

Chapter 3 Ginger Production and Trade in the District

Ginger and Ginger Varieties

Ginger is the dried, scraped rhizome of *Zingiber officinale* and grows as laterally flattened branched pieces of about five to 15cm long, one to five cm wide, and about one cm thick. It is a perennial herb. The plant rarely flowers, and vegetative propagation is necessary. It contains one to two per cent volatile oil with an aromatic odour and pungent taste (Table 3.1). The aroma of ginger is pleasant and spicy and the flavour and taste penetrating, pungent, and slightly bitter. In India, the dry ginger rhizome is used as a spice in a number of culinary preparations such as vegetables, certain curried meats, table sauces, pickles, curry powders, gingerbread, confectionery, and so on. It is also used to some extent in manufacturing soft drinks, ginger ale, ginger oil, oleoresin, essences, and tinctures. The composition and nutritive value per 100g of rhizome are given in Table 3.1 (Pruthi 1979).

**Table 3.1 : Composition of
Ginger Rhizomes**

Ingredient	Quantity (per 100g of rhizome)
Moisture	6.9g
Protein	8.6g
Fat	6.4g
Fibre	5.9g
Phosphorous	0.15g
Sodium	0.03g
Potassium	0.4g
Vitamin A	175IU
Vitamin B ₁	0.85mg
Vitamin B ₂	0.13mg
Niacin	1.9mg
Vitamin C	12.0mg
Iron	0.001g
Food energy	380 calories

Source: Singh and Singh 1996

Ginger is not a typically mountain-specific product, as it grows in different agro-climatic zones. A particular variety, however, grows in areas up to 1,500masl in north-eastern India.

There are several cultivars of ginger grown in the country, the varieties being known by their places of origin or the places in which they are grown. Accordingly, the local ginger variety currently being grown in most areas of the West Garo Hills is called *Tura*. Some of the prominent indigenous varieties grown in India are *Maran* (Assam) and *Kuruppampadi*, *Ernad*, and *Wynad* (all from Kerala). Apart from the local *Tura* variety, which is also referred to as *Tama*, *Nadia* is recommended by the Department of Horticulture. The composition of the local variety of ginger, as well as the recommended variety, *Nadia*, is given in Table 3.2. The *Tura* variety contains a substantial amount of moisture.

Table 3.2: Composition of *Tura* and *Nadia* Varieties of Ginger

Component	<i>Tura</i> variety%	<i>Nadia</i> variety%
Moisture	11.00	11.50
Starch (by acid hydrolysis)	55.20	59.00
Crude protein (N ^o 6.25%)	13.10	10.50
Crude fibre	6.38	5.67
Ash		
Total	5.82	8.23
Acid insoluble	0.17	0.11
Water extract	20.80	20.1
Acetone extract	4.20	3.90
Volatile oil	1.70	1.00

All values are on dry weight basis.
Source: CFTRI 1989

The composition of the rhizome varies depending on the variety, and different rhizomes are suitable for different products (Annexes 3A and B). Sree Kumar et al. (1980) evaluated 30 ginger varieties for qualitative attributes and concluded that crude fibre content varied from 3.5 per cent in the *Tura* variety to six per cent in the *Jorhat* variety (Table 3.3). Their findings showed that varieties having high dry ginger recovery had low fibre content and vice versa. Oleoresin content varied widely

among the types ranging from three per cent in the *Poona* variety to 10.8 per cent in the Rio de Janeiro one.

Since ginger has a favourable income earning potential, the state Horticulture Department is introducing other improved varieties such as *Suprabha*. This is one of the three varieties, namely, *Suprabha*, *Suruchi* and *Surabhi*, that have been released under the All India Coordinated Spices' Improvement Project. Oil content in these re-

Table 3.3: Quality Characteristics of Selected Ginger Varieties

Variety	Avg. Weigh of rhizomes (%)	Recovery of dry ginger (%)	Fibre content (%)	Oleoresin content (%)
<i>Maran</i>	184.4	22.8	4.3	7.2
<i>Jorhat</i>	163.9	20.2	6.0	8.8
<i>Tura</i>	176.9	28.0	3.5	4.0
<i>Poona</i>	124.4	24.0	4.0	3.0
Rio de Janeiro	301.6	18.0	5.8	10.8
Wynad				
- Local	215.0	19.5	4.8	4.9
- Mananthody	216.0	20.1	4.8	4.8
Kunnamangalam	128.3	21.8	4.1	6.1

Source: CFTRI 1989

cently released varieties varies from 1.9 to 2.1 per cent (Edison and Kallapurackal 1991). The *Suprabha* (PGS-35) variety was released from Pottangi. It gives an average yield of 16.6 tonnes of fresh rhizome per hectare, 1.9 per cent essential oil, 4.4 per cent crude fibre, and 8.9 per cent oleoresin (Sivadasan and Madhusudana 1996).

