

Spices and Fruit for Micro-enterprises

**A Study of the Potentials of Ginger
and Pineapples in West Garo Hills
Meghalaya, India**

**Anjali M. Bhatia
Nandita Hazarika
Randhir Singha**

**International Centre for Integrated
Mountain Development
Kathmandu, Nepal
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Project Team

Research Team

Ms Anjali Mohan Bhatia
Ms Nandita Hazarika (Principal Investigator)
Mr Randhir Singha

Project Advisors

Mr Sanjay Mande
Mr Dilip Singh

Administrative Support Ms Pratibha Shukla
Ms Maya Devi

T. S. Papola
Head
Mountain Enterprises and Infrastructure Division

Preface

Development experiences in most of the mountain areas of the Hindu Kush-Himalayan Region, over the past decades, have shown that the prevailing predominant mode of their economies – subsistence agriculture – is becoming increasingly unsustainable both economically and ecologically. Diversification of economic activities into products and services, for which these areas offer a comparative advantage, through enterprise-based production for the market, is considered necessary for sustaining livelihoods and alleviating the poverty of the rapidly increasing population. It is in this context that ICIMOD established a programme on Development of Micro-enterprises in Mountain Areas with the objectives of identifying constraints and opportunities and developing policy, programme, and training guidelines for enterprise development in hill and mountain areas of the HKH region. As part of this programme, the Centre has commissioned a number of studies in different countries and areas of the HKH region with a view to documenting experiences of development and functioning of enterprises covering different aspects such as comparative advantage of products, processes, and factors in enterprise development, technology, credit, marketing, and development of entrepreneurial skills as well as policies and programmes by government and non-government agencies for promotion of enterprises.

The present paper '**Spices and Fruit for Micro-Enterprises: A Study of the Potentials of Ginger and Pineapples in West Garo Hills, Meghalaya, India**', by Anjali M. Bhatia, Nandita Hazarika, and Randhir Singha, is one in this series of studies. It is being published with the hope that it will be found useful by those engaged in research and development, policy-making, programme formulation, and implementation for the promotion of enterprises, as well as by present and potential entrepreneurs in their respective activities.

T. S. Papola
Head
Mountain Enterprises and Infrastructure Division

Acknowled **Abstract**

This report examines the feasibility of developing micro-enterprises based on processing of ginger and pineapple crops in the West Garo Hills, Meghalaya. Based on secondary information, an intensive primary survey was carried out to interact with farmers, traders, and credit institutions. While ginger drying emerges as a viable option, pineapple processing requires large-scale investments, unsuitable for household/ community level enterprises. Integration of improved farming methods and market regulation with value addition were identified as imperatives for the success of micro-enterprise development. Among the ginger-drying options evaluated, the gasifier-based process could be introduced for demonstration purposes. The options for value addition would not only increase returns for farmers but also provide them with alternatives, thereby enhancing their bargaining power.

Keywords: micro-enterprise, dry ginger, pineapple, agroprocessing, market, regulated market, gasifier, shifting (*jhum*) cultivation, credit, storage.

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IRDP Integrated Rural Development Programme

JRY Jawahar Rozgar Yojana

KVIC Khadi Village Industries Commission

MWS Million Well Scheme

NABARD National Bank for Agriculture and Rural Development

NEC North Eastern Council

List of Abbreviations

Apex Bank	Meghalaya Cooperative Apex Bank
CFTRI	Central Food Technological Research Institute
CPCRI	Central Plantation Crops' Research Institute
DIC	District Industries Centre
DRDA	District Rural Development Agency
DWCRA	Development of Women and Children in Rural Areas
GOI	Government of India
IARI	Indian Agricultural Research Institute
IAY	Indira Awas Yojana
ICAR	Indian Council for Agricultural Research
IRDP	Integrated Rural Development Programme
JRY	Jawahar Rozgar Yojana
KVIC	Khadi Village Industries Commission
MWS	Million Well Scheme
NABARD	National Bank for Agriculture and Rural Development
NEC	North Eastern Council
NEITCO	North-eastern Industrial and Technical Consultancy Organization Ltd.
NERAMAC	North Eastern Regional Marketing Corporation Ltd.
NGO	Non-governmental Organization
PMRY	Prime Minister Rozgar Yojana
SISI	Small Industries Service Institute
TRIFED	Tribal Co-operative Marketing Development Federation of India Ltd.
TRYSEM	Training for Rural Youths for Self Employment
TERI	Tata Energy Research Institute
REG	Rural Energy Group

Content List of Local Terms

<i>Jhum</i>	Shifting cultivation	1
<i>Machongs</i>	Various exogamous sub-clans of the main clans	2
<i>Nokna</i>	The youngest daughter of the household who becomes the heiress	4
<i>Nokkrom</i>	The heiress daughter's (<i>Nokna</i>) husband	4
<i>A'khing</i>	Administrative units	5
<i>Nokma</i>	The chief of the <i>A'khing</i> lands	6
<i>Mahari</i>	Closely related kin	6
<i>Mesta</i>	Roselle (<i>Hibiscus expl. Sabda riffa</i>) L. Var. <i>F. Altissima</i> - Malvaceae	7
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Chapter 1

Introduction

Hill economies in India are based on local resources and dictated by local needs. A majority of the population is dependent on agriculture, and it provides a significant proportion of household incomes. Generally low soil productivity and the subsistence characteristics of agricultural activities, restrict the availability of marketable surplus. This is aggravated by an inadequate infrastructure and consequently high transport costs. However, the demand for agricultural and horticultural products that are not in sufficient supply from the lowlands offers a unique advantage to hill farmers to produce, process, and market these products. Strengthening these comparative advantages could be extremely beneficial for the local population, especially in the context of employment and income, since agriculture is the sole means of livelihood in the hills. Therefore, defining appropriate strategies must involve all the stakeholders and adequate integration of the production process with market research.

The processing of agricultural and horticultural produce is relevant for these economies because of the many benefits that can accrue from it. Firstly, processing would increase the shelf life of otherwise perishable crops that have to be transported over long distances by slow and uncertain road networks. Secondly, with the growing demand for processed fruits and spices from countries that do not produce them, there could be an export potential for them. Thirdly, the advantage lies in the employment creation potential of the processing activity and in the diversification of employment opportunities from growing crops to more entrepreneurial and marketing options. Finally, value addition of commercial crops in the area of production would reduce the involvement of the intermediaries in marketing of processed foods. All these factors together could result in valuable improvements in the quality of life of hill/mountain populations.

Agroprocessing in Meghalaya's Economy

Meghalaya, a State in northeastern India, is representative of the ecological complexity of the northeastern hill region, with natural topographic and climatic features determining the course of human settlements and modes of economic production. The main land use system in this area is shifting cultivation, locally called *jhum*. However, with reduction in the duration of the *jhum* cycle, there has been extensive erosion and soil impoverishment and decreasing returns from such agricultural operations. In recent years, the State government has taken various steps to encourage settled cultivation with cash crops.

Since the population was primarily dependent on farming, it was considered necessary to find ways to diversify into areas offering a comparative advantage, such as horticulture and processing agricultural products, thereby developing alternative sources of income. To this end, the State government encouraged people to grow cotton, jute, and *mesta* (Roselle). In addition, it encouraged coffee and rubber plantations and citrus and pineapple cultivation. Broom grass, which grows wild in the area, has become an important income-generating source for marginal farmers. Similarly, cane and bamboo products have been encouraged and marketing facilities were provided where possible. Areca nut plantations and supari making have also become extremely profitable ventures in some areas.

Ginger and pineapple as commercial crops are cultivated extensively in the State, and they appear to have immense potential for value addition through processing. The state is the second largest producer of gin-

ger in India, contributing 20 per cent of the total national produce. The proportion of land under ginger in 1990-91 was 2.86 per cent, accounting for 12.01 per cent of India's total land area used for ginger cultivation. The area and production of ginger in the State during the last decade are presented in Figure 1.1.

Pineapple is a popular fruit crop. Meghalaya has the second largest area used for pineapple cultivation in the northeastern States. Figure 1.2 presents the production and area under pineapple production for Meghalaya for the period from 1989-90 to 1995-96.

Most of the agricultural produce is sold in raw form. There is one cotton-spinning mill in the West Garo Hills. It was established in 1954-55. Since 1976-77, the management of the mill has diversified its activities to include oil extraction. In addition, there are two food preservation units, under the management of the Department of Agriculture. These units mainly serve as demonstration units for squashes, jams, pineapple slices, and titbits. With several cash crops now being cultivated in the area, there is a fairly good potential for agro-processing.

Objective of the Study

The main objective of the study was to examine the feasibility of developing micro-enterprises based on existing farm produce, especially ginger and pineapples in the West Garo Hills of Meghalaya.

The study was conducted as follows.

- Assessment of the raw material required for the micro-enterprise and sufficiency of inputs from existing land holdings
- Documentation of available credit facilities and financial institutions and assess-

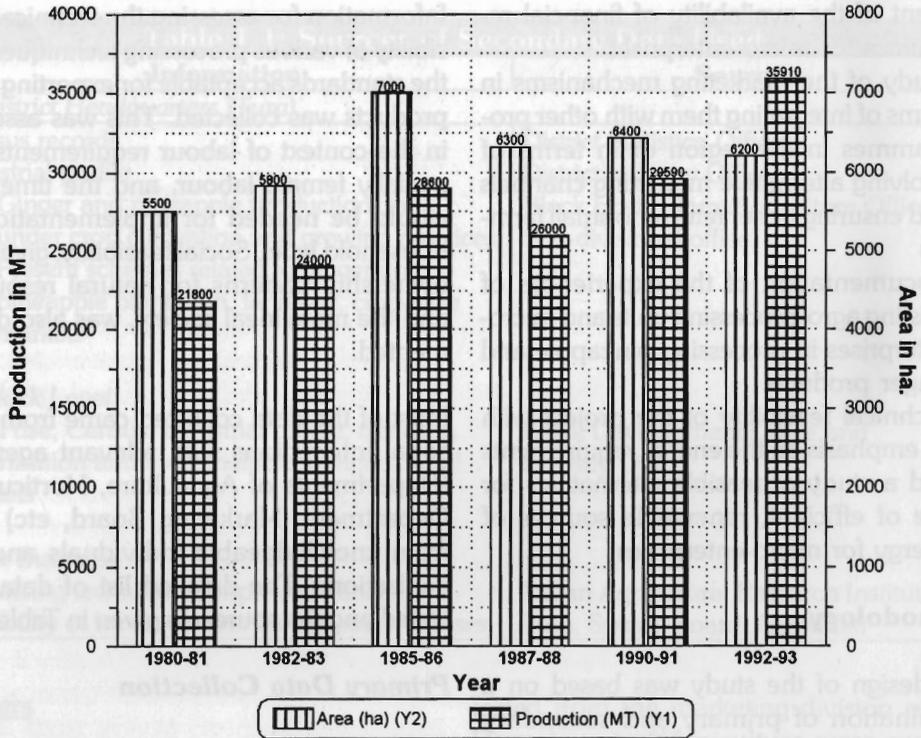


Figure 1.1: Production of and Area under Ginger in Meghalaya

Source: Basic Statistics of North Eastern Region 1995, North Eastern Council, 1995.

