Annex 1
List of Markets

Block - Wise List of Weekly Primary Markets (unregulated)		
S.No.	**Place**	**Principal Commodities Traded**
Rongram Block		
1.	Rongram	Rice, ginger, betel leaf, oranges, pineapple, vegetables,chillies (dry) cotton
2.	Jengjal	Rice, ginger, cotton, turmeric, arum
3.	Rani	Rice, ginger, cotton chillies, turmeric, arum, betel leaf
Dadenggiri Block		
4.	Dadenggiri	Rice, ginger, pineapple, vegetables, jute, mesta, mustard, cotton, sesamum, arum
Tikrikilla Block		
5.	Tikrikilla	Rice, cotton, potatoes, areca nut, betel leaf, onion, vegetable jute, mustard seed, chillies (dry), and bananas
Zikzak Block		
6.	Mahendraganj	Rice, potatoes, areca nut, jute, mustard, pulses
7.	Kalaipara	Rice, areca nut, betel leaf, jute and mesta, mustard, chillies
8.	Kalaichar	Rice, bananas, other fruit, jute, mesta, mustard, cotton
Selsella Block		
9.	Selsella	Rice, Jute, mesta, chillies (dry), vegetables
10.	Chibinang	Rice, ginger, pineapple, bananas, jute, mesta, mustard seed, chillies (dry), cotton, sesamum, arum
11.	Romagal	Rice, ginger, vegetables, jute, mesta, cotton
12.	Garobadha	Rice, maize, potato, ginger, areca nut, betel leaf, orange, pineapple, onion, millet, mustard seeds, chillies (dry), cotton, bananas
13.	Rajabala	Rice, pulses, areca nut, betel leaf, vegetables, mustard seed, jute mesta, cotton, bananas
Betasing Block		
14.	Betasing	Rice, bananas, jute, mesta, vegetables
15.	Ampati	Rice, millet, maize, potatoes
Dalu Block		
16.	Barengapara	Rice, potatoes, areca nut, oranges, pineapple, bananas, other fruit, vegetables, turmeric, jute, mesta, chillies
17.	Kherapara	Rice, ginger, jute, mesta, chillies, cotton

Market Days in West Garo Hills	
Day	**Market**
Monday	Betasing, Dolongiri
Tuesday	Garobadha, Chibinang, Purakhasia
Wednesday	Kherapara, Dadengiri, Kailaipara
Thursday	Romeagal, Kailachur, Jengal, Selsella, Dalu
Friday	Rongram, Mahindroganj, Tikrikilla, Tura
Saturday	Ampati, Rajabala
Sunday	No markets

Annex 2
Commodities Regulated by the Marketing Board

The Marketing Board has classified all commodities into nine groups and introduced regulation for the following commodities.

GROUP 1

(1) Jute (baled and unbaled)
(2) Cotton (ginned and unginned)
(3) Mesta

GROUP 2

(1) Paddy
(2) Rice
(3) Cheura (beaten rice)
(4) Khai (puffed rice)
(5) Wheat and wheat products
(6) Maize
(7) Other millets
(8) Paddy husk
(9) Rice bran and polish
(10) Wheat bran and polish

GROUP 3

(1) Sesamum
(2) Mustard

GROUP 4

(1) Mandarin oranges
(2) Oranges
(3) Other citrus fruits
(4) Pineapples
(5) Bananas
(6) Papaya
(7) Pears
(8) Plums
(9) Peaches

GROUP 5

(1) Potatoes
(2) Sweet potatoes
(3) Tomatoes
(4) Leafy and fresh vegetables
(5) Yams

GROUP 6

(1) Turmeric (whole and powdered)
(2) Ginger
(3) Chillies (dry and green)
(4) Black pepper
(5) Betel nut
(6) Betel leaf
(7) Bay leaf

GROUP 7

(1) Eggs
(2) Poultry
(3) Cattle
(4) Sheep
(5) Goats
(6) Buffaloes
(7) Milk
(8) Butter and Cream
(9) Ghee
(10) Wool
(11) Hide and skin

GROUP 8

(1) Timber
(2) Bamboo
(3) Broom Grass
(4) Resin wood (*Dhup lakri*)

GROUP 9

All types of fish (excluding canned fish)

Annex 3A
Ginger Varieties and Their Products

Many varieties of ginger are grown in different parts of the country. Some of these varieties are Burdwan, China, Ernad, Joharat, Karakal, Maran, Nadia, Poona, Rio de Janeiro, Suprabha, Surabhi, Suruchi, Thiladiam, Thingpui, Tofengive, Wynad, etc. Of these Johrat, Nadia, Thiladiam, and Thingpui are grown in Assam, Burdwan in West Bengal, and Wynad in Kerala. All these varieties differ in shape, size, rhizomes, yields, moisture content, flavour, and other characteristics, making them suitable for different products, as given below.