Production

Ginger is an important cash crop in the district. Table 3.4 shows the annual area and production of ginger in the district from 1990-91 to 1996-97. The annual area under the crop is determined by the market prices of the previous year, and this in turn results in a general increase or decrease in supply during the current year. In most years, people cultivate about 10,000 metric tonnes, a large proportion of which is marketable surplus. This makes the ginger trade an important income-earning source for farmers.

Table 3.4: Year-wise Area and Production of Ginger in the District

Year	Area (ha)	Production (MT)	Yield (kg/ha)
1996-97*	-	11,460	-
1995-96	2,316	10,738	4,636
1994-95	2,095	9,710	4,635
1993-94	2,098	9,732	4,639
1992-93	2,213	10,261	4,637
1991-92	2,216	10,284	4,641
1990-91	2,203	10,250	4,653

* Anticipated production of ginger for 1996-97

Source: District Agriculture Officer 1997

The farmers in the district grow ginger as a single crop under rainfed conditions (*jhum* cultivation). Hence, cultivation is concentrated mainly in hilly areas where farmers have not shifted over to settled cultivation

completely and still practise *jhum* cultivation. Ginger cultivation is important in the Rongram and Dadenggiri blocks (Figure 3.1), which together account for almost 63 per cent of the district's area under ginger cultivation (Table 3.5).

Table 3.5: Block-wise Area and Production of Ginger (1995-96)

Block	Area (ha)	Production (MT)	Yield (kg/ha)
Rongram	846	3,921	4,635
Dadenggiri	620	2,877	4,640
Selsella	367	1,702	4,637
Tikrikilla	305	1,414	4,635
Dalu	89	412	4,630
Betasing	60	278	4,639
Zikzak	29	134	4,635
Total	2,316	10,738	4,636

Source : District Agriculture Officer 1997

The crop is planted in the month of April, prior to the onset of the monsoons. It is harvested in about 10 months, mainly from December to February. In addition to the final harvest, the seeds for the next season are taken out in July and August after the sprouts have attained a height of about 30-35cm. Almost 70 per cent of the seed planted is recovered through this practice. However, some of the farmers plant only small (3-4cm) pieces of seed rhizomes that are not harvested. The final crop is harvested by March. Hence, the supply of ginger continues almost throughout the year, with May, June, and November being the lean months. Ginger cultivation requires a lot of labour. Inorganic fertilizers are also essential.

Factors Influencing Prices and Annual Variations

Three forms of ginger are grown for the ginger trade – fresh, for use in cooking; dried,