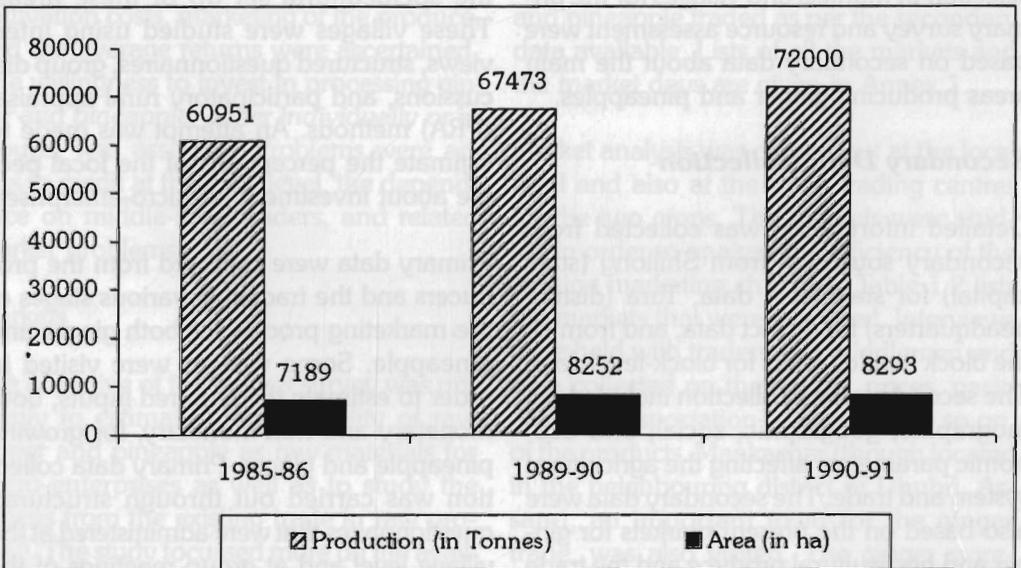


Figure 1.2: Production of and Area under Pineapples in Meghalaya

Source: Directorate of Agriculture, Government of Meghalaya 1997

ment of the availability of financial resources for micro-enterprises

- Study of the marketing mechanisms in terms of integrating them with other programmes in the region or in terms of evolving alternative marketing channels and ensuring better returns to small farmers
- Documentation of the experiences of existing agro-processing units and micro-enterprises in processing pineapple and ginger products
- Technical feasibility of the project with an emphasis on the energy requirements and a study of feasible alternatives for use of efficient, renewable sources of energy for micro-enterprises

Methodology

The design of the study was based on a combination of primary and secondary data collection. Given a duration of only four months, an extensive rapid survey of farmers and markets was undertaken. The selection of markets and villages for the primary survey and resource assessment were based on secondary data about the main areas producing ginger and pineapples.

Secondary Data Collection

Detailed information was collected from secondary sources – from Shillong (state capital) for state-level data, Tura (district headquarters) for district data, and from all the block headquarters for block-level data. The secondary data collection included demographic, geographic, social, and economic parameters affecting the agricultural system and trade. The secondary data were also based on the present markets for ginger and horticultural produce and the trade in agro-processed products.

Information for assessing the technical feasibility of various processing techniques and the standards acceptable for exporting food products was collected. This was assessed in the context of labour requirements, especially female labour, and the time that would be needed for implementation at household level. Social feasibility, given the ownership patterns for natural resources and the matrilineal society, was also documented.

Most of the data collected came from personal interactions with relevant agencies (Departments of Agriculture, Horticulture Department, Marketing Board, etc) and from knowledgeable individuals and organizations. The detailed list of data collected and the sources is given in Table 1.1.

Primary Data Collection

Primary data collection was carried out in selected villages to assess the resources available in the village and to understand the sociocultural set up of these areas. These villages were studied using interviews, structured questionnaires, group discussions, and participatory rural appraisal (PRA) methods. An attempt was made to estimate the perceptions of the local people about investment in micro-enterprises.

Primary data were collected from the producers and the traders at various stages of the marketing process for both ginger and pineapple. Some villages were visited in order to estimate the required inputs, both monetary and non-monetary, for growing pineapple and ginger. Primary data collection was carried out through structured questionnaires that were administered at the village level and at group meetings of the villagers.

Table 1.1: Sources of Secondary Data Used

Information	Source
<i>At District Headquarters (Tura)</i>	
Census records Industrial profile <ul style="list-style-type: none"> • Ginger and pineapple production, area under crop cultivation and growing practices • Present schemes related to ginger and pineapple plantation, land use, crop-wise markets 	District Statistics' Office District Industry Office Block Horticulture/Agriculture Office Sub-divisional office
<i>At Block Level</i>	
Land use, Census, industrial profile, trends in urbanisation and industrialisation, agricultural markets	Block Development Office and Industry Office
<i>Other Institutes</i>	
Processing techniques, improved varieties Suitability of local varieties for various processes	Indian Agricultural Research Institute, Tura, Spices' Board, Guwahati

Farmers

Group meetings and discussions were held with individuals and households. Details of the area under the two crops, production, cultivation costs, marketing of the produce, and the average returns were ascertained. The willingness to invest in processing ginger and pineapple, either individually or in groups, was assessed. Problems were access to credit at the local level, the dependence on middle-level traders, and related market problems.

Markets

The objective of the market survey was primarily to estimate the availability of raw ginger and pineapple as raw materials for micro-enterprises as well as to study the returns from the existing trade in raw produce. The study focussed more on the availability of ginger because the survey and discussions revealed constraints in pineapple processing units. Secondary data col-

lected from the marketing division of the Department of Agriculture were supplemented by the primary survey of selected markets. Selection of sample markets was made on the basis of the quantity of ginger and pineapple traded as per the secondary data available. Lists of all the markets and the market days are given in Annex 1.

Market analysis was carried out at the local level and also at the main trading centres for the two crops. The markets were studied in order to analyse the efficiency of the existing marketing channels. Table 1.2 lists the markets that were surveyed. Interviews were held with traders and middlemen and data collected on the supply, prices, packaging, transportation, demand, and so on, of the products. Mankachar (though located in the neighbouring district of Dhubri, Assam), an important town for the ginger trade, was also visited. The ginger storehouses were visited to explore their capacities, costs, and other factors involved in the present trade of ginger.

Table 1.2: List of the Markets Surveyed

Markets	Market days
Ampati	Saturday
Garobadha	Tuesday
Chibinang	Tuesday
Dadenggiri	Wednesday
Jengjal	Thursday
Rongram	Friday
Mahendraganj	Friday

Financial Institutions

Credit facilities available from local institutions, both government banks and development agencies, were explored to assess the available financial support for local enterprises. The banks included the State Bank of India, the Union Bank, the Meghalaya Cooperative Apex Bank, and the National Bank for Agriculture and Rural Development (NABARD). Among the other government agencies, the District Industries' Centre, the Small Industries' Service Institute, and the Khadi Village Industries' Commission (KVIC) were visited.

There are several government projects — the Integrated Rural Development Programme (IRDP), *Jawahar Rozgar Yojana* (JRY), etc — under the District Rural Development Agency (DRDA) that aim to eradicate poverty through the creation of opportunities of self-and wage employment. Discussions were held with resource persons for these agencies.

The Tribal Cooperative Marketing Development Federation of India Limited (TRIFED), a national federation that aims to promote agro- and forest-based produce for income generation for tribal peo-

ple throughout the country, is involved in the marketing of several products, including ginger. Hence, an attempt was made to investigate their present and potential roles in the development of micro-enterprises.

Research Organizations

Organizations involved in the development of improved agricultural crops and processing techniques for production of agro-products, such as the Spices' Board and the Indian Agricultural Research Institute (IARI), were also visited. An assessment of the services for testing raw crops, chemicals used for processing products, and so on was carried out.

Cooperatives and NGOs

Institutions involved at any stage in the growth and marketing of the two products were studied. These included cooperatives and NGOs such as the Mothers' Unions and Village-level Farmers' Cooperatives.

Agro-processing Units

There are no food processing units in the West Garo Hills. However, visits were made to the nearest food preservation unit operated by the Department of Agriculture of the Government of Meghalaya at Dainadubi in East Garo Hills and to Associated Beverages (in Ri Bhoi district), a firm manufacturing fruit products, to document their experiences in establishing and operating their units. An effort was made to ascertain the feasibility of household-level processes, especially for pineapples, that could produce a semi-processed raw material for the Dainadubi units.

Definition of a Micro-Enterprise for the Study Area

Traditional income-generating activities, both farm and off-farm, face several difficulties. These include competition from industrial products, lack of proper marketing channels, and the dependence of producers on agents and middlemen. However, these activities are important as they supplement the meagre, seasonal incomes from farming. The possibility of initiating income-generating activities, with appropriate processing of farm-based raw materials using sustainable non-conventional energy sources and the active participation of women, is a possibility to be explored in this region.

Given the fact that micro-enterprises can increase rural incomes and provide better returns from the resources available, the options were evaluated based on a single family's investment and earning potential. The proportion of rural families benefitting from the plan proposed was also considered.

Hence, it was observed that, if pineapple processing were to be carried out on a large scale, the people would not have the resources required. Pineapple products would have to be aggregated, by a village or a group of villages, at a central processing point. The investment required to process pineapple for canned products and jams is high and the standards, infrastructure, and marketing should be excellent. Partially processed pineapples have a short shelf life, making such an enterprise risky.

The present trade in ginger revolves around fresh rhizomes, while the main exports and supplies to the domestic market are of dried/powdered ginger. This provides an opportunity to explore avenues for drying ginger

locally, thereby increasing the returns to the farmers. The seasonality of the produce and the prices could also balance out if the shelf life of fresh ginger could be increased so that a fall in prices does not take place during the two to three months of harvest. This would involve cold storage facilities or processing at source.

Both options were evaluated, keeping in mind the interests of stakeholders, especially their investment capabilities and the dependency on middlemen. Thus, the details for micro-enterprise establishment in the area were determined based on certain critical factors, apart from the amounts of investment required for the enterprise that have been described in Chapter 5. Enterprises have been evaluated at farmer, community, and current trader levels. In addition, larger business enterprises were evaluated to assess their role in providing the initial impetus to project and market development, with subsequent expansion and involvement of the local people once a market is established.

Hence, it was found that products that have a longer shelf life, e.g., spices, and have a ready market providing better opportunities for trade (fresh or processed), suffer from price fluctuations and the vagaries of consumer preferences. For processed fruit, markets need considerable development as consumers not only prefer freshly processed fruits but they also prefer established brand names associated with better quality standards and mechanised processing. All this makes manual processing uncompetitive, both quality and price wise.

Scope of the Study

The study document details the existing trade in pineapple and ginger and their

products. The possibility of developing pineapple and ginger-based micro-enterprises in the area has been studied also. The report also documents the credit facilities available in the study area and the prerequisites for planning micro-enterprise development initiatives.

Limitations

The study mainly concentrates on the potential for micro-enterprises in ginger processing, as it was observed that processing pineapple is not feasible at household level. After detailed interaction with the farmers, traders, and government agencies concerned, it was found that ginger drying was one of the enterprises being actively considered. Therefore, an attempt has been made to deal with this option in greater detail.

The two crops, ginger and pineapple, have different harvest seasons and, given the short duration of the study, field visits could not be matched to the harvest season for both crops. While it was possible to inter-

view ginger traders to quite an extent, the pineapple season was over and only a few traders, based in local areas, could be identified.

Also, because the main markets for ginger and pineapple are located outside the district and state, it was not possible to assess such markets fully. Therefore, the demand estimations for the products concerned were based on interviews with the local traders. However, the supply scenario was studied in detail, thus the market assessment for supply of ginger and pineapple was carried out satisfactorily.

Lastly, given the scope of the study, the limited time of four months and logistics involved in surveys of the local markets, merchants, producer households, and the government departments and financial institutions, it was not possible to carry out more intensive interviews. Hence, the emphasis of the report has been on secondary published material on all the components that could highlight areas for further research.

Chapter 2

The Study Area

Meghalaya

In the northeastern region of India, hills constitute 70 per cent of the area. Meghalaya is representative of the ecological complexity in this hill region, with natural topographic and climatic features determining the course of human settlements and modes of production. Rich in biodiversity, it boasts of a number of rare species of flora, which include orchids, insectivorous plants, and a diversity of fauna. Home to a large number of ethnic, linguistic, and cultural groups, it is characterised also by the strategic vulnerability and economic backwardness.

Meghalaya is mostly a plateau region. It is situated at an average elevation of 1,000masl, ranging from 610 and 1,830masl. It is home to the Garo, Khasi, and Jaintia hill ranges, with the higher ridges in the coniferous belt sloping gently down to the subtropical and tropical zones. It lies between latitudes $25^{\circ}47'$ and $26^{\circ}10'$ north and longitudes $98^{\circ}47'$ and $97^{\circ}47'$

east. Covering an area of 22,429sq.km. it can be divided into seven districts – the West Garo Hills, East Garo Hills, South Garo Hills, West Khasi Hills, East Khasi Hills, Ri Bhoi, and Jaintia Hills. The Khasi and Jaintia Hills occupy 13,400sq.km., and the rest of the area is covered by the Garo Hills. The climate varies from warm pre-humid to humid. Mean temperatures vary from $13.0 - 21.6^{\circ}\text{C}$.