Form of Product	Suitable Varieties
Dry ginger	Maran, Nadia, Karakal, Mananthody, Kurupampady
Fresh Ginger	Rio-de-Janeiro, China, Wynad, Maran
Exportable dry ginger	Calicut, Cochin (Kerala)
Ginger oleoresin	Ernad Chernad, China Kuruppampadi, Rio de Janeiro
Ginger oil	Sleeva local, Narasapattam, Ernad Chernad, Himachal Pradesh

Annex 3B
Classification of Ginger in International Trade

Internationally, fresh, preserved, and dry ginger are traded. The varieties of ginger are usually known by their country of origin. The most well-known ginger varieties are listed below.

Fresh	Dry	Preserved
Brazilian	Jamaican	Australian
West Indian	Indian	Chinese
Mauritian	Nigerian	Hong Kong
Fijian	Sierra Leonean	
	Chinese	
	Australian	

The Indian varieties are sub-classified into Malabar ginger, which includes the Cochin and Calicut varieties, and Assam ginger.

Other classifications depend on whether dry ginger is marketed whole, split, or sliced, and there is an important range of sub-classifications based on this. They include:

- peeled, scraped, or uncoated from which the skin has been removed without damage to the underlying tissues;
- rough scraped from which the skin has been partially removed, usually only on one side;
- unpeeled or coated, the skin remaining intact;
- black ginger – the rhizomes are scalded for 10-15 minutes in boiling water before being scraped or dried – the scalding kills the rhizomes and renders scaling easier, but it tends to darken the colour of the product;
- bleached or limed – the rhizomes are peeled clean and treated with lime or sulphurous acid in order to impart a lighter colour; and
- split or sliced ginger – the unpeeled or uncraped rhizomes, which have been either split longitudinally or sliced in order to accelerate drying.

Annex 4
Market-Wise Retail Prices for Ginger

Retail Prices of Ginger for the Year April '96 to March '97* in the Main Markets of the District

Market	Mar 97	Feb	Jan	Dec 96	Nov	Oct	Sep	Aug	July	May	Apr
Tura	12	12	12	10	10	11	12	13	16	18	20
Garobadha	7	7.5	9	9	8	8	10	8	12	16	12
Ampati	7.5	9	8	9	9	8	9	10	12	16	12
Rajabala	7	5.5	7	8	7.5	8	8	8	12	15	12
Tikrikilla	8	8	6	8	8	10	10	10	16	18	11
Chibinang	7	5	7	8	7.5	8	8	8	14	15	15
Dadenggiri	4	5	5	5	5	5	7	4	10	30	11
Rongram	3.5	8	6	4	4.25	4.75	-	2.3	8	16	11
Jengjal	4	-	4	-	4	5	6	4	8	16	10
Kherapara	3	8	8	3.75	-	5	-	11	10	15	8
Selsella	7	5	8	8	7.5	8	8	8	12	15	15
Romeagal	6	7.5	7.5	9	8	7.5	8	8	9	11	11
Mahindroganj	9	9	10	10	10	6.5	12	11	16	18	14
Kalaichar	-	-	-	-	-	-	-	-	12	-	14
Betasing	5	5	5	5	6	6	6	4	12	16	12
Kalaipara	6	5	7	8	7	7	8	8	12	15	12
Purakhasia	3.5	9	8	4.25	3.5	5	7	3.5	12	18	20
Dalu	12	12	12	10	10	3.25	12	2	14	18	20
Average	**6.5**	**7.5**	**7.6**	**7.4**	**7.2**	**6.8**	**8.6**	**7.2**	**12**	**16.8**	**13.3**

Source : District Agriculture Officer, West Garo Hills, Tura, 1997
* Data for June were not available

Annex 5
List of Pineapple Processing Enterprises in Meghalaya

Fruit Processing Unit

Fruit Preservation Officer
Government of Meghalaya
Dainadubi, East Garo Hills

Garo Hills Cooperative Cotton and Oil Mill Ltd.

