder, loaded into a still for distillation and steam is passed through the slurry/paste/powder. The steam containing the volatile components is condensed with cold water and collected in separate container. The oil can be separated from the water upon cooling by the separatory funnel. Re-distillation can be done to increase oil yield. Usually oil yield obtained from dried rhizomes is 1.5% to 3.5% on dry weight basis and o.4% on green weight basis depending upon variety of ginger used.

Ginger Oleoresin

This is a blend of oil and resinoids. Oleoresin is obtained by extraction of dried ginger, pulverized to coarse powder, with organic solvents like ethanol or acetone. Oleoresin content ranges from 3.5% to 9.5%. But to get the true flavour of fresh ginger, solvent extraction is not the ideal choice because during the removal of the solvent from the extract, several components are lost along with the solvent.

Ginger Oleoresin

Supercritical Fluid extraction offers another choice whereby the true fresh flavour is retained in the extract. Supercritical Fluid Extraction Process (SCFE) is also known as CO_2 Extraction Process. It is a high technology process for extracting oleoresins from fresh ginger with the use of hazardous organic solvent such as acetone, hexane and methylene chloride. SCFE is the two-step process which uses a dense gas as a solvent eg. Carbon dioxide (CO_2) for extraction, above its critical temperature (31^{o}c) and critical pressure (74bar). The feed (fresh ginger), generally ground solid is charged into the extractor. Supercritical CO2 is fed to the extractor through a high-pressure pump (100-500 bar0. The extract laden CO2 is sent to a separator (60-120 bar) via a pressure reduction valve. At reduced temperature and pressure conditions, the extract precipitates out in the separator. The exact free CO2 stream, leaving the separator is then recycled to the extractor.

Ginger Candy

Ginger candy can be prepared by selecting big sized rhizomes of low fiber content. These rhizomes should be washed with water to remove the adhered dirt and debris. The peel should be removed with the help of wooden splinters or knives and wash thoroughly with water. After this, rhizomes should be pricked properly with the help of forks so that sugar can penetrate deep in the tissues. The pricked rhizomes should be cut into piece of 1-2cm thickness. The ginger pieces should be removed from water and kept in shade for drying. After this, the ginger pieces should be spread in a stainless steel utensil having alternate layer of sugar and ginger pieces (1kg ginger pieces: 1kg sugar) and kept for 24 hours.

On second day remove the ginger pieces from sugar syrup and add 2 gm citric acid and boil the syrup until sugar strength reached up to 60o brix. Allow the syrup to cool, add the ginger pieces into the syrup and keep it for 24 hours. On the third day remove the ginger pieces and add 1gm citric acid and boil the syrup until sugar strength reached up to 65oBrix, allow the syrup to cool and add the ginger pieces into the syrup. Again keep it for 24 hours.

On next day, the same process should be repeated by addition of 1gm citric acid and boiling the syrup until the sugar strength reaches up to 75oBrix. Allow the syrup to cool and add the pieces into the syrup. Keep it for 4 days in syrup. Then remove the well soaked pieces from syrup and dry it in oven at 60o C for 6-8 hours. These dried pieces can be coated with powdered sugar or confectioner's sugar or glucose powder by sprinkling the powder over the pieces and mixed thoroughly. Fill the coated ginger candy in glass/jars or pack in polyethylene pouches and store in cool and dry place.

Ginger Soft Drink

Ginger ready to serve (RTS) soft drink can be prepared by selecting healthy and blemish free rhizomes. The rhizomes are washed with water and peeled with the help of wooden splinters or knives. Cut into small pieces and pulp by passing through mixer-grinder by addition of little water to facilitate easy pulping. After pulping, strain the pulp and keep it for 1 hour for settling down the

sediments at bottom. Siphon off the clear juice and mix it with sugar syrup solution which can be prepared by addition of sugar + citric acid + water @ 120gm + 3gm citric acid + 850 ml water.

Strain the sugar syrup with muslin cloth to remove the impurities from dissolved sugar and mix the ginger juice or pulp @ 30 ml and then add the ingredient thoroughly and fill into the bottles then crown cork. The sealed bottles should be pasteurized at 85oC for 15 minutes and then cooled and can be kept for storage in cool and dry place.

Ginger Shreds

Ginger shreds can be prepared by washing and peeling of the rhizomes. After peeling, rhizomes should be grated in to small pieces. Then grated small pieces of ginger should be kept in the muslin cloths and squeezed slightly to remove excess juice content. Then add black salt and common salt @ 4% and it should be kept in oven for drying at 60oC for 2 days.

Final product should be packed in polyethylene pouches and kept in cool and dry place for use. However, a mechanical shredder can also be used to cut the young stem ginger to fine and even shreds after trimming and washing process. The ginger shreds are then blanched and packed in containers with a vinegar-based solution with no added sugar to preserve the fresh ginger. There is also an option with sugar.