Traditionally, local communities have been dependent on natural resources for their biomass needs and daily sustenance. The land use in this area is mainly characterised by shifting cultivation, locally called *jhum*. Apart from large-scale extraction of timber, fuelwood, and fodder, *jhum* cultivation is considered to be the main cause of the conversion and degradation of forest lands. With an unsustainable decrease in the *jhum* cycle, there has been extensive erosion and soil impoverishment, finally resulting in increased poverty for indigenous communities.

West Garo Hill District

West Garo Hills were a part of Assam until 1971 when Meghalaya attained statehood. The West Garo Hills lie between latitudes 25°8' and 26°1' north and longitudes 89°50' and 90°59' east in the western corner of Meghalaya. The southern and western boundaries are shared with Mymensing district and a part of the Rangpur district of Bangladesh. To the north lies the Goalpara district of Assam; the East Garo Hills border the northeast, and the West Khasi Hills the east. The district was created in 1976 and, in the middle of 1993, it was sub-divided into the West Garo Hills and the South Garo Hills. The average elevation of the district is about 950masl.

The district now covers an area of 3,714sq.km. (Planning Organization 1995). Administratively, the district consists of three sub-divisions (see map) that are further subdivided into seven Community Development Blocks (DoES 1995).

Topography and Climate

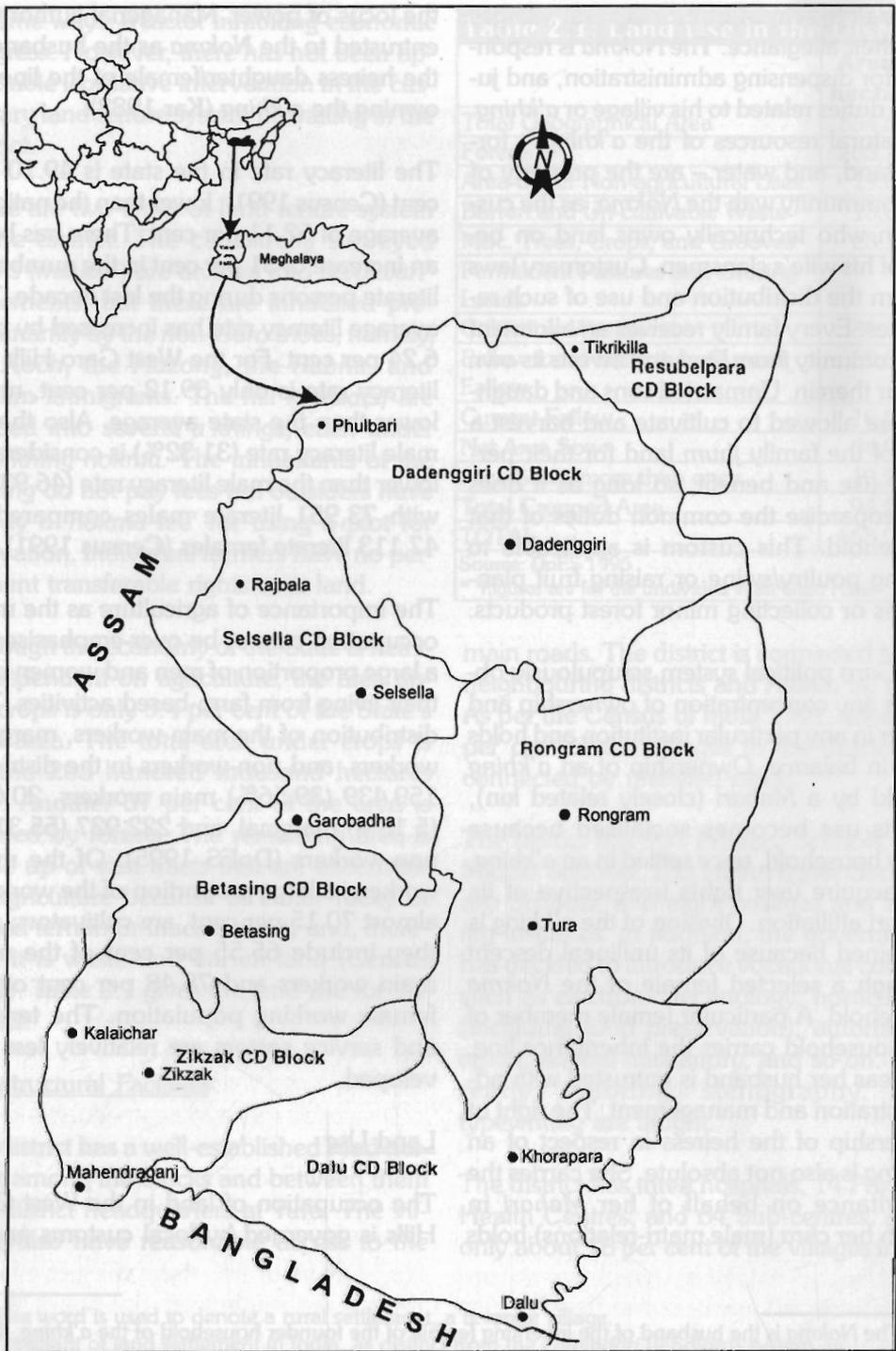
Geographically, the district is located in the Garo Hills. Its topography is marked by undulating tracts with high ridges and narrow valleys, and the plains fall mainly along the borders of Assam and Bangladesh. A large portion of the land mass is hilly, and the land rises sharply from the plains in the south and, after attaining the highest elevations in the Tura and Arabella ranges, slopes towards the Brahmaputra River in the north. The altitude ranges from 35masl in the plains to 1,200masl in the Tura range. The district is endowed with a substantial network of well-developed rivers, fed by heavy precipitation. The soil is acidic laterite with a predominance of clay.

The climate is humid subtropical, with annual temperatures varying from a minimum of 10.38 to a maximum of 38°C. The district receives between 475 to 550cm of rainfall annually. Precipitation takes place mainly between April and October with little or no rainfall between November and March (Planning Organization 1995).

Sociocultural Profile of the District

With a total population of 4,03,027, the district is a distinct area, because of its diverse bio-physical environment and the rich cultural milieu of the indigenous communities. Inhabited by hill tribes, the area is sparsely populated with a population density of 109/km² (Planning Organization 1995), though the density is considerably higher than the state average of 79/km² (Census 1991). The *Garo* tribe is the dominant ethnic community in the district, and the society is divided into two ideally exogamous clans or sects — the *Sangma* and *Marak*. These are further subdivided into various exogamous clans or *Machong*. The *Garos* are a matrilineal community and descent is through the mother only. Clan affiliation is determined by the mother, i.e., the children bear the title of their mother. All property and other material effects belong to the mother and are passed from mother to female child. The youngest daughter (*Nokna*) automatically inherits the family assets and her husband is called *Nokkrom*. Traditionally, after marriage, the son-in-law, or *Nokkrom*, resides in his wife's house. On the death of the father-in-law, the *Nokkrom* becomes the head of the family. The non-inheriting daughters of the family establish households away from their parents after marriage.

The *Garo* have their own administrative areas called, *a'khing*, under a chief called the



Location of West Garo Hills, Meghalaya, India

*Nokma*¹ to whom one or several villages owe their allegiance. The *Nokma* is responsible for dispensing administration, and judicial duties related to his village or *a'khing*. All natural resources of the *a'khing* – forests, land, and water – are the property of the community with the *Nokma*, as the custodian who technically owns land on behalf of his wife's clansmen. Customary laws govern the distribution and use of such resources. Every family receives an allotment of community *jhum* land and invests its own labour therein. Unmarried sons and daughters are allowed to cultivate and harvest a part of the family *jhum* land for their personal use and benefit, so long as it does not jeopardise the common duties of that household. This custom is applicable to rearing poultry/swine or raising fruit plantations or collecting minor forest products.

The Garo political system scrupulously obviates any concentration of ownership and power in any particular institution and holds both in balance. Ownership of an *a'khing* is held by a *Mahari* (closely related kin), but its use becomes socialised because every household, once settled in an *a'khing*, can acquire user rights irrespective of its *Mahari* affiliation. Division of the *a'khing* is restrained because of its unilineal descent through a selected female of the *Nokma* household. A particular female member of the household carries the inheritance line, whereas her husband is entrusted with administration and management. The right of ownership of the heiress in respect of an *a'khing* is also not absolute. She carries the inheritance on behalf of her *Mahari* in which her *chra* (male matri-relations) holds

the locus of power. Managerial authority is entrusted to the *Nokma* as the husband of the heiress daughter/female of the lineage owning the *a'khing* (Kar 1982).

The literacy rate in the state is 49.10 per cent (Census 1991), lower than the national average of 52.11 per cent. There has been an increase of 51 per cent in the number of literate persons during the last decade. The average literacy rate has increased by only 6.24 per cent. For the West Garo Hills the literacy rate is only 39.12 per cent, much lower than the state average. Also the female literacy rate (31.32%) is considerably lower than the male literacy rate (46.93%), with 73,951 literate males compared to 47,113 literate females (Census 1991).

The importance of agriculture as the main occupation cannot be over-emphasised as a large proportion of men and women earn their living from farm-based activities. The distribution of the main workers, marginal workers, and non-workers in the district is 159,439 (39.56%) main workers, 20,661 (5.13%) marginal, and 222,927 (55.31%) non-workers (DoES 1995). Of the main workers, a large proportion of the workers, almost 70.15 per cent, are cultivators; and they include 65.55 per cent of the male main workers and 78.48 per cent of the female working population. The tertiary and service sectors are relatively less developed.

Land Use

The occupation of land in the West Garo Hills is governed by local customs and is,

¹ The *Nokma* is the husband of the inheriting female of the founder household of the *a'khing*. The son-in-law (*Nokrrum*) becomes the *Nokma* after the death of the father-in-law. The office of the *Nokma* is hereditary.

in some ways, a factor inhibiting economic progress. However, there has not been appreciable legislative intervention in the customary land tenure system prevailing in the district.

There are two types of land tenure system in the district. The cadastrally surveyed plains (*mauza*²) are divided into *reyotwari*³ settlements, but these are inhabited predominantly by the non-Garo tribes, namely, the *Koch*, the *Hazong*, the *Rabha*, and Muslim immigrants. The hill *mauza*(s) are divided into several *a'khings*, each under an *a'kning nokma*. The inhabitants of the *a'kning* do not pay fees but outsiders have to pay a 'nokma fee' for using a plot for cultivation. Individual farmers have no permanent transferable rights over land.

Although the economy of the State is heavily dependent on agriculture, the area under crops is only 9.4 per cent of the State's land area. The total area under crops is around 203 hundred thousand hectares only. Another 37 per cent of the area is covered by forests. The remaining area is made up of vast tracts that are unsuitable for agriculture because of either rocky or rugged terrain or inaccessibility and, therefore, it is waste and barren land (Census 1991). Table 2.1 gives the land use for the district.

Infrastructural Facilities

The district has a well-established road network among the blocks and between them and district headquarters at Tura. The villages also have reasonable access to the

Table 2.1: Land Use in the District*

	Area in hectares
Total Geographical Area	554,500
Forests	263,254
Area under Non-agricultural Uses	19,082
Barren and Un-cultivable Waste	13,017
Misc. Trees, Crops, and Grooves	28,195
Permanent Pastures and Grazing Lands	nil
Cultivable Wasteland	80,113
Fallow Land other than Current Fallow	59,833
Current Fallow	16,015
Net Area Sown	74,991
Area Sown more than once	19,283
Total Cropped Area	94,274
TOTAL	668,057

Source: DoES 1995
* Figures are for the undivided West Garo Hills.

main roads. The district is connected to the neighbouring districts and Assam by road. As per the Census of India 1991, about 13 per cent of the villages in the district are connected by metalled roads.