Phulbari, West Garo Hills

Fruit Processing Unit

Fruit Technology Officer
Fruit Garden, Shillong

Hibi Fruit Products

Krishna Mandir , Jail Road
Shillong

Rajao Fruit Products

Lower Jail Road
Shillong

Associated Beverages

Burnihat

Annex 6
Fibre Extraction from Pineapple Leaf

Introduction

A UNDP (United Nations Development Programme) supported project was carried out at the South India Textile Research Association (SITRA), Coimbatore, India. The main objective of this project was the development of fibres for the production of yarn and woven and knitted fabrics for both domestic and export markets from unconventional resources, such as pineapple leaves, that mostly go to waste. This project was mainly concerned with pineapple leaf fibre (PALF), as it is available in abundance and is easier to use than other unconventional fibres.

Process

Pineapple fibres can be extracted from the leaves by a mechanical process (decortication) after the leaves are one-year old. Machine decortication involves scraping of the bark, rim, or outer coat of the plant and the machines used for this purpose are known as Raspador machines. SITRA has built four, non-automatic Raspador machines for this project. The capacity of a Raspador machine is about five kg of PALF in eight hours. SITRA has also completed construction of a high production decorticating machine with a capacity of 60 to 70kg of fibre/eight hour shift. This machine has already been licensed for commercial use.

After decortication, some gum and resin are still present in the PALF, rendering it brittle and coarse. Hence, the gum has to be removed using acid or alkali to make the fibre soft and fine. The estimated cost of the softened pineapple fibre is approximately Rs 5.88/kg (Table 1).

The softened fibre was spun at SITRA on seven different spinning systems. Of these, the project profiles for the ring spinning system and the rotter spinning system, which were effective, are given in Tables 2 and 3 below. In addition, the comparative costs of yarn production in the two spinning systems are summarised in Table 4.

Use of Pineapple Leaf Waste

In view of the fact that the yield of PALF is only about two to 2.6 per cent of the weight of green leaf, proper use of wastes that accrue during extraction of pineapple leaves (using the decorticating machine) should receive due attention in order to make the process of PALF production commercially viable. Pilot experiments were carried out at SITRA, Coimbatore, to manufacture paper boards and fuel briquettes using pineapple leaf waste.

Table 1: Approximate Cost of Softened Pineapple Leaf Fibre	
Element of cost	**Rs/shift of 8 hours**
Cost of leaves at Rs 0.10/kg	500.00
Cost of labour - 3 operatives/shift at Rs 30/operative/shift	90.00
Power cost (18 units/shift at a cost of Rs 2/unit)	36.00
Repair, maintenance, transport, and other costs	100.00
Capital recovery at 15.6% of the machine cost	100.00
Total	**834.00**
Cost/kg of raw fibre	8.26
Cost of fibre softening/kg of fibre	2.30
Cost of fibre cutting/kg of fibre	0.22
Total	**10.70**
Resale value of waste/kg of fibre	4.90
Cost/kg of softened fibre	**5.88**

Table 2: Project Profile for a Ring Spinning Plant with a capacity of 1,000 kg/day of 2S yarn				
Machinery	**No of Units Required**	**Cost/Unit of the M/c (Rs)**	**Prod/Unit/Day**	**Total Cost (Rs)**
Ring Frames	400 Spdls	600/spdl	2.1 kg/spdl/day	2,88,000
Draw frames (breaker and finisher)	7 machines	2,00,000/machine	300 kg/Mc/day	14,00,000
Converter cards	9	3,00,000/machine	120 kg/card/day	27,00,000
Lap forming unit	1	8,00,000/unit	1000 kg/day/unit	8,00,000
Cone Winder	24 drums	-	60 kg/drum/day	2,00,000
Land	5 acres	5000/acre	-	25,000
Building	11,500sq.ft.	100/sq. ft.	-	11,50,000
Electrical installations, furniture etc.	-	-	-	3,00,000
Total project cost				**68,63,000**

Paper Boards : Paper boards were manufactured using 100 per cent pineapple leaf waste and using one part pineapple leaf waste and one part waste paper. Paper boards made out of 100 per cent pineapple leaf waste were found to be inferior to those made from 100 per cent waste paper in terms of breaking length, tearing factor, and bursting factor. However, paper boards from 50 per cent leaf waste/50 per cent paper waste were found comparable in quality to conventional paper boards made out of 100 per cent waste paper.