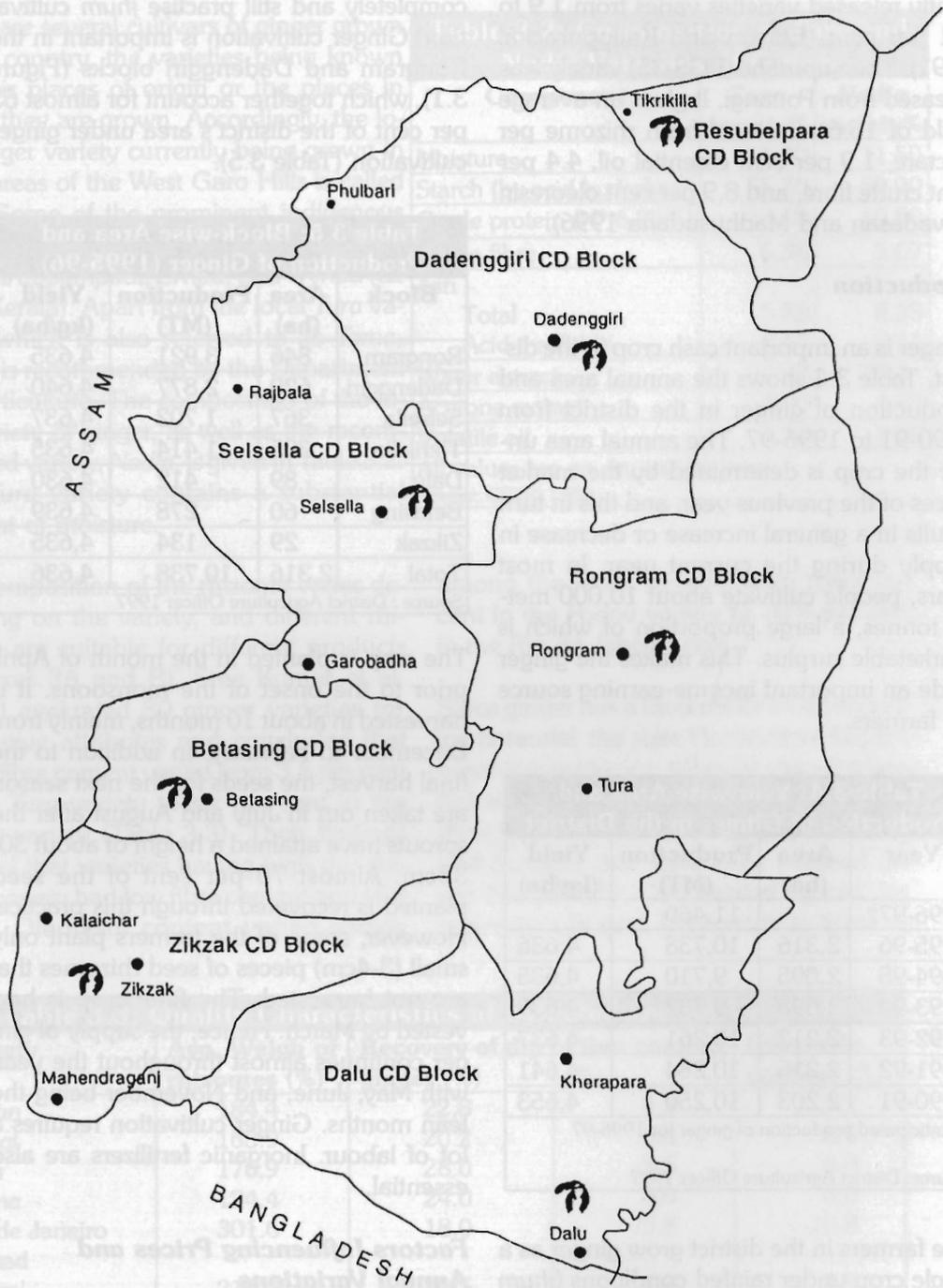


Figure 3.1: Location of Major Ginger-producing Areas in West Garo Hills

as powdered spice; and preserved, as a flavour for the confectionery trade. In export markets, the demand is for the preserved rhizome, whether whole, sliced, or powdered. In the West Garo Hills, however, the trade is confined to buying/selling fresh rhizomes only. Table 3.6 summarises retail and wholesale prices in 1996-97, showing the variations over the months.

the estimates of the Department of Agriculture was about Rs⁵ 3.5/kg in 1996-97.

However, as per the local farmers, the price fell as low as Rs one/kg. This is especially the case with the produce that does reach the market. It forms a considerable proportion of the total trade during the main harvest season, with middlemen purchasing

Table 3.6: Month-wise Retail and Wholesale Prices for Ginger (April '96-March '97)

Month	Retail Price (Rs/kg)			Wholesale Price (Rs/Q)		
	Low	High	Avg	Low	High	Avg
April '96	12	20	13.3	470	750	645
May	10	20	16.8	300	685	542
June*				365	450	405
July	8	16	12	200	300	227
August	2	16	7.2	200	375	281
September	5	12	8.6	250	400	317
October	3.5	11	6.8	250	500	373
November	2.5	10	7.2	275	440	308
December	3.5	10	7.4	225	410	260
January '97	5	12	7.6	325	400	287
February	5	12	7.5	375	210	285
March	3	12	6.5	187.5	275	232
Average			9.1			347

* Data for June were not available

Source: District Agricultural Officer, West Garo Hills, Tura 1997

Retail prices of ginger in the main markets of the district for the year from April '96 to March '97 are given in Annex 4. This shows the variation within the markets of the district. The annual fluctuation in prices is driven by supply in the local markets, consequently falling to extremely low levels during the harvest season, increasing only after the main harvest season is over. During the main harvest season from December to February, the average price as per

from farmers on site. This option saves farmers the effort and costs involved in transporting the produce to market, especially in the absence of a guarantee of demand on a particular day. Also, the need for short-term credit has made farmers dependent on pre-harvest contractors who extend credit to farmers, on the understanding that they will sell the crops to them. This increases the dependence on traders and middlemen to extend credit for standing

⁵ There are 42.10 Indian rupees to one U.S. dollar.

crops and considerably reduces the returns from harvests. In addition, at times, unsold stock accumulates, causing loss through rotting and a further fall in prices below the costs of production. Most of the farmers in the area felt that there had been a decline in returns, making the ginger growing venture an uneconomical option.