The district has 967 Primary Schools, 207 Middle Schools, 105 High/Higher Secondary Schools, and eight colleges and training institutes. In addition, the government has decided to introduce vocational courses such as electronic technology, horticulture (including food preservation), automobile repair, animal husbandry, and so on. Currently, tailoring, stenography, and typewriting are taught.

The district has three hospitals, 14 Primary Health Centres, and 64 Sub-centres. Also, only about 18 per cent of the villages in the

² The word is used to denote a rural settlement, a revenue village.

³ A variant of land settlement in India, as distinct from the *Zamindari* (landlord) system, in which the tenant farmers supplicated directly to the king/state, without an intermediary like the *Zamindar*.

district received electricity in 1991 (Table 2.2).

ests, and to the *Nokma*, in the case of unreserved forests (Census 1991).

Table 2.2: Block-wise Distribution of Villages As Per the Availability of Amenities

C D Block	No. of inhabited villages	No (with %) of villages having the following amenities		
		Market / <i>Haat</i>	Approach by metalled road	Power supply
Dadenggiri (including Tikrikilla)	263	11 (41.83)	13 (4.94)	7 (2.66)
Selsella	304	19 (6.25)	44 (14.47)	108 (35.53)
Rongram	230	6 (2.61)	41 (17.83)	29 (12.61)
Betasing	200	10 (5.00)	22 (11.00)	38 (19.00)
Zikzak	189	8 (4.23)	23 (12.17)	23 (12.17)
Dalu	249	19 (7.63)	39 (15.66)	57 (22.89)
District	1435	73 (5.09)	182 (12.68)	262 (18.26)

Source: Census of India 1991

Forests

As a result of the variation in altitude (600 to 1,600masl), the district has different climatic zones, ranging from tropical to sub-temperate, that support several vegetation types – from moist deciduous to tropical semi-evergreen forests. The forests fall into three different administrative systems – reserve forests under the Forest Department, unclassified forests under the district councils, and unreserved forests owned by the clans. In the West Garo Hills, there are six reserved forests with an area of about 109.36sq.km. A considerable portion of these reserved forests consists of *Shorea robusta* trees. Other valuable trees are *Tectona grandis*, *Gmelina arborea*, *Sterospermum chelonodes*, and *Albezzia procera*. The unclassified forests are managed by the Garo Hills' District Council and the unreserved forests by the *Nokma*. Timber from the forest areas is extracted on the basis of royalty payments to the District Council, in the case of the unclassified for-

The unclassified forests, though managed by the District Council, are included in the *a'khing* land of every *Nokma*. These forests may be subjected to annual shifting cultivation. This has resulted in depletion in and degradation of the growing stock, with mostly secondary scrub forests remaining in such areas.

During 1977-82, emphasis was placed on increasing the productivity of forests and linking forest development with industry and the rural economy. As a result, in the state controlled forest, 22.50sq.km. were planted with economically valuable species and 4.66sq.km. with fast growing species during the five-year period.

In addition, in an attempt to preserve wildlife habitats in the state, the government created the Siju Wildlife Sanctuary in West Garo district. The sanctuary lies on the banks of the Simsang River, covering an area of 5.18sq.km. (Census 1991).

Agriculture, Horticulture⁴ and Livestock

The majority (88.57%) of the population in the study region is rural (Census 1991). Thus, the life support systems of the Garo tribe have traditionally relied on (and continue to do so) the natural resources, especially forest resources, for survival and sustenance directly or indirectly. Shifting agriculture is practised on hill slopes, while wet rice cultivation takes place on the plains. Approximately 85.84 per cent of the total working population is engaged in agriculture. The dependence on *jhum* is interlinked with the forests, as these constitute the source lands for agriculture and fulfill other subsistence needs for fodder, timber, and fuel.

The fallow period is five to seven years, and about 5.7 per cent (2,650sq.km.) of the area is the minimum area under shifting cultivation at any point in time. The number of households practising shifting cultivation in 1981 was 28,877, engaging 1,41,786 people (DoES 1995). Efforts to control *jhum* cultivation have focussed on promotion of settled agriculture and growth of cash crop and horticultural species. Agriculture remains the main income generating source for the local people, especially in view of the high soil productivity and abundant rainfall, making conditions suitable for a wide range of crops.

Paddy is the main crop and is the staple food of the people. Other food crops grown include maize, millet, tapioca, and sweet potatoes. Paddy and maize are summer crops and pulses are grown in winter. The total area under agriculture in the district is 94,274 hectares out of which 57,136 hec-

tares are cultivated with food grains, resulting in production of 63,882M.T. (Planning Organization 1995). Jute and *mesta*, cotton, oilseeds, bananas, and pineapples are the main cash crops grown in the district. Other cash crops grown are sugarcane, tobacco, ginger, chillies, and other fruits and vegetables.

With continuous shifting cultivation and deforestation, land becomes almost barren and unproductive. Such natural constraints have forced farmers to shift from traditional cropping patterns to more remunerative crops. Horticultural crops and plantation crops were promoted by the Department. The important fruit crops in the district include oranges, pineapples, bananas, and jackfruit. Papaya, litchi, guava, pear, and other citrus fruits are also grown. The total area under the main horticultural crops is 7,254 hectares with a production of 76,858M.T. An additional area of 551 hectares was brought under horticulture by distributing 2.23 hundred thousand plants and grafts to the farmers in 1994.

The important plantation crops are areca and cashew nuts. Other plantation crops, such as coconut, tea, black pepper, betel leaf, and bayleaf, are also grown to some extent. The total area under plantation crops is 7,156 hectares with a production of 7,845M.T.

The main spices are ginger, turmeric, and chillies. Besides these, large cardamoms and cinnamon have been introduced recently. The area under different spice crops is 3,686 hectares with a production of 11,450M.T. (Planning Organization 1995).

⁴ Horticulture here means market gardening – cash crop cultivation — and not gardening as per the dictionary definition.

The main limitation to increasing yields from agriculture in the area is the lack of adequate irrigation facilities. The Soil Conservation Department and the Department of Agriculture have undertaken some schemes for land reclamation. The minor irrigation schemes executed in the district include construction of small weir dams and bunds for flow irrigation.

Livestock

Livestock husbandry in the district is mainly concerned with rearing cows, bullocks, poultry, and pigs. The cattle population is primarily maintained as draught power for settled agricultural operations; but it is also a source of food (meat for self consumption or sale during the festive season). However, in *jhum* cultivation the use of draught power is not required. The total livestock population is 323,762. Chickens and pigs are raised for self consumption or for sale by some families (Table 2.3). Some of the villages, especially in the hilly areas of the district, do not rear goats for the fear of overgrazing in the *jhum* areas.

Table 2.3: Livestock Population in the District

Type	Number
Cattle	203,580
Buffalos	15,286
Goats	48,802
Sheep	2,616
Pigs	53,478

Source: Planning Organization 1995

State Agricultural Department and Marketing Board : The agriculture and horticulture departments have their district headquarters at Tura and are headed by a District Agriculture Officer. At the state level, the headquarters of these departments is

at Shillong, the state capital. The organizational structure (Figure 2.1) is as follows.

The Departments of Agriculture and Horticulture : The emphasis of the Department of Agriculture in the last few years has been on encouraging agriculture and on increasing productivity of food grains to achieve self-reliance in them. To this end, the department has been promoting the adoption of double and multiple cropping systems, better farming practices, and irrigation facilities. Efforts to use high-yielding varieties and to cater to the need for quality planting materials of fruit and plantation crops have also been made. The department has a tea nursery at Rongram and three horticultural nurseries at Rongram, Damalgre, and Zikzak. The use of pesticides is not common in the area, although loss of crops due to disease is common. The department has been distributing pesticides and educating the farmers about various techniques for preventing and controlling crop diseases.

The department has made significant progress in encouraging fruit and plantation crops. Efforts are being made by them to tackle some of the problems persisting in the fruit industry. Some of the main areas identified for future action are:

- extension of areas under fruit trees and plantation crops as per the agro-climatic zones,
- supply of genuine and quality planting materials,
- optimisation of production per unit area through rejuvenation of orchards,
- strengthening of transfer of orchard-management technology,
- availability of credit at lower rates of interest for fruit and plantation crops because of perishability, and

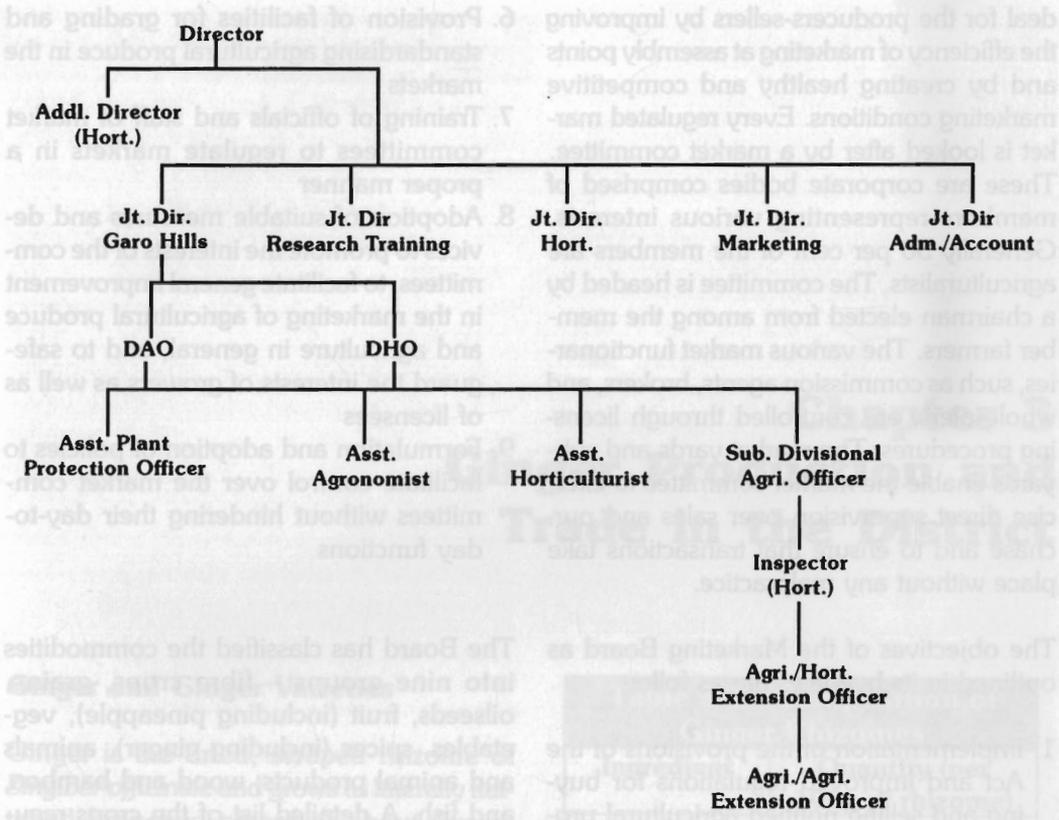


Figure 2.1: Organizational Structure of Agriculture and Horticulture

- creation of large fruit growing belts with the provision of necessary facilities such as cold storage, preservation, processing, and marketing.

Marketing Board : At present, the market for the agricultural output in West Garo Hills is unregulated for the most part. The Market Regulation Act 1980 was enacted in Meghalaya to establish an efficient agricultural marketing system and ensure good prices for growers. This Act delineates:

- an area under the authority and responsibility of each regulated market,
- commodities that come under regulation, and

- the constitution of a Market Committee to implement the provisions of the Act.

A marketing board was established in 1983, with headquarters in Shillong. It started functioning in 1983 with a skeleton staff and expansion activities include the establishment of the first secondary regulated market at Garobadha (CAM 1993).

The main function of the Marketing Board is to establish secondary regulated markets and primary market yards in different areas. A regulated market is an institution that provides for better regulation of sales and purchase of agricultural produce, in order to protect the interests of and ensure a fair

deal for the producers-sellers by improving the efficiency of marketing at assembly points and by creating healthy and competitive marketing conditions. Every regulated market is looked after by a market committee. These are corporate bodies comprised of members representing various interests. Generally 50 per cent of the members are agriculturalists. The committee is headed by a chairman elected from among the member farmers. The various market functionaries, such as commission agents, brokers, and wholesalers, are controlled through licensing procedures. The market yards and sub-yards enable the market committee to exercise direct supervision over sales and purchase and to ensure that transactions take place without any malpractice.