Fuel Briquettes : Fuel briquettes were manufactured (Belletizer) using PALF waste. The properties of the fuel briquettes made out of PALF waste are given in Table 5 below, together with those of coal and 100 per cent de-oiled rice bran.

Table 3: Project Profile for a Rotter Spinning Plant to Spin 1,000kg/day of 2S yarn				
Machinery	**No of Units Required**	**Cost/Unit of the M/c (Rs)**	**Prod./unit/ day**	**Total cost (Rs)**
1. Rotor spinning machine	60	2,000/rotor	16.75kg/rotor/day	7,20,000
2. Draw frames (breaker and finisher)	7	2,00,000	300kg/machine/day	14,00,000
3. Converter cards	9	3,00,000	120kg/card/day	27,00,000
4. Lap-forming unit	1	8,00,000	1,800kg/day	8,00,000
Land	5 acres	5000/acres	-	25,000
Building	10000sq.ft.	100/sq. ft.	-	10,00,000
Electrical accessories, furniture etc.	-			3,00,000
Total project cost				**69,45,000**

Table 4: Cost of Production of One kg of PALF Yarn (2S)		
Breakdown of Costs	**Rotter Spinning**	**Ring Spinning**
Raw materials	5.88	5.88
Power	3.40	3.71
Wages and salaries	1.44	2.04
Stores, consumables, packing, others	2.75	2.75
Capital recovery factor	3.00	3.00
Total	**16.47**	**17.38**

Table 5: Properties of PALF Waste Fuel Briquettes and Coal			
Properties	**Type of Material**		
	Coal	**100% De-oiled Rice Bran**	**PALF* Waste**
Moisture (%) by weight	-	8.17	8.75
Volatile matter (%) by wt.	-	61.02	66.46
Ash (%) by wt.	20 to 40	20.97	15.84
Fixed carbon by wt.	-	9.04	8.95
Calorific value (kCal/kg)	3,000 to 5,300	3,307	3,311
* Briquettes made out of 50 per cent PALF waste and 50 per cent de-oiled rice bran			

Fuel briquettes made out of pineapple leaf waste were found to possess acceptable levels of calorific value. The ash content in briquettes made out of PALF waste is low compared to that in coal. Therefore, its heat value is expected to be higher.

Source: SITRA 1993

Annex 7
Suitability of Local Ginger Varieties for Processing

This experiment was carried out by CFTRI (CFTRI 1989).

Objectives

Evaluation of the varieties of ginger commercially important in Meghalaya, with specific reference to:

- suitability for manufacturing fresh ginger products such as preserves, candy, and crystallised ginger and ginger in brine;
- the influence of harvest maturity on such fresh ginger products; and
- identifying the optimal harvest maturity for the variety at the location for production of fresh ginger products.

The study aimed to identify a suitable variety (varieties) of commercial importance (grown in the Meghalaya region) and with characteristics suitable for making various products, especially the following.

a. Ginger preserve
b. Ginger candy
c. Crystallised ginger
d. Ginger in brine

The influence of harvest maturity on the quality of fresh ginger and the products made from it were evaluated.

Experimental Plots

With the assistance of the Director of Agriculture, Government of Meghalaya, two ginger growing plots were selected in two different places, one at Umsining near Shillong for the Nadia variety and the other near Tura at Jengjal for the local Garo variety, also called 'Tama' variety.

The selected plots (10 x 10 m area) were divided into sub-plots of one sq. m. each and samples were dug out from 15 sub-plots at monthly intervals during October, November, and December 1988 using a random block design. Harvested ginger rhizomes were washed thoroughly in water to free them from mud and the rhizomes were air dried overnight. Next day the data, with respect to the total number of plants, weight of rhizomes, weight of leaves, and weight of root hairs, were collected. The ginger was packed in gunny bags (15-20kg) and brought to Mysore by air/train. At CFTRI, Mysore, the following experiments were carried out.