However, apart from the annual variations in wholesale prices in the district, one of the reasons for concern about the ginger trade is declining prices over the last decade. Figure 3.2 shows the trend in wholesale prices of ginger.

At present, there are no institutional mechanisms to ensure minimum returns to farmers or to protect them from the fluctuations of supply and demand in any of the markets. Once the Market Regulation Act becomes effective, with the functioning of market yards and sub-yards, the farmers will

be able to receive a minimum support price. However, the establishment of such a system will take time and is a lengthy process. In the meantime, care will have to be taken to ensure that the traders who are procuring the ginger from the fields are also made to pay a fair price to the farmer.

Marketing Channels

The trade in ginger involves several middlemen at various stages from farmers' fields to final consumers. Apart from the pre-harvest contractors, who are often commission agents for traders, other middlemen include the village middlemen, traders, wholesalers, and retailers. The village middlemen form the link between farmers and traders (or their commission agents) at the local level. The traders send bulk quantities to wholesalers based in various parts of the country, while wholesalers form the link between these traders and business

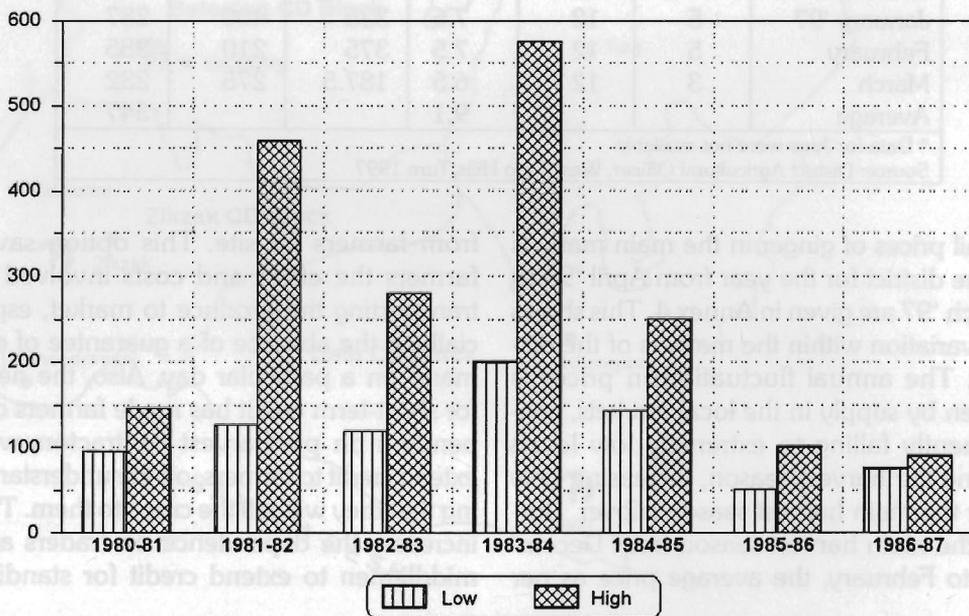


Figure 3.2: Trends in Wholesale Prices (Rs) of Ginger

men (exporters) and/or the retailers at country level (Figure 3.3).

Farmer

The local weekly markets provide the farmer-trader meeting places. Farmers transport ginger in bamboo baskets of various sizes and weights. The assessment of the weight is based on estimates made by farmers and agents, and could be more or less than the quantity estimated. Since these baskets are often carried manually to market, it is difficult to estimate the actual cost of transportation of ginger from field to market. If the market is at a considerable distance, the farmers carry the ginger in baskets or bags (60-70kg) on hired bullock carts that charge Rs 20-30 per bag, depending on the distance.