The objectives of the Marketing Board as outlined in its bye-laws are as follow.

1. Implementation of the provisions of the Act and improved regulations for buying and selling notified agricultural produce in the state
2. Provision of infrastructural facilities in each new, regulated market with amenities such as godowns, auction platforms, traders' shops, retailers' shops, rest houses for farmers, banks, post offices, and jute baling presses, etc
3. General improvement in marketing efficiency by promoting discipline among the trading community and other market functionaries by introducing the licensing system into market yards
4. Provision of grants and loans for the financially weak market committees to enable them to discharge their functions and duties effectively
5. Propaganda and publicity on matters pertaining to regulated marketing of agricultural produce in the state

6. Provision of facilities for grading and standardising agricultural produce in the markets
7. Training of officials and staff of market committees to regulate markets in a proper manner
8. Adoption of suitable measures and devices to promote the interests of the committees, to facilitate general improvement in the marketing of agricultural produce and agriculture in general, and to safeguard the interests of growers as well as of licensees
9. Formulation and adoption of policies to facilitate control over the market committees without hindering their day-to-day functions

The Board has classified the commodities into nine groups – fibre crops, grains, oilseeds, fruit (including pineapple), vegetables, spices (including ginger), animals and animal products, wood and bamboo, and fish. A detailed list of the crops regulated is given in Annex 2.

In the West Garo Hills, the regulated market yard proposed for Garobadha will be equipped with godowns, trader rooms, and cold storage facilities. The farmers will be able to bring their farm produce, have it weighed or measured with standard weighing equipment, and sell it through open auction to get the best rates available. The provision of storage, both seasonal and on a day-to-day basis, would allow farmers to leave the produce when prices are low on a particular day because of excess supply in the market. Their susceptibility to the fluctuations in daily prices would be reduced considerably as a result of this facility and ensure a minimum support price for farmers.

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: CFTRI1989

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,

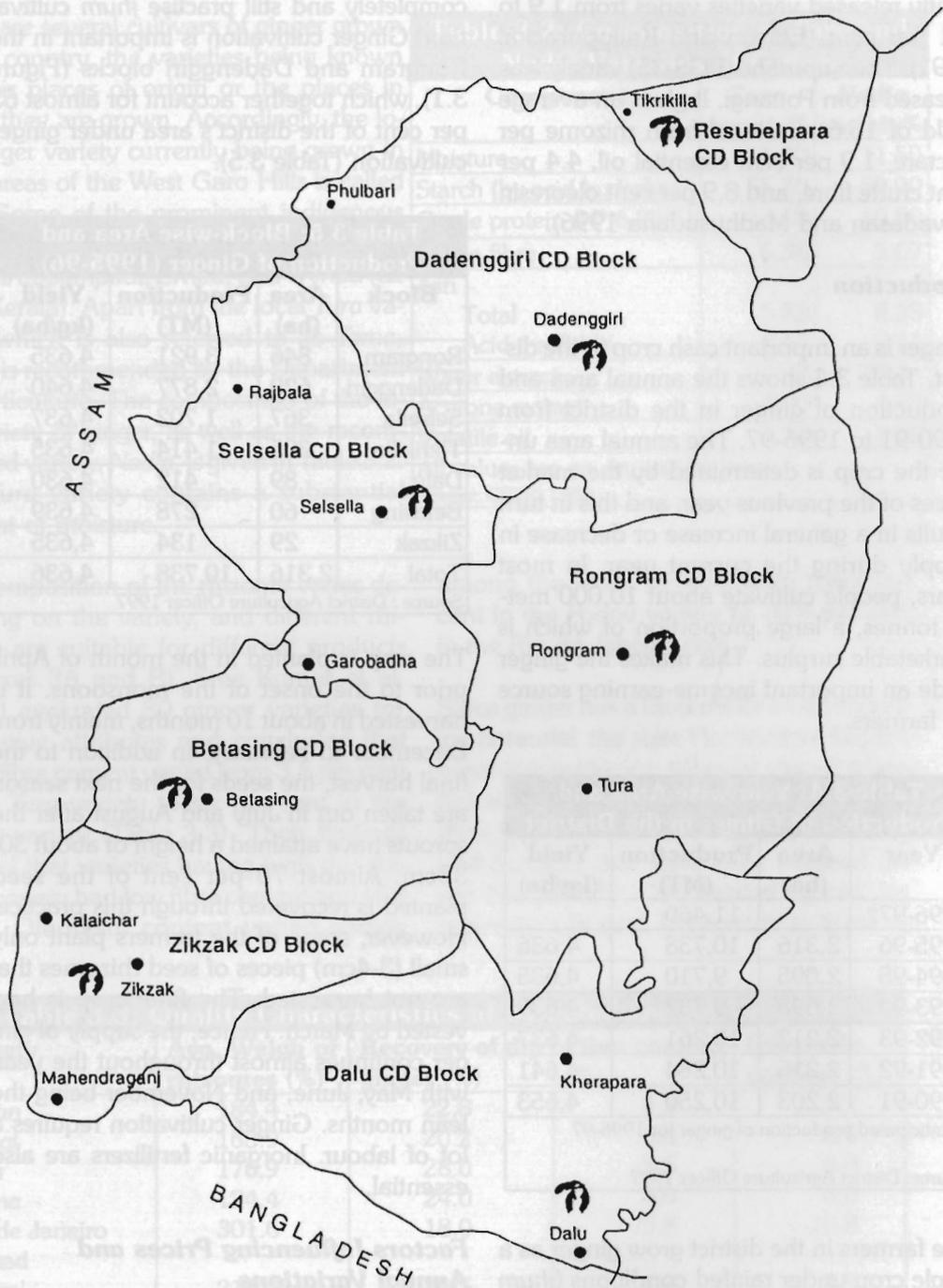


Figure 3.1: Location of Major Ginger-producing Areas in West Garo Hills

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

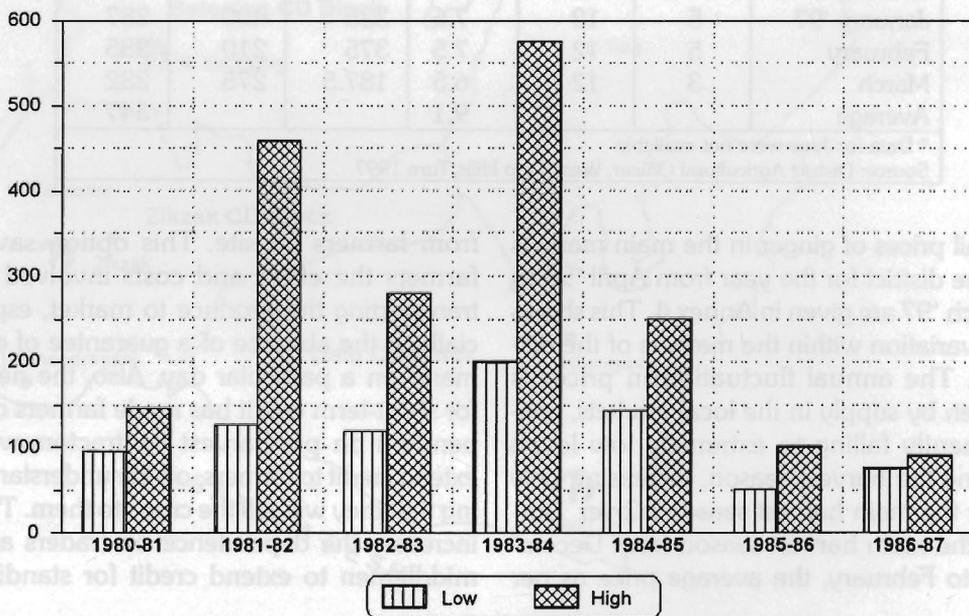


Figure 3.2: Trends in Wholesale Prices (Rs) of Ginger

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.

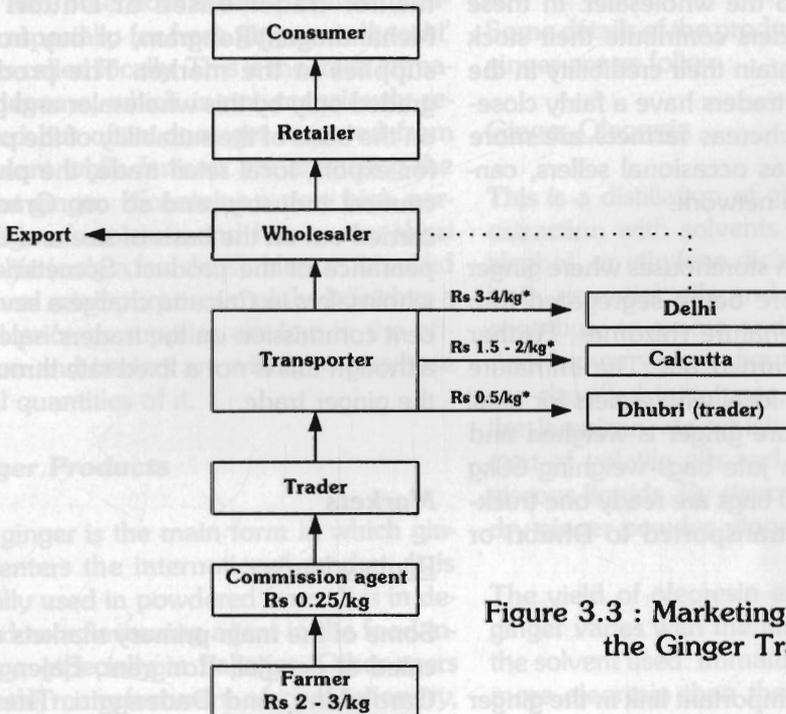


Figure 3.3 : Marketing Channel for the Ginger Trade

* 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

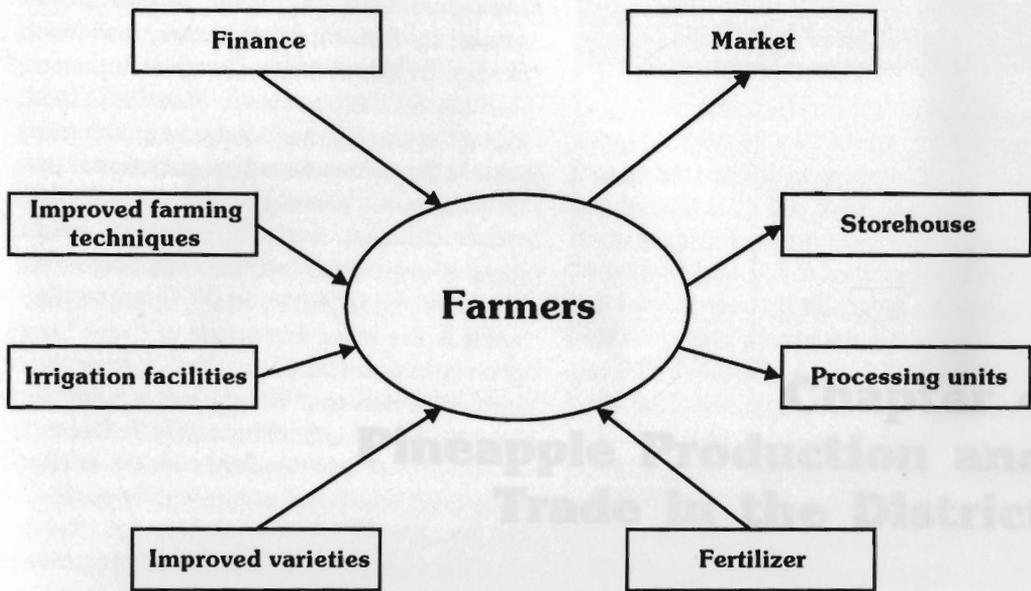


Figure 3.4: Forward and Backward Linkages in the Ginger Trade

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.