1. Loss of weight during transportation
2. Analysis of ginger samples for dry yield, moisture, and volatile oil – the shear value of fresh ginger was determined using the Warner Bratzler Shear Meter
3. Preservation of unpeeled whole ginger

4. Preservation of peeled whole ginger
5. Preparation of various ginger products in syrup (preserve): ginger candy, crystallised ginger, ginger in brine, salted dry chips, and other products

Weight

The loss of weight in ginger during transportation from Meghalaya to Mysore over a period of six to seven days ranged from six-10 per cent. There was no visible difference in the appearance of ginger rhizomes after transportation. No spoilage was noticed.

Dry Yields

For the Nadia variety, three harvests were collected from October to December. For the Tama variety only one harvest was collected in October and subsequent harvesting was not carried out because the October produce were inferior in quality and fibrous in texture and not suitable for the products listed earlier. Dry yields and volatile oil content for Nadia and Tama varieties are given in the table below.

Variety/ Harvest	Dry Yield (MFB%)	Volatile Oil Content (MFB v/w%)
Nadia - Oct	9.28	3.76
Nadia - Nov	11.72	2.53
Nadia - Dec	14.90	2.17
Tama - Oct	8.83	4.08

There is an obvious increase in dry matter and decrease in volatile oil content with increasing maturity for the Nadia variety.

The shear values for the above sample were determined using a Warner Bratzlar Shear meter. The average values are indicated below.

Variety/Harvest	Average shear value
Nadia – Oct	7.7
Nadia – Nov	10.2
Nadia – Dec	13.6
Tama – Oct	15.6

It can be seen that, for the *Nadia* variety, there is a gradual increase in the shear value, indicating texture hardening with increasing maturity. Nadia, harvested in October, having an average shear value of 7.7, was tender to chew and also gave good quality products, e.g., ginger in brine and ginger preserve. Tama harvested in October itself was quite hard in texture and the average shear value was 15.6. The products made from this were not of satisfactory quality, especially with respect to texture.

Preservation of Unpeeled/Peeled Whole Ginger

The availability of tender ginger is seasonal. It is available for a short duration only. Hence, it is necessary to preserve it for use off-season.

For preservation of fresh ginger, the following steeping solution compositions were evaluated.

a) Brine made up of 6% salt + 1% acetic acid + 200 ppm SO2
b) Brine made up of 10% salt + 1% acetic acid + 200 ppm SO@
c) Brine made up of 12% salt + 1% acetic acid

The ginger samples both unpeeled/peeled stored in the above solutions at room temperature had retained an acceptable texture and flavour over a period of 11 months. The rhizomes were not soft or slimy. However, a slight browning was noticed on the surface and inside also. The suitability of this ginger (11 months storage) for making preserves or candy has to be studied. Based on these observations, brine containing 6% salt + 1% acetic acid + 200 ppm SO_2 can be used for bulk preservation of fresh ginger.

Preparation of Products

From five to ten kg of raw materials were used to make the products described below.

Ginger in Syrup (Preserve): The ginger stored in steeping solution was taken out and washed well in water. The washed ginger was peeled and cut into cubes, using stainless steel knives. It was sorted to remove fibrous, discoloured, and defective portions. The cubes were of from 12-19mm. The tender trimmings were cut into small bits (2mm cubes). The salt was removed from them by washing them well in water.

Cooking Options

1. Open cooking in water
2. Pressure cooking in water
3. Pressure cooking in steam

The cubes were pricked before syruping.

Making Syrup

1. Quick process
2. Slow process

Open boiling takes nearly six hours for cubes and three hours for titbits to achieve the desired degree of softness. In order to save the time and energy involved in cooking, pressure cooking (at 15 lbs) was carried out. This method considerably reduced the cooking time to 60 minutes in the case of cubes and 30 minutes in the case of titbits. The material can be pressure cooked either in steam or water. The cooking time can be varied depending on the maturity and firmness of the raw material.

The cooked material was cooled in running water, hand-pricked (cubes), and taken to make syrup treatment.