Ginger Pickle

Ginger pickle can be prepared by washing and peeling of the rhizomes. The peeled rhizomes will be cut into small rectangular pieces, which are dried in shade for removal of outer moisture. The mixture of spices (Ajwain (Carom Seeds) + black pepper + cumin seed + chilli powder and citric acid @ 1ogm each for 250gm of ginger pieces) should be prepared and mixed together. After this, fill all materials into a glass jar and keep for sun during up to 2 weeks with occasional stirring. Finally it can be stored in a cool and dry place.

Ginger Chutney

Chutney of good quality and taste can be prepared by using ginger. For this ginger rhizomes (250g) and garlic (100g) should also be grinded in mixer and the resulting paste of ginger mixed with tamarind and garlic. This mixture should be heated a little and add salt (100g). Then frying of another garlic paste (100g), fenugreek powder (20g) should be mixed with ginger paste, sugar (500g) and fill into glass jar. Final product should be stored in cool and dry place.

MARKET PROSPECT OF GINGER

Nigeria is blessed with arable land suitable in most parts for ginger production. There are also abund anthuman resources which can be harnessed to
provide both technical and local marketing opportunities. These can be harnessed to enhance production and marketing of the crop. Ginger farmers are amongst the most organized and enlightened group of farmers in Nigeria. However further enlightenment especially on the benefits of mechanizing production is needed in order to stimulate their interest.

Owing to its high temperature applications along with favourable solubility characteristics, oleoresin is widely used as a flavouring agent in the food industry. Growing 29 market demand for packaged spices and spice mixes in food applications has assisted the overall market growth. They mostly have their applications in salad dressings and coloring pickle products. They are mainly suited for high temperature applications which consist of baking and frying. Besides, they are used widely as an additive in food industry due to its solubility characteristics. Oleoresins are mostly preferred because of their microbiological advantages, uniformity in flavour and aroma, ease of storage and transport.

A large percentage of the ginger is exported to China, United Kingdom, Germany, Spain, Netherlands, France, United States of America, Russia, Saudi Arabia Chad, Sudan, Italy and Ghana, among others. Dried ginger is used predominantly for flavouring coffee especially in the Middle East. It contains medicinal qualities and it is also used to calm nausea and aids digestion. Dried ginger is used in many different cooking methods. It is an important spice in Asia, the Caribbean and African cooking.

The worldwide consumption of ginger is increasing. The global and European market for ginger is expected to show significant growth until at least 2020. Especially in the winter of 2016-2017, the European demand for ginger peaked due to the colder weather. Consumers buy ginger during the winter because of its health properties. For example, consumers use ginger as a sore throat remedy. The growing ginger market in Europe provides opportunities for you as an exporter. Buyers are increasingly willing to invest in long-term relationships or collaborations with their suppliers to ensure sufficient supplies.

In 2017, the total European imports of dried ginger reached 160 thousand tonnes. Since 2013, the import volume has increased by 12% annually. The import value increased in that same period by 13% annually, reaching €250 million in 2017.

In 2017, more than 70% of the total European imports were sourced directly from developing countries. Please note that Figure 1 below excludes countries other than European or developing countries. In 2017, these other countries accounted for only 0.12% of the total European imports.

Since ginger cannot be produced in Europe, the European supplies illustrated in Figure 1 are based on re-exports. European re-exports accounted for 29% of the total imports in 2017.

The Netherlands is the largest importer and trader of ginger in Europe. Its imports have increased significantly in volume by 13% annually between 2013 and 2017. In 2017, 97% of Netherlands imports were sourced directly in developing countries. The country has a high and relatively unstable per capita consumption. Since 2014, consumption increased significantly. This instability and sharp increase could be caused by the country's important role as a trade hub for intra-European trade,

since consumption is calculated as imports minus exports. While consumption is not expected to be that instable, imports and re-exports of ginger varied significantly during the last years, due to stockpiling. The volume of stock is not accounted for in these figures.

Since the United Kingdom sources 93% of its ginger from developing countries, it is an interesting export market for your products. The country is also the second largest importer of ginger in Europe, which could be caused by the relatively substantial population of Asian descent. Its consumption per capita is significantly higher than the European average and has been increasing slightly since 2014.

Germany is the third largest importer of ginger. Its total imports in volume increased by 14% annually since 2013. The German per capita consumption is slightly higher than the European average.

France is a large importer of ginger and its imports have increased in volume by 13% annually since 2013. In 2017, the imported volume in France reached 6,400 tonnes.

Italy is an important trade hub for ginger. Since 2013, imports of ginger in Italy have increased significantly by an annual rate of 39%.

Spain is a fast-growing market for ginger. Imports into the country increased by 29% between 2013 and 2017.

Many other smaller importers are increasingly importing ginger directly from developing countries over the last five years. Examples are Portugal (growing by 33% of imports annually), Austria (25%), Sweden (20%), and Poland (17%).

Sources and Related Links:

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