Chapter 4

Pineapple Production and Trade in the District

Pineapple and Pineapple Varieties

Ananas comosus, or pineapple, is one of the most important fruit crops in India. It is a perennial herb, measuring 90-100cm in height. It has two types of root; one occurring around the stem in a hemispherical mass with some arising from the axils and others consisting of slender roots that penetrate the soil up to 1.2m. The stems are thick, stout, and hidden by leaves that may be 20-50cm high and 7-11cm thick. The flowers are fleshy, the sorosis cylindrical or sometimes tapering, formed by an aggregate of fruits, called eyes. The fruit normally weighs between one to 2.5kg, with the weight rarely going up to 10kg. The shell is usually dark green when unripe and dark orange-yellow when ripe. The fruits are sometimes seedless.

The fresh fruit is a good source of Vitamins A and B and is rich in Vitamin C. It also contains some minerals, such as iron and phosphorus, and has low sugar and fat con-

tents. Analysis of the fruit (edible portion, 60%) gave the following values. Apart from other minerals, the fruit contains magnesium, 20.0; sodium, 34.7; potassium, 37.0; copper, 0.36; sulphur, 20.0; and chlorine, 13.0mg/100g (Table 4.1). The fruit also contains p-coumaric, caffeic, ferulic, and sinapic acids and several amino acids (Wealth of India 1948). The flesh of the fruit is pale yellow to yellow and varies according to the climatic and edaphic factors. The summer-ripened fruits have more yellow pigment and higher translucence than winter-ripened ones: these fruits exhibit marked chemical differences. The acids and sugars vary according to the cultivar, but the general range of acids is from 0.5 to 0.9 per cent by acid titration, and the range of sugars is from 12° to 16° brix. The ripe fruit is acidic and sweet, the lower half being the sweetest.

The ripe fruit is eaten fresh, made into preserves, or is canned. It is used in curries and meat dishes. Several conserves, pre-

Table 4.1: Composition of Pineapple Fruit

Moisture	87.8
Protein	0.4
Fat	0.1
Fibre	0.5
Carbohydrates	10.8
Minerals	0.4g/100g
Calcium	20.0
Phosphorus (Phytin P, 2)	9.0
Iron	1.2
Thiamine	0.2
Riboflavin	0.12
Niacin	0.1
Vitamin C	39.0
Oxalic acid	5.0 mg/100g
Carotene	18/g
Cal value	46 cal/100g

erves, jams, etc can be made from pineapples. Cocktails, punches, juice, and salads are also prepared from this fruit. Grated or crushed, it is used for making pies, ice creams, and cakes. It is an ingredient in several recipes. The core is made into candies.

Native to tropical America, the pineapple was introduced into India in 1548 on the East Coast, but spread to many other areas of the country. It is grown as a purely rainfed crop from the plains up to about 1,000masl. Although it thrives in littoral and inundated areas, it grows on other soils as well.

Varieties of pineapple are grown in India. Diversity in cultivars permits the species to grow in a wide range of climatic and edaphic conditions. These cultivars are grown from sea level to 1,525m and from the semi-arid regions, with 51cm of rainfall per annum, to the tropical and rain forest regions, with 554cm of rainfall per annum.

Some important varieties grown in the country include Giant Kew, Queen Kew,

Mauritius, and Jaldhoop, which are all grown in Assam, Meghalaya, and West Bengal. In Maharashtra, Tamil Nadu, Kerala and Karnataka, however, Mauritius, Desi, Giant Kew, and local Coorg are grown more widely. Since vegetative propagation is preferred, the cultivars are fairly stable and rather definitely marked. The cultivars are generally grouped into three categories: (i) Cayenne, (ii) Queen, and (iii) Spanish. Cayenne is the most important of these three groups; the cultivar, Smooth Cayenne, also known as Kew and Giant Kew, is cultivated extensively (Wealth of India 1948). Recently a cultivar which produces many suckers and fruits has been isolated in Tripura.

In Meghalaya, Kew, Queen, and Mauritius are cultivated on a commercial scale, though in the West Garo Hills, Giant Kew is the most popular cultivar. Commercial cultivation in the district commenced in the mid-forties. Farmers obtain suckers for plantation from the district departments of agriculture/horticulture; the suckers bear fruit for two years. No fertilizers are applied to the plantations, but suckers are periodically thinned to yield a large number of fruits.

The National Horticultural Board in the Ministry of Agriculture has specific programmes for the development of this fruit. In order to produce good quality fruit and improve its yield, good quality seeds with heavy manuring, sufficient water, and good shade are required. The farmers in India often pick the fruits that are under-ripe, less sweet, and lack colour and flavour. This is because ripe fruits have a poor shelf life under ambient storage conditions.

Production

In Meghalaya, pineapple is grown mostly in the Garo and Khasi hills. Table 4.2 shows

the area and production of pineapples in the West Garo Hills. In the district, pineapples are intercropped with areca nuts on the hill slopes. The pineapple growing areas are concentrated in the northern part of the district, with maximum production of pineapples coming from Dadenggiri and Tikrikilla blocks (Figure 4.1). The block-wise area and production of pineapples in the district for 1995-96 are given in Table 4.3.

Under favourable climatic conditions, the quality of the fruit is excellent, the main problem being marketing, since 80 per cent of the total crop becomes ready for harvesting within a small period of time between July and September. The second harvest from December to January usually results in low yields.

Prices and Annual Variations

Pineapples are marketed as both fresh and processed fruits – fresh for direct consumption, canned as garnishing for ingredients in a variety of dishes, and processed as juice or squashes. In the West Garo Hills, however, the trade is confined to buying/selling fresh fruit only. It is estimated (based on primary survey) that two hundred and a half thousand pieces enter the local market daily from June to August in the Chibinang area of Dadenggiri block. The system of grading the fruit, based on recognised grade standards, is virtually non-existent in the district and in the state. The farmer rarely grades the produce. At most, the fruits are sorted into batches according to size. Table 4.4 summarises the retail and wholesale

Table 4.2: Year-wise Area and Production of Pineapple in West Garo Hills

Year	Area (ha)	Production (MT)	Yield (kg/ha)
1996-97*	na	16,780*	na
1995-96	1,895	15,260	8,053
1994-95	1,885	15,180	8,053
1993-94	1,883	15,170	8,056
1992-93	3,018	17,158	5,685
1991-92	3,015	17,101	5,672
1990-91	3,009	17,067	5,672

* Forecasted figures for pineapple production anticipated for 1996-97.

Source: District Agricultural Office, West Garo Hills, Tura, 1997.

Table 4.3: Block-wise Area and Production of Pineapple (1995-96)

Block	Area (ha)	Production (MT)	Yield (kg/ha)
Dadenggiri	356	2,866	8,052
Tikrikilla	302	2,432	8,054
Rongram	290	2,336	8,055
Dalu	271	2,182	8,054
Selsella	267	2,149	8,050
Betasing	219	1,764	8,055
Zikzak	190	1,531	8,056
Total	1,895	15,260	8,053

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

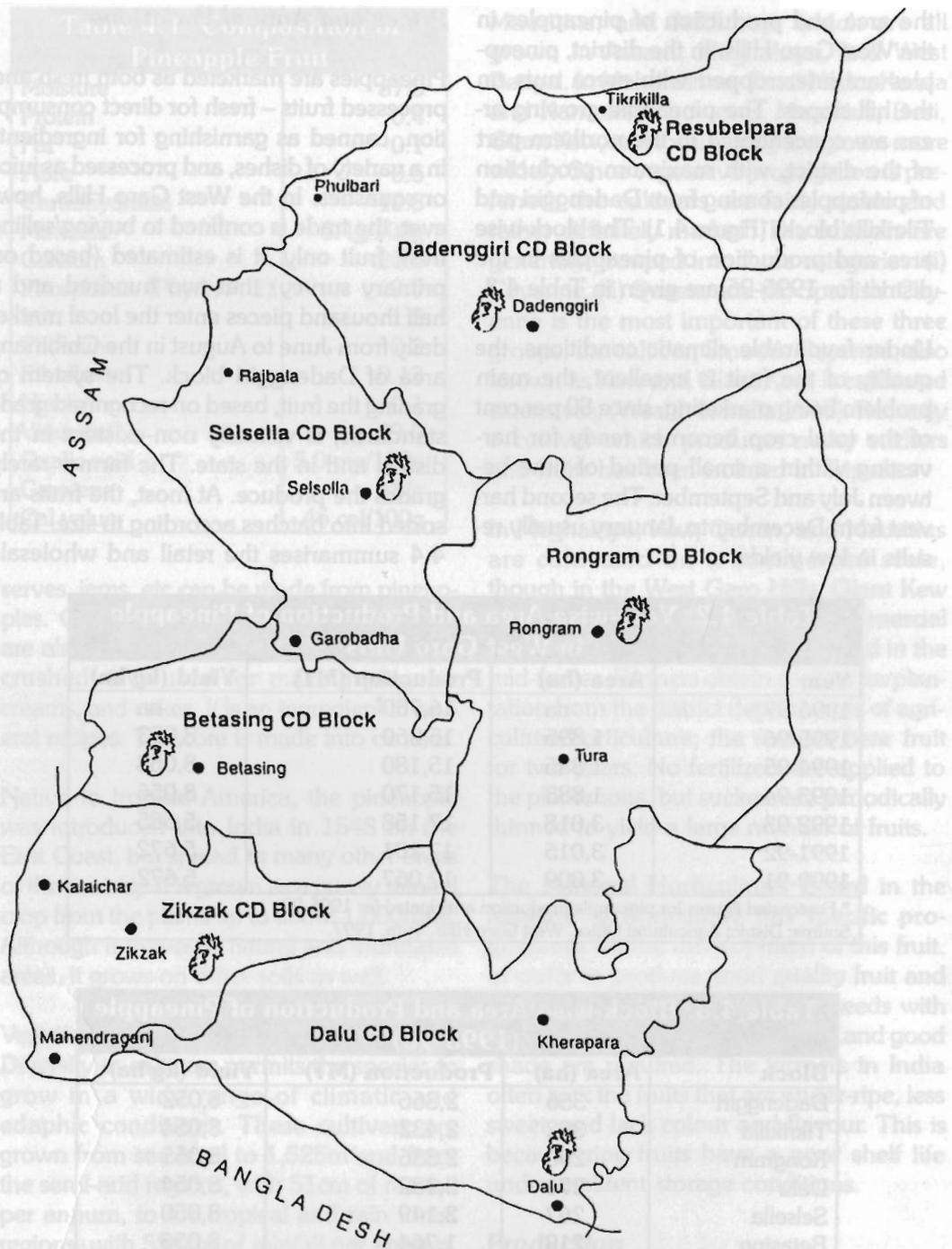


Figure 4.1: Location of the Main Pineapple Producing Areas in the West Garo Hills

prices during 1997, showing monthly variations.

The aforementioned prices are those prevailing in the various markets on respective market days. Hence, this does not include the price of the fruit not entering the

result, there is increasing dependence on traders and middlemen for credit on standing crops, thereby reducing the returns from the harvest. In addition, unsold stock often accumulates, causing loss through rotting and a fall in prices below the costs of production.

Table 4.4 : Month-wise Retail and Wholesale Prices for Pineapple (1997)

Month	Retail Price (Rs/piece)			Wholesale Price (Rs/100 piece)		
	Low	High	Avg	Low	High	Avg
March '97	2	8	4	na	na	na
June '97	2	4	3.2	150	200	na
July '97	1.5	5	3.3	-	-	-
August '97	2	4.5	3	150	250	170
October '97	1.5	5	Na	-	-	-

Source: Office of the Assistant Agricultural Marketing Officer, West Garo Hills, Tura, 1997.

market at all. The proportion of pineapples sold directly to pre-harvest contractors and village merchants is substantial, as the transportation of raw fruits to market is a problem because of poor communication links between the villages and the market. For local farmers, selling to pre-harvest contractors also helps to reduce the risks. During the harvest season from July to September, the average wholesale price as per the estimates of the Department of Agriculture was about two rupees per pineapple in 1997. However, according to local farmers, the price fell as low as one rupee per pineapple. The discrepancy in the prices quoted by the Department and the farmers is because much of the produce is sold directly to middlemen and does not enter the market at all. Uncertainty in prevailing prices has made the farmers dependent on the pre-harvest contractors. These contractors extend credit to farmers on the understanding that the farmers will sell the mature crops to them. Moreover, the traders also take care of the transportation of fruit from the farms to the final destination. As a

Most farmers claimed that there had been a fall in profits, making pineapple growing uneconomical. In a study by Saikia and Borah (1984) on the production and marketing of pineapples in Meghalaya (a study in the East Khasi Hills), it was found that pineapple cultivation was not profitable mainly because of the low price the crop fetched. The area cultivated with pineapples is limited. There is a wide gap between farmers' prices and selling prices, with a high profit margin being enjoyed by market functionaries. The approximate purchases (percentage share) by different groups involved in the trading of pineapples are as follow: itinerant merchant, 50 per cent; direct consumer, 15 per cent; wholesalers, 10 per cent; processing units, 10 per cent.