Commission Agent

The ginger brought to market is purchased by agents commissioned by traders. In the markets surveyed, there were five to six traders who came together in a hired truck with their agents. The trading unit has been fixed at 60kg – the capacity of the jute sacks normally used to transport ginger from the markets to the stores. The traders fix the ceiling at which they are prepared to purchase ginger from commission agents. The agents are also provided with advances by the traders to buy ginger from the farmers. The agent usually strikes a deal with the farmers only if his profit is more than Rs 15/bag. Since the ceiling fixed by the trader usually varies between Rs 120 - Rs 140 per bag during the off-season, and is slightly more during harvest time, the farmer usually gets about Rs 100-120 per 60kg.

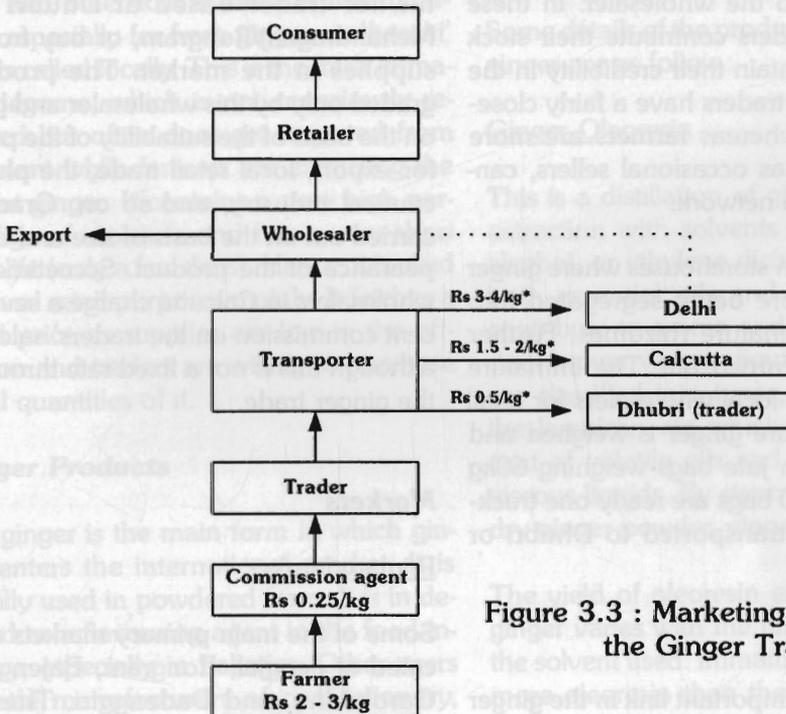


Figure 3.3 : Marketing Channel for the Ginger Trade

* Cost of transportation

Trader

The traders procure ginger from weekly markets all over the district, collect the supplies into truckloads, and transport them to wholesalers elsewhere — Dhubri (Assam), Calcutta, Delhi, or Guwahati. It was observed that, whereas there was competition among the agents who purchased ginger from the farmers to meet their targets and procure the maximum quantity, there was limited competition among traders vis-a-vis prices. They commence with the same procurement prices, increasing them only if a supply is not available at that rate. Also, prices are determined by the wholesalers who buy the ginger from them. At certain times, a trader might have an order for a quantity of ginger from a particular buyer and will be willing to buy the ginger at slightly higher rates in order to honour his commitments to the wholesaler. In these cases, other traders contribute their stock in order to maintain their credibility in the market. Hence, traders have a fairly close-knit network, whereas farmers are more numerous but, as occasional sellers, cannot have such a network.

Traders maintain storehouses where ginger is cleaned before being segregated into mature and immature rhizomes. Further grading is not carried out. The immature ginger is sold to local wholesalers for retail trade. The mature ginger is weighed and packed again in jute bags weighing 60kg each. When 200 bags are ready one truckload, they are transported to Dhubri or Calcutta.

Transport

Transport is an important link in the ginger trade. Several steps facilitate the movement of ginger from the production area to the

final consumer. In transporting ginger to Calcutta or other destinations, the transporters provide insurance against losses resulting from accidents and so on. However, any loss due to rotting, even if caused by a delay on the road, has to be borne by the trader. The transport network is well established and runs smoothly. Availability of trucks is not a problem either.

Wholesalers

Wholesalers are based in the main cities of various states — Calcutta, Delhi, Benaras, etc. They are the distribution agents for ginger — supplying the produce to companies, retailers, and exporters. A wholesaler estimates the demand for ginger locally and obtains bulk orders from other buyers. According to the demand estimated, he/she may either place a confirmed order with his/her trader based at Dhubri or at Mehandraganj/Rongram, or buy from the supplies in the market. The product is graded only by this wholesaler and graded on the basis of the suitability of the product for export, local retail trade, the pharmaceutical industry, and so on. Grading is carried out on the basis of size and the appearance of the product. Sometimes, the wholesalers in Calcutta charge a seven per cent commission on the traders' sale price, although this is not a fixed rate throughout the ginger trade.