In the quick method, the concentration of the covering syrup was raised in seven stages of 20 Brix. In the slow method the syrup strength was raised in 12 stages of 10 Brix. The product from the slow method was superior in quality. Cubes subjected to the quick method had a slightly shrivelled appearance. There was not much difference in the quality of titbits in syrup made by slow or quick methods. The ginger in the syrup was allowed to equilibrate and was subsequently packed in suitable containers. This is the ginger preserve available in the market. In the case of titbits, the excess syrup was drained and the bits packed and called tutti-frutti.

Ginger Candy : The ginger in syrup made as above was warmed and the syrup drained away. The pieces were air dried and packed. This is ginger candy.

Crystallised Ginger : The ginger preserve was heated and the syrup drained away. The cubes or titbits were partially air-dried and cooked with crystallised sugar and again air dried. The excess sugar was re-

moved by sieving and the product suitably packed.

Ginger in Brine : Ginger in brine is also an important commercial product and consumed in considerable quantities in some countries, especially in Japan.

The ginger in brine was prepared in four ways, namely

a) whole peeled ginger in brine,
b) cubes in brine,
c) titbits in brine, and
d) shreddings in brine.

The brine used for the above products consisted of 12 per cent salt with one per cent acetic acid. The quality of the products was very good, even after three months in storage.

Salted Dry Chips : The ginger, after peeling, was sliced, sprinkled with table salt and left overnight. Next day, the excess water was drained and the slices sun dried. This product can serve as a useful adjunct in culinary preparations. The trimmings obtained during cube making can also be used for making this product.

Other Products: It is also possible to make the following products from fresh ginger – ginger jam, ginger marmalade, ginger squash, ginger-pineapple syrup, ginger chutney, ginger pickle, etc. The trimmings, which are fibrous in nature, but otherwise sound in quality, can be used for making ginger powder.

Comments

Two commercial varieties, e.g., Tama and Nadia, obtained from the Meghalaya region, were evaluated. Tama was found to be fibrous even in the October crop. The products made from Tama were found to be unsatisfactory in quality.

Nadia is harvested at three maturities, e.g., in October, November, and December. These were studied for making various products. The Nadia variety in October was found to be less fibrous, crisp in texture, mild in pungency, and having a desirable flavour. The quality of the products prepared from Nadia in October was superior to those found in the variety of harvested Nadia in November and December, as was also the Tama harvested in October.

Annex 8
Pre-Harvest and Post-Harvest Operations for Ginger

Pre-harvest Operations

The planting material may be treated with suitable insecticide/fungicide, but only on the recommendation and under the supervision of experts. Pesticides banned in the countries importing ginger from India should never be used. In case the crop is affected by diseases or insects, insecticides or fungicides need to be applied only after consulting experts and at the dosage and according to the schedule recommended by them. Importing countries check for pesticide residues in exported ginger.

Harvesting

The rhizomes are harvested carefully to avoid injury to them. The harvested rhizomes are then washed to remove the soil. This helps ensure a uniform colour for the dried product. If rhizomes are kept in heaps for long they are liable to ferment.

Processing

Peeling

The rhizomes are cleaned by washing to get rid of extraneous matter deposited on the scraped surface. While scraping, extreme care is taken not to rupture the oleoresin cell lying just below the outer skin. Destruction of the oleoresin cell affects the intrinsic quality of ginger. Sharpened pieces of wood or bamboo or other suitable material are used to peel the rhizomes. Iron knives leave black stains on the peeled surfaces affecting the appearance of rhizomes. Care is taken to collect peeled rhizomes in clean receptacles only. Any dirt or extraneous matter that happens to stick to the wet scraped surface of the rhizome adheres to it on drying.

Drying

Ginger is dried only on clean surfaces to ensure that the product does not become contaminated with extraneous matter. Only clean bamboo mats (not coated with cowdung), or a cement/concrete surface properly cleaned or other suitable clean surface are used to dry ginger.

Ginger is dried to a safe moisture level of eight to 10 per cent wherever possible. Improved drying methods using solar or artificial dryers are best. Care is taken to avoid mould growing on the rhizomes during the drying operation. Improperly dried ginger is susceptible to mould growth – for example, a fungus known as 'Aflatoxin' which is highly injurious to health. Care is taken not to mix well-dried ginger with improperly dried lots as both are liable to infestation.