There are no cooperative societies for growers in the district, or even in the state. 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 mar-

kets. As in the case of ginger, once the Market Regulation Act becomes effective, with the operationalisation of market yards and sub-yards, the farmers should be able to obtain a basic support price.

Marketing Channels

There are different types of functionaries operating in the pineapple trade, as is the case for ginger. In addition, however, the roles of pre-harvest contractors and village merchants are important in the pineapple trade. These are detailed below.

Pre-harvest Contractors

Pre-harvest contractors offer a price for a garden or a plot when it is at the flowering stage or when it bears fruit. They bear all the risks involved once the bargain is struck. It is a big gamble for pre-harvest contractors because the chances of making a profit or heavy loss are equal. Farmers do not have to bear any risks and they get the amount agreed upon. This type of sale can be observed also for mangoes, apples, citrus fruit, and bananas as well, especially when a contractor anticipates a favourable market for a particular type of crop. Correspondingly, the farmer is assured of a fixed return irrespective of the price fluctuation in the market.

Village Merchants

This class of merchants plays a vital role in procuring fruits and vegetables on site. Based mostly in rural areas, these merchants purchase pineapples on site and transport them to a nearby city or town for sale. The price paid to the farmer depends on the up-country market. The merchant advances money to the grower depending on factors such as the nature of the crop,

economic conditions of the producer, and so on. This class of merchants purchases about 40-50 per cent of the pineapples from the villages. They play an important role, since most of the growers cannot go to market daily with small quantities of produce, or arrange for transport at affordable rates. Hence, it is often more economical for an individual farmer to sell the fruits to a village merchant. These village merchants generally do not give an unfair deal to the farmers as the product is sold only in the local markets and the prevailing prices are known to farmers.

Apart from these, there are commission agents, traders, wholesalers, and retailers, as in the ginger trade. The trade channels are shown in Figure 4.2.

Pineapple Products and Processing of Pineapples in the District

Apart from being consumed as fresh fruit, there are several pineapple products that are extremely popular in the domestic as well as in the international market. Some of the products are briefly described below.

The main products are preserved slices, rings, tidbits of pineapple, and oranges. Litchi jam and *amla* (the fruit of *Emblica officinalis*) pickle are also produced. In addition, fruit squashes from these fruits are produced by the unit. The production of pineapple products in 1995-96 was about 30 MT, in 1996-97, however, it fell to only 25 MT. Approximately 1,20,000 pineapples were used as raw material. Products from pineapple waste, such as vinegar from the peels, were tried but these could not compete with synthetic vinegar. The average unit cost for products from the pineapple is about Rs 26.

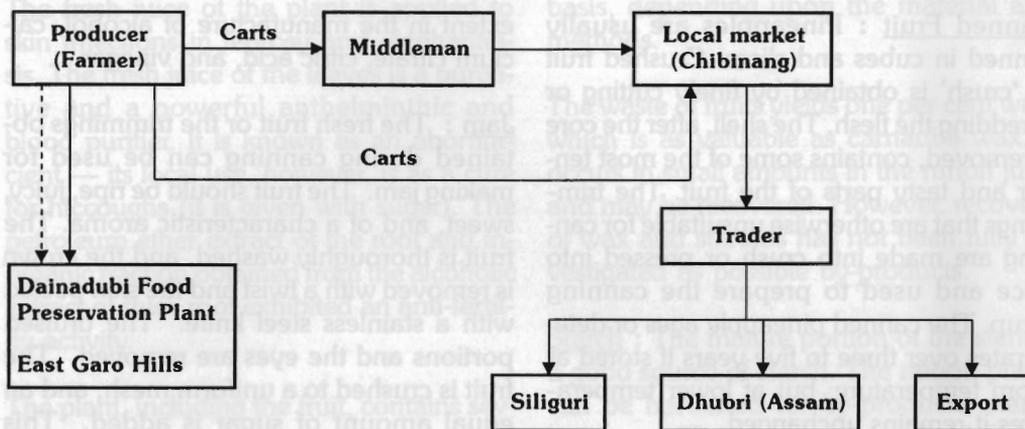


Figure 4.2: Marketing Channels for Pineapples

The main unit for processing pineapple in the area is the Food Preservation Plant at Dainadubi, in East Garo Hills, located almost on the border of the West Garo Hills. A list of other processing units in the state is given in Annex 5. The experiences of the plant in processing pineapple and selling the finished products are mixed. While there is a potential for the products in external markets, the consumption within the district or the state is limited.

Food Processing Unit, Dainadubi

This unit was established in 1965, mainly as a demonstration project. The installation cost was about Rs 1,500,000. The installed capacity of 40 MT has not been expanded since establishment of the plant. It is maintained and operated by the state's Department of Agriculture. The unit has been operating below its installed capacity. This is mainly because of the lack of demand for preserved fruit products. The main causes, apart from the shortcomings in marketing efforts, can be attributed to the cultural profiles and the preference of the people for fresh fruits rather than preserved fruit. Also, the quality asso-

ciated with the product is extremely important and the totally mechanised units have definite advantages over products that are prepared by manual processes. Some of the details regarding the operation of the plant are given below.

Raw Materials : The unit procures the raw materials from the farmers by offering them a basic support price for the fruit. The average price offered at the plant gate (landing price) was Rs 185 for 100 pineapples in 1997. In some cases the factory provides transport facilities with rental charges that include the cost of petrol otherwise borne by to farmer.

Marketing : The unit operates on the basis of orders received from NEREMAC (North Eastern Regional Marketing Corporation Ltd) or a few other outlets at Guwahati. Direct marketing is usually not undertaken. The tins or bottles for preservation are also supplied by the agencies that place the orders. The cost of the packaging tins is the main cost, amounting to Rs10.5/tin. The main problem in the area is marketing the products, especially since NEREMAC itself receives limited orders.

Canned Fruit : Pineapples are usually canned in cubes and slices. Crushed fruit or 'crush' is obtained by finely cutting or shredding the flesh. The shell, after the core is removed, contains some of the most tender and tasty parts of the fruit. The trimmings that are otherwise unsuitable for canning are made into crush or pressed into juice and used to prepare the canning syrup. The canned pineapple ages or deteriorates over three to five years if stored at room temperature; but at lower temperatures it remains unchanged.

Frozen Fruit : To prepare the frozen fruit, the best quality pineapples are selected and the most tender and tasty parts are used. The tender parts are cut into pieces, packed in cellophane bags, filled with syrup, and closed. They are quick-frozen, but not sterilised. They can be used for garnishing.

Juice, Sugar and Syrup : The juice is extracted from the fruit and sweetened. The cut pieces or trimmings recovered from the canning industry are also used. For canning, the juice is boiled at 82-85°C, poured hot into the cans, and sealed immediately. The cans are then boiled in water at 80-82° for 25 minutes. Potassium metabisulphite is added as a preservative. The canned juice contains Vitamin C (5.9-10.6%).

The juice that accumulates during canning and crushing can be converted into sugar and packing syrup. The juice from one tonne of 'Cayenne' pineapple contains 16-20kg of sugar. The juice and the stem are a source of commercial-grade alcohol and the former of an alcoholic beverage also. The juice of ripe fruits possesses antiscorbutic, diuretic, and refrigeration properties. It allays gastric irritability in fever and improves the appetite by helping the body absorb proteins. Pineapple juice is used to a great

extent in the manufacture of alcohol, calcium citrate, citric acid, and vinegar.

Jam : The fresh fruit or the trimmings obtained during canning can be used for making jam. The fruit should be ripe, juicy, sweet, and of a characteristic aroma. The fruit is thoroughly washed, and the crown is removed with a twist and the skin peeled with a stainless steel knife. The bruised portions and the eyes are removed. The fruit is crushed to a uniform mesh, and an equal amount of sugar is added. This mixture is allowed to settle until the sugar dissolves, and later it is cooked until it thickens sufficiently. The hot jam is bottled in sterilized jars or cans, sealed, and allowed to cool.

Feed : The residue of the pineapple plant and the fruit are sources of cattle feed. Some of these products, such as bran, are well established; others, such as crown-feed, whole-plant meal, stem-meal, and extracted stem-meal can be developed. The dried waste, consisting of pressed peels and core (56-60% of fruit), is known as bran and in Hawaii it is commonly used as a feed for livestock. The peels, core, etc, after the extraction of juice, are chopped into fine pieces and dried in steam-heated evaporators and sterilized; the moisture is brought down to 12 per cent. Addition of lime (0.21%) helps it to dry quickly. Cattle fed on bran increase their milk yields. Besides Vitamins A and B, the bran contains moisture - 10.0 per cent; starch and sugars - 54.0 per cent; protein - 3.5 per cent; and fibre - 18.0 per cent.

Wine and Medicine : The pineapple waste can also be used for making wine. The pulp can be converted into a sweet-smelling and tasty ensilage after 48 hours of fermentation.

The fresh juice of the plant is applied to skin infections in leprosy and elephantiasis. The fresh juice of the leaves is a purgative and a powerful anthelmintic and blood purifier. It is known as an abortifacient — its local use, however, is as a cure for hiccoughs (it is given with sugar). The petroleum ether extract of the root and inorganic fraction obtained from the alcoholic extract of thick root exhibited an anti-fertility activity.

The plant, including the fruit, contains several enzymes, the main one being the proteolytic enzyme, commonly known as bromelain, and is extracted from the stems for use commercially. Bromelain can be used to tenderise meat as a chill-proofing reagent for beer, as a food additive, and bating reagent for hides. In addition, it has been employed in the paint industry to improve the stability of protein emulsifiers used in latex paints. It is useful for determining antibody substances, dissolving necrogenic tissues, and treating digestive troubles; when applied as an antiphlogistic it shows less after-effects. The fruit-bromelain mixture is active in hydrolysing protein, such as egg albumen, casein or haemoglobin, over a pH of 5.5-8.5. It aids digestion.

Citric, malic, ascorbic, and oxalic acids can be obtained as by-products from the pineapple fruit and the plant. Of these, the extraction and purification of citric acid are the easiest. The runoff juice contains 0.6-1.2 per cent of citric acid. Part of the acid can be removed before converting the juice into packing syrup. Oxalic acid can be produced from the waste of fruits. In the Assam and Meghalaya areas alone more than 10,000 tonnes of waste from the fruit are available. The recovery of oxalic acid varies from 22 - 80 per cent on a dry matter

basis, depending upon the material and methods.

The waste of fruits yields one per cent wax, which is as valuable as carnauba wax. It occurs in small amounts in the runoff juice and may be recovered. However, recovery of wax and steroids has not been fully investigated as possible by-products.

Starch : The mature portion of the stem is a good source of starch. The ratoon plants can be harvested for by-products, starch being one. The percentages of starch found on a fresh weight basis are 10-15 in stems and three in leaves. The starch contains amylose (36%). The physical characteristics of the starch resemble those of starch from rice more than from corn, potatoes, or any other common starch. The gel made from this starch is remarkably clear and transparent, but retrogrades. The purified starch may be used as edible or industrial starch and the impure portion as a feed for cattle, chicken, or hogs. The hydrolysed starch can be used as a source of sugar for sweetening or as a medium for growing yeast or mould.