Markets

Primary Market

Some of the main primary markets are located at Jengjal, Rongram, Bajengduba, Garobadha, and Dadenggiri. These are weekly markets, held on different days in different places (Annex 1).

Assembling Centre

Mahendraganj is a base for many of the traders and their agents. It is an important assembly point for ginger. Another important collection centre for ginger is at Rongram where traders have storehouses.

Trade/Transportation Base

One of the main trading centres for ginger is at Dhubri, Assam. It is a base for several traders and for transporters especially. These traders and transporters are in constant touch with wholesalers based in other states and procure information on demand and prices, also confirming orders from wholesalers.

Local Retail Markets

Tura and other towns serve as retail markets, especially for fresh ginger, or 'beechi' as it is called locally. This is the fresh immature legume, which is not consciously removed but often does get removed from the plant while farmers are extracting the parent ginger. It contains a very high percentage of moisture and has a very short shelf life (only a few days). Hence, it is used for local retail purposes mainly. It fetches a good price as supplies are low in the off-season and traders are willing to purchase small quantities of it.

Ginger Products

Dry ginger is the main form in which ginger enters the international market. It is usually used in powdered form. It is in demand as a flavouring agent in the food industry, especially in bakeries. Other users include manufacturers of confectionery, soups and other pre-cooked canned foods, soft and alcoholic beverages, sausages and

other processed meat products, pickles, and chutneys. In the past few years, it has also been used increasingly in the soft drink industry.

Ginger oil and ginger oleoresins, are two other products that are in demand internationally. They are used as flavours and possess certain advantages over the powdered spice. Being liquids, they are clean and provide a consistent flavour. The pharmaceutical industry is also a minor user of the oleoresin, especially for throat lozenges. The main uses of ginger oil are to flavour confectionery, beverages, and bakery products. It is also used in the perfume industry, particularly in certain cosmetic products for men. Limited amounts of ginger oil are added to the oleoresin to produce the required balance between odour and pungency.

Some details of the products extracted from ginger are as follow.

Ginger Oleoresin

This is a distillation of ginger obtained by extraction with solvents such as acetone, alcohol, or ethylene dichloride. It contains both essential oils and oleoresin, which contribute to aroma and pungency. It is a dark brown viscous liquid. The oleoresins are classified into types, i.e., the African, the Jamaican, etc, which contain 25-30 per cent of volatile oils and are semi-solid or viscous liquids. By steam distillation of the dry ginger powder, ginger oil is obtained.

The yield of oleoresin extracted from dry ginger varies with the time of harvest and the solvent used. Immature ginger contains more oleoresin than the fully mature ginger, and this determines the choice of ginger variety and the harvest time. Table 3.2

lists the oleoresin contents of some Indian varieties. Extraction with 95 per cent ethyl alcohol gives more than three times as much oleoresin as extraction with acetone. Extraction with 1:1 ethyl alcohol-acetone yields approximately 60 per cent more oleoresin than acetone alone, and the extract, has a satisfactory flavour.

India exports small quantities of these two products to countries such as the USA, Germany, Australia, France, U.K., the Netherlands, Japan, Holland, and so on. The USA, however, is the biggest importer.

Ginger Oil

Ginger oil is used primarily as flavouring for food and drinks. It is also used in manufacturing tinctures that are essentially alcoholic essences for pharmaceutical purposes. Ginger contains three per cent volatile oil that imparts a special aroma. The oil is contained in the layer just below the skin of the ginger and is scraped off if the ginger is peeled carelessly. Hence, the waste ginger scrapings that are generally thrown away by farmers and manufacturers could be used for the extraction of oil; a valuable product.

For oil extraction, the scraping should not be allowed to dry, and distillation should be carried out directly after peeling. Since the oil is volatile, it can evaporate rapidly.