The bulk of ginger exported from India is cleaned by dipping freshly scraped ginger in a slurry of slaked lime. When the water adhering to the rhizomes dries off, they are again dipped in the slurry. This process is repeated till the rhizomes become uniformly white. Ginger dried by ordinary methods also can be bleached by this method. Bleached ginger can be kept longer; however, the USA, Europe, Canada, and Japan prefer unbleached ginger as bleached ginger contains amounts of calcium that are beyond permissible limits.

Packing

Only new and clean bags are used for packing dry ginger. It is preferable to use polythene laminated gunny bags for this purpose.

Storage

Dry ginger is stored; preferrably dunnage of wooden crates is used to stack the packed bags to prevent the ingress of moisture from the floor. Care is taken to stack the bags 50 to 60cm away from the walls. No insecticide should, under any circumstances, be used on dry ginger. Only authorised persons should be entrusted with the work of fumigation if ginger is stored for a longer period of time. Insects, rodents, and other animals should be prevented from infesting the premises where ginger is stored. Stored ginger should be periodically exposed to the sun. Prolonged storage of ginger results in deterioration of its aroma, flavour, and pungency.

If care is taken right from cultivation, harvesting, post-harvest handling, processing, packing, storage, and transportation; by adopting good cultivation practices, good harvesting practices, good processing practices, and good packing, storage, and transportation practices; it will be possible to prevent contamination.

Source: Export Inspection Agency 1995

Annex 9
Ginger Quality Requirements for Export

Introduction

The quality of spices is the most important factor in the world spice trade. Importance is given to clean spices and not to cleaned spices. There are various food laws protecting citizens from importing countries and demanding conformance to safe levels of contamination. Some of the requirements of importing countries, such as the USA and European countries, are given below.

Cleanliness Specifications

The ASTA (American Spice Trade Association) Cleanliness Specifications were evolved for compliance by spice importers in the USA on the initiative of the US Food and Drug Administration. The objective of the policy of the FDA was to reach an understanding on self-regulation with spice importers in order to shift most of the sampling and analysis of spice imports from the FDA to the industry. It gave the industry the privilege of importing spices under conditional release without formal GDA inspection. In exchange, the importers guarantee that all spice shipments found to be adulterated, on sampling and analysis by an ASTA approved laboratory, would be returned to the exporting country or would be properly cleaned or reconditioned before being put into consumer channels.

However, the ASTA Cleanliness Specifications for unprocessed spices are a supplementary part of the ASTA's import contract. Further, these specifications do not substitute the total requirements under the FFD & C Act. The ASTA Specifications set limits only for extraneous matter, which is removable by further processing under Good Manufacturing Practice (GMP), to place the product in condition for consumption.

Limits of Contaminants Permitted in Ginger under ASTA Cleanliness Specifications

Extraneous Matter

Everything foreign to the product itself; this includes but is not restricted to stones, dirt, wire, strings, stems, sticks, non-toxic foreign

Name of Spice	Whole Insect Dead	Excreta Mammalian	Excreta Other	Mould	Insect Defined Infested	Foreign Matter
Ginger	by count	by mg/lb	by mg/lb	% by wt*	% by wt*	% by wt
	4	3.0	3.0			1.00
* More than 3% of mouldy pieces and /or insect infested pieces by weight						

seeds, excreta, manure, and animal contamination.

Mould

A product is classified as mouldy if it contains mould visible to the naked eye and exceeding 1/4 of its surface area and the presence of mycelial filaments and spores are confirmed when examined with the aid of a microscope (40 H magnification or less).

Reconditioning

A lot that fails to meet the ASTA Cleanliness specifications must be reconditioned. Reconditioning may include but is not limited to techniques such as fumigating, washing, cutting, sifting, aspirating, and blowing.

US - FDA Defect Action Levels

Like other food items, import of ginger into the USA is subject to the regulations of the US-FDA. Entries not in compliance with the regulations are detained.

Food Defect Action Levels are established by the FDA on the basis that it is not possible to grow, harvest, or process crops that are totally free from natural defects. The alternative to increase the use of chemicals to control insects, rodents, and other sources of contamination is not acceptable because of the potential health hazards from chemical residues. To resolve this problem, the FDA has set Defect Action Levels, stating the amount of contamination that will subject the food to enforcement action. The FDA continues to lower the action levels as the performance improves. The mixing of food to dilute contamination is prohibited and renders the product illegal regardless of the defect level in the final product.