Fibre : The leaves yield a valuable fibre. Care is required in selecting leaves for fibre. The fibre can be extracted, either by decortication of the raw leaf or by retting, or by a combination of water-retting and scraping. Decortication of the raw leaf is done by scraping and stripping with a blunt knife to remove the pulp, and the fibre is cleaned in water and dried. In the retting process, the leaves are kept under water for about 18 days, after which they are thoroughly washed to remove the decomposed pulp and other matter. The extracted fibres are hung to dry or spread in the shade for draining. Sun drying lowers the tensile strength of the fibre but bleaches it; bleach-

ing, however, destroys the adhesion that facilitates spinning.

The main fibre-producing countries are the Philippines and Taiwan. In India, although it has been estimated that at least 3,000 tonnes of fibre can be produced annually, only small quantities are available. The leaves from the plant grown from the fruit in the tropical sun are not suitable for fibre because they are narrow and contain thick cuticles, making extraction of fibre difficult; plants grown in the shade are more suitable. In the Philippines and Taiwan, the crop is also grown exclusively for fibre. These plants are grown in the shade and the fruit buds are removed. When the leaves are in their prime, they are picked and processed. In India, the South India Textile Research Association (SITRA) has developed a technology and process for manufacturing pineapple fibre. The production of pineapple fibre on a commercial scale, however, has not yet begun in India (SITRA 1993).

The fibre can be used for making sacks, curtains, matting, carpet backing, and ropes. Several artistic and utility textiles such as furnishing fabrics, tablemats, bags, etc can be made. Twines and threads can be made out of the fibre. The cloth can be manufactured in fine colours and strong textures (as fine as silk cloth with the finest count), varying from coarse to fine. Paper can be manufactured from this fibre. It is remarkably thin, smooth, pliable, and as supple as cloth; it may be wrinkled and then smoothed without any damage, but has no tear-resistance — but this can be rectified by adding proper resin. The waste from the preparation of fibre can be used for making paper. In the Philippines, a very delicate and very costly fabric, called *pina*, is made from fibres extracted from pineapple

leaves. This cloth is noted for its sheerness, beauty, and relative strength.

Potentials for Micro-Enterprises

The pineapples grown in the study area find a ready market for consumption as fresh fruit. In fact, most people said they would rather have fresh fruit than processed products; apart from the fact that processed fruit was more expensive than fresh. Hence, there is hardly any local demand for processed pineapple products.

In assessing the processing of pineapples into various products for national markets or export, it was found that the initial investment for any pineapple-processing unit is substantial. This could certainly not be undertaken at the household or community level, but would require an experienced entrepreneur. The requirements for trade involve strict quality control for both products and processes, and, hence, this could not be implemented on a small scale. Also, there could not be more than one or two such enterprises in the same area, as there may not be sufficient fresh fruit available. Hence, pineapple was found to be unsuitable for development of micro-enterprises in the area.

The possibility for partial processing of pineapples to supply the existing fruit processing units with semi-processed raw materials was explored. In this respect, it was found that pineapple products had an extremely short shelf life and would spoil before they could be transported to the processing plants. Hence, this option was ruled out.

Market interventions, such as price regulation, fair competition, and storage facilities,

would be applicable to the pineapple trade as well. Another important requirement for farmers is the availability of short-term

credit against growing stock or products stocked in market yards. These are detailed in the following Chapter.

new value-added products. These options and the objectives that would be served by each of them are presented in Figure 5.1.

Markets

The need for an efficient market cannot be over-emphasised as this option is the only alternative available to the farmer to generate immediate income. This could be in the form of interventions in present market mechanisms, with emphasis on improvement in the marketing channel, a reduction in the number of intermediaries, provision of better information flow in the



Figure 5.1: Forward Linkages and Their Objectives

markets, and/or provision of regulatory mechanisms to ensure fair minimum prices for farmers.

Chapter 5

Micro-Enterprise Potential

Objectives of Micro-Enterprise Development

In the context of ginger and pineapple crops, the basic aim of any development initiative is to increase the returns to farmers from farm activities. Such interventions can be described as changes in the present market, new facilities, e.g., for storage, or new value-added products. These options and the objectives that would be served by each of them are presented in Figure 5.1.

Markets

The need for an efficient market cannot be over-emphasised as this option is the only alternative available to the farmer to generate immediate income. This could be in the form of interventions in present market mechanisms, with emphasis on improvement in the marketing channel, a reduction in the number of intermediaries, provision of better information flow in the

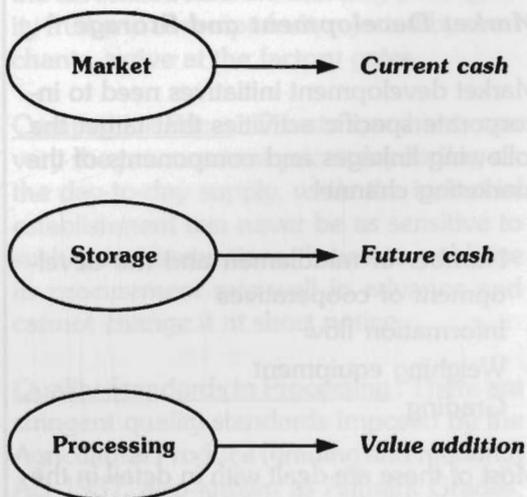


Figure 5.1: Forward Linkages and Their Objectives

markets, and/or provision of regulatory mechanisms to ensure fair, minimum prices for farmers.

Storage

The second intervention is the provision of storage facilities, especially for perishable crops and also for ginger, as this would help to reduce price fluctuations and arrest the fall in prices during harvest time. In addition, it would help to improve cash flow to farmers, thereby helping them reduce dependence on expensive short-term credit advanced to them by the pre-harvest agents.

Processing

The third type of intervention is the establishment of processing units that would help to add value to the crop and increase in returns for the farmer. These options are analysed in detail in the following sections.

Market Development and Storage

Market development initiatives need to incorporate specific activities that target the following linkages and components of the marketing channel.

- Number of middlemen and the development of cooperatives
- Information flow
- Weighing equipment
- Grading

Most of these are dealt with in detail in the proposed Market Act of Meghalaya (Box 5.1) and, hence, are not detailed here. There are specific provisions planned for integrating these 'backward linkages' in the development of agriculture in the area.

For storage facilities, the Department has plans to provide for cold storage and also have storehouses where farmers can leave

Box 5.1 Functioning of a Typical Regulated Market

In a typical regulated market, the commodity that is brought in by a farmer is numbered (lot no) and weighed by an authorised person and the weight is recorded. The lot is then arranged on the auction platform. A quality grader inspects the lot and a grade is assigned. The lot number, grade, etc are then flagged on the lot. Sales take place at a prescribed time by open auction or by closed tender system. Only licensed traders are allowed to participate in the transaction. Where there is a closed tender system of sale, the market committee issues slips for offering quotations. On the slips the lot number, price offered, etc are noted down. Once all the lots that a trader proposes to buy are quoted, the slips are deposited in a box. At a prescribed time, the tenders are taken out and the sale is confirmed to the highest bidder, and a sale agreement is signed. The farmer is paid immediately, either by the Market Committee or by the Commission Agent after deducting the prescribed service charges. The buyer in turn pays the Market Committee/Commission Agent and takes delivery of the goods within the prescribed time.

Once the lot is weighed and recorded, the farmer is free to attend to other business. The produce he/she has brought is under the care and protection of the Market Committee/Commission Agent. If a farmer is not satisfied with the price offered by the highest bidder, he/she need not sell the produce. If there is any urgency for cash, the farmer may deposit the stock in the warehouse of the market committee and take a percentage of the value of goods so deposited. The farmer may dispose of the goods when it is convenient. Thus, a regulated market provides a forum for the farmer to have the farm produce graded and get a price commensurate with quality.

the products over night or for a few days until they get the prices they expect. This would ensure that farmers are not pressured to sell their crops on a particular day, even if the selling price is low on that day. This would be especially beneficial for marginal small farmers who are vulnerable to such price fluctuations. Another scheme proposed under the Marketing Board is for the provision of credit against the produce stored.

Processing Units

These could be developed at the household or the community level depending on the type of product being developed. This section discusses the options available for processing pineapple and ginger at the local level.

Pineapple Products

As discussed in previous chapters, processing pineapple products requires large investments in infrastructure and considerable management inputs in terms of labour management, operations, and quality management. Also, the plant presently operating at Dainadhubi faces a shortage of good quality fruit as there is competition from the merchants who offer either better prices or facilities, such as transport, credit, etc, that the processing unit is unable to match. Another problem faced by the plant is packaging of processed products, as the packaging containers have to be procured from other manufacturers, and this almost doubles the price of the final product. The packaging is extremely important as the product is targetted at the final consumers and, unless it is suitably packed, it may fail to find a market. Some of the problems identified related to the production and sale of processed fruit are as follow.

Investment : Initial investments are substantial and require financial support from banks or other institutions, generally against some collateral such as land ownership rights and so on.

Seasonality : The crops are seasonal with the result that the plant operates for only part of the year, unless it is involved in the production of other products as well.

Procurement of Good Quality Fruit : At the time when the fruit is harvested, the competition for good quality fruit is intense and, given the well-established network of middlemen and merchants, it is difficult for any industrial unit to compete in terms of having a procurement network of its own for quality raw material. At the same time, while these units can offer a basic support price, the associated risks are that only poor quality fruit and over-ripe fruit, rejected by merchants, arrive at the factory gates.

Competitive Prices : Private merchants can vary the procurement prices depending on the day-to-day supply, while the industrial establishment can never be as sensitive to such price fluctuations. It has to publicise its procurement rate well in advance and cannot change it at short notice.

Quality Standards in Processing : There are stringent quality standards imposed by the Agricultural Produce (grading and marking) Act 1937, also known as Agmark Grades, and the Indian Standards' Organization (ISO). Small units are unable to attain these standards, especially as they have no control over the raw material.

Packaging : Packaging of processed fruit products, as mentioned earlier, causes the units to be dependent on other manufacturers and increases their costs.

Brand and Marketing : Since the products are for direct consumption, the brand name and the advertising of the product become important. For small units this is obviously extremely difficult. While institutional establishments, especially hotels and restaurants, can be targetted by small-scale units, in the absence of a significant price advantage, most of the main hotels prefer to stock more popular and well-known brands.

Hence, most of the growers and the local government departments expressed the opinion that processing fruit had more pitfalls than profits and would not be very successful on a small scale. However, the pineapple leaf waste from the present fruit processing units could be used to make fibre, and this has a number of uses. Fibre extraction technology is in the experimental stage and is being developed in India. In one such initiative, undertaken by SITRA with financial support from UNDP (see Annex 6), fibre extraction machines have been developed and the fibre tested for several end products. However, since investment in the fibre extraction plant is substantial and the local availability of sufficient quantities of pineapple leaf restricted to the units where pineapple is processed into other products or is consumed in very large quantities, this enterprise is not possible at the household/community level.

Ginger Products

Compared to processed fruit products, the processing of spices multiplies their value, and they are easier to market as they have an established acceptability in both the domestic and international markets. Therefore, the ensuing sections evaluate the op-

tion of processing ginger into different products and the scales of operation.

Micro-Enterprise based on Products from Ginger

There are several forms in which ginger is consumed. These were detailed in Chapter 3. However, only some of these products could be tried out at the local level, depending on the variety of ginger grown and within the existing trade framework. Some ginger products⁶ could be based on drying ginger or processing it in to other forms of processed ginger, as is detailed below.

Ginger in Brine : Ginger rhizomes can be preserved for long periods before they are processed. The method consists of steeping unpeeled or peeled ginger in a solution containing salt, acetic acid (AA), and potassium metabisulphite (KMS).

The tender, preferably fibreless, large-sized rhizomes are collected and washed in cold water to remove the adhering dirt and mud. After peeling them, they are sorted according to quality and cut into pieces. A brine solution is prepared with 12 per cent salt and one per cent acetic acid. The strength can be reduced by using KMS (Table 5.1). The ginger is then steeped in this solution and stored in acid-alkali proof HDPE jars. Ginger in brine can be exported in the HDPE jars. This is an intermediary product and is used in preparation of ginger preserve/candy.

Ginger Preserve : The tender, fibreless and large rootless fingers are selected and washed with cold water. Their skins are

⁶ The descriptions of the following four processes in this section for the preservation of ginger are adapted from CFTRI (1989).

Table 5.1: Storage Life