Dry Ginger

Dry unbleached ginger is prepared by peeling the outer skin and drying the cleaned inner rhizome. The yield of dehydrated ginger is about 16.6 per cent of the raw ginger. The raw material is selected and mud

and other impurities removed. The skin is peeled partially, either manually or by using a mechanical peeler. The rhizomes may be soaked in water overnight to facilitate peeling. Often sharpened bamboo pieces are used for this. Peeling results in the loss of about 10 - 12 per cent of the bulk. The rhizomes are then cleaned and spread in the sun to dry. This takes from five to seven days and sometimes even more as the weather in Meghalaya is often cloudy, especially in harvest season. The ginger may also be dried in gasifiers or solar dryers at temperatures of 60°C, as higher temperatures could result in a loss of volatile oils which are effected at temperatures above 80°C. The drying time is usually 24 hours in a cross-flow dryer at 60°C and 14 hours in a thorough flow dryer. The dried slices are packed in suitable containers and can be stored for a period of five months. This product is known as rough or unbleached ginger.

Maran, Nadia, Karakal, Mananthody, and Kurupampady varieties of ginger are flavoured for drying, as they dry easily and have a higher yield than other varieties. The Rio de Janeiro, China, Wynad, and Maran types are more suitable as vegetables for use without drying. The exportable varieties of dry ginger, namely, Calicut and Cochin, are produced in Kerala. They are the most popular varieties in the world.

The local variety gives a recovery of dry ginger of 28 per cent (Table 3.2). Besides this, the *Nadia* variety has a potential yield of 5-1.0 T/ha and a maturity period of between 240-250 days. The dry ginger recovery for *Nadia* is 22.6 per cent and for *Suprabha* 20.5 per cent (Sivadasan 1996). Hence, with these options trade in dry ginger could be introduced.

The average prices of fresh and dry ginger in India in 1994-95 were Rs seven/kg and Rs 29.13/kg respectively. The price of dry ginger rose to Rs 47.50/kg in May 1996. While there is a demand for dry ginger in the world market, contamination from external sources during harvesting, post-harvest handling, and processing often makes the quality of Indian ginger unacceptable for export.

Bleached Ginger

To prepare bleached ginger, the peeled ginger is treated with lime water before sun-drying. This type of limed dry ginger is prepared in Kerala mostly. It may be fumigated with sulphur fumes for 12 hours and dried in the sun for a day. The process is repeated once or twice to obtain a white, fully bleached product. This is then dried thoroughly and stored. It is sometimes dipped in lime to improve the appearance and ward off insects during storage.

Powdered Dry Ginger

Dry ginger is powdered for use in vegetable preparation and as an ingredient in curry powders. It is also used in the preparation of ginger beer, ginger brandy, ginger wine, and also in traditional and *ayurvedic* medicines.

Starch from Spent Ginger

The crude starch content in ginger varies from 52 - 60 per cent. After the recovery of volatile oil from ginger scraping and oleoresin from dry ginger, the spent ginger, which has practically no flavour, can be used for the preparation of starch. The quality compares favourably with starch prepared from other sources.

Vitaminised Effervescent Ginger Powder

Ginger powders of different types are prepared commercially and used to prepare drinks. These powders include plain ginger powder, vitaminised ginger powder, effervescent ginger powder, and vitaminised effervescent ginger powder. The vitaminised ginger powder contains sufficient ascorbic acid (added to the ginger powder). One kilogramme of powder, on dilution with six to seven litres of water, yields a drink that, apart from being refreshing, also contains sufficient Vitamin C for the daily requirements of an adult.

Ginger Beverages

The alcoholic drinks produced from ginger are 'Ginger-Brandy', 'Ginger-Wine', and 'Ginger-Beer'. Apart from these alcoholic beverages, ginger is also used for the preparation of several soft drinks. Fresh ginger is converted into a fine paste. After mixing with sugar and lime juice or acid and water, it is used to manufacture soft drinks such as 'ginger syrup'. One product developed at the CFTRI, Mysore, is the 'Ginger Cocktail'. The other drinks available in the market are 'Ginger Cordial', and 'Ginger Nectar'.

Ginger Preserve

Like other fruit preserves, ginger preserve is manufactured by the fruit preservation industry in India. Fibrous varieties of ginger are considered less suitable for manufacturing ginger preserve.

Ginger Candy/Crystallised Ginger

Ginger candy is another commercial product in the market. Crystallised ginger candy is prepared by rolling the well-drained gin-

ger (ginger candy) from the preserve into fine pulverised or crystalline sugar.

Lime Ginger Pickle

Green ginger is an ingredient commonly used in the preparation of pickles such as 'lime ginger'.

Ginger Essences

The essence of ginger contains ginger oil, clove oil, mace oil, and alcohol. These essences are for culinary use. Ginger bakery and confectionery products are prepared by using ginger as an essential ingredient. Examples are gingerbread, ginger biscuits, ginger cakes, sweetmeats, ginger puddings, ginger mints, chocolates, and so on.