Product	Defect	Action Level
Ginger (whole)	Insect filth and /or mould	Average of 3% or more pieces by weight are insect infested and / or mouldy
	Mammalian	Average of 3mg or more of mammalian excreta per pound

Environment Protection Agency (EPA) Regulations on Pesticide Residues

Tolerance for pesticidal residues on many raw agricultural commodities has been established under Section 408 of the law. Tolerances are established, revoked, or changed by the Environmental Protection Agency. The FDA is responsible for enforcing safe levels of pesticide residues in food. In the absence of tolerance or tolerance exemption, the FDA may establish action levels. A raw agricultural commodity that contains a pesticide residue in excess of the tolerance prescribed is in violation of the law and hence becomes liable for action.

Current Good Manufacturing Practice Regulations (CGMP Regulations)

The provisions under these regulations are to ensure that food has been manufactured under sanitary conditions. The criteria under this action are applied to determine whether food has been prepared, packed, or held in insanitary conditions whereby it might have become contaminated with filth or might have been rendered injurious to health. Many food materials are intended for further processing and manufacturing

into finished foods. Such processing in no way relieves the raw materials from the requirements of cleanliness and freedom from deletrious impurities.

Fair Packaging and Labelling Act

The Provisions of the Act become mandatory in the case of foods packed in retail/ consumer packs. Exports of ginger to the USA have to meet the provisions of the Federal Food, Drug, and Cosmetic Act and the accompanying regulations such as the EPA regulations on pesticide residues, CGMP Regulations, FDA Food Defect Action Levels, and the ASTA Cleanliness Specifications. Apparently these requirements can be met only when it is ensured that ginger is cultivated, harvested, processed, packed, stored, and transported under sanitary and hygienic conditions and by observing good manufacturing practices to avoid contamination and any deterioration in quality.

Requirements of Other Countries

India exports an appreciable quantity of ginger to European Countries. The harmonised food standards which the unified market of the European Economic Community adopted are more stringent than those of the individual countries in the community. The harmonised standards may set limits for pesticide residues, mycotoxins, and other contaminants.

The current analytical requirements for ginger imported into Germany are given in the following section.

Moisture % max	12.0
Volatile oil % min	1.5
Total ash % max	7.0
Acid insoluble ash % max	1.0
Pass through particle size % min	95.0 (Sieve No. 35)

Germany has also set permissible limits of pesticides in spices. Limits for some commonly used pesticides are as follow.

Name of Chemical	Max. Quantity in mg. per kg.
Aldrin	0.1
Dieldrin	0.01
Heptachlor	0.1
Isodrin	0.01

The Netherlands has also prescribed permissible pesticide residue limits in spices as detailed below.

Name of Chemical	Limit
Phosphor pesticides	
Diazinon	Less than 0.01mg/kg
Methyl Parathion	Less than 0.005mg/kg
Malathion	Less than 0.01mg/kg
Chlorinated pesticides	
Lindane	Less than 0.001 ppm
Heptachlor	Less than 0.005 ppm
Aldrin	Less than 0.005 ppm
Dieldrin	Less than 0.01 ppm
Endrin	Less than 0.01 ppm

The European Economic Community has monitoring programmes for aflatoxin in spices.

The permissible level of aflatoxin has been reduced by a law enacted in May 1991, applicable for countries in the European Economic Community, especially in Germany.

Permissible levels of aflatoxin B1	2 ppb
B1+B2+G1+G2	4 ppb

Conclusion

The requirements of importing countries keep on changing from time to time as discovery of a new pathogen or a contaminant would compel these countries to review the existing quality parameters and set new limits. Consumer awareness in these countries also has a lot of influence on such legislative measures. Hence, it is an extremely challenging task to ensure that India can cater to these quality parameters.

Annex 10
Plates

A Typical *Garo* Dwelling

Women De-husking Paddy

Harvesting Ginger from *Jhum* Fields

Farmers Transporting Ginger to Market

Trading Ginger in the Local Market

Storage of Seed Ginger in Pits

Pineapples Ready for Harvest

A New Pineapple Plantation