Status of Ginger Processing in the District

At present, a large proportion (of 10,000 MT) of products is exported from the district. However, this applies to fresh ginger only, with no processing being undertaken. The reasons, commonly cited by traders and farmers alike, are the following.

- Lack of awareness about processed ginger products
- The yield of dry ginger from the local fibrous variety is low and cannot compete with superior varieties.
- Lack of opportunities for ginger processing using scientifically superior methods that would ensure good quality products
- Ignorance about possible markets for ginger products and the unwillingness to risk investment in uncertain ventures

Development projects until now have been externally aided and initiated, with the result that people lack the initiative and confidence to undertake projects on their own. However, there are farmers (mainly the economically better off) who have expressed the willingness to be pioneers for the activity, provided they are given some guidance on the technical procedures for processing and market outlets.

Potentials Opportunities and Constraints for Micro-enterprises

Any micro-enterprise or development initiative could be successful if it addressed both forward and backward linkages in a cost-effective and efficient manner. Figure 3.4 summarises the linkages in the production and trade of ginger in the district.

The potential for development of forward linkages through processing ginger exists. Two broad categories have potential—dry ginger and processed ginger products such as ginger candy, preserved ginger, etc. Chapter 5 details the opportunities and constraints for each of the options available.

The market potential for dry ginger makes ginger drying a feasible option for farmers and small entrepreneurs. There is an unmet market demand for dry ginger. Dry ginger could be powdered or sold as whole ginger. The moisture content in raw ginger is about 80 per cent, and this has to be reduced to 15-20 per cent for storage and for sale as dry ginger. The process of drying ginger in the sun is slow and takes a minimum of five to seven days. The alternative could be for the people to use biomass-based gasifiers or solar dryers. For trade, the product has to be free of impurities and

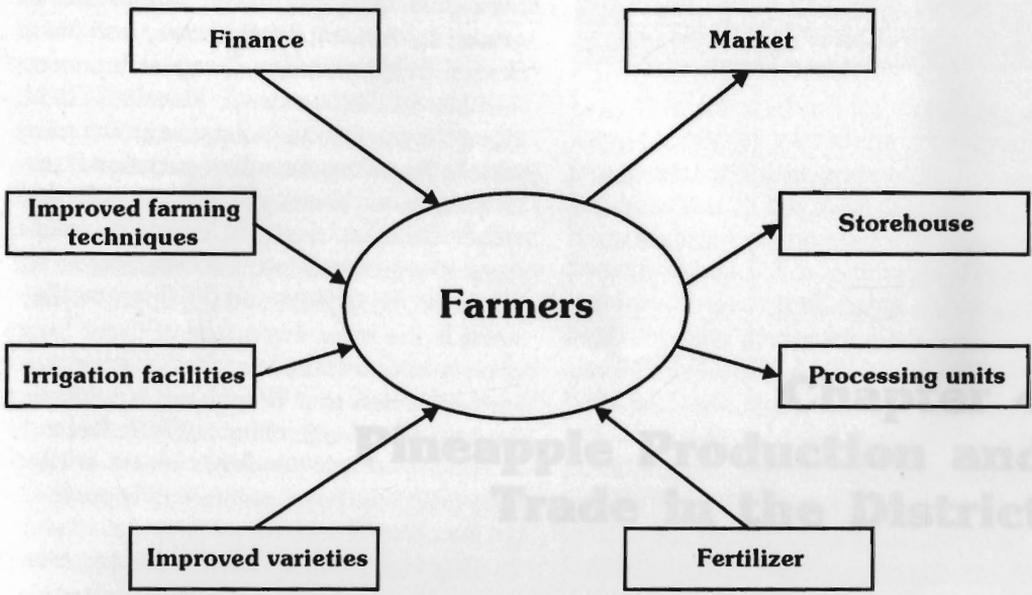


Figure 3.4: Forward and Backward Linkages in the Ginger Trade

dirt particles. Hence, adequate care has to be taken for growing the best variety and proper cleaning and drying of rhizomes. These possibilities have been analysed in Chapter 5.

The main objective of the micro-enterprise would be to balance the variations in the

day-to-day prices of ginger and the fall in off-season prices. The longer shelf life of the products would help to increase the marketable surplus. The primary constraint is the initial development of markets and finding a sufficient number of outlets for processed ginger products. These considerations have been detailed in Chapter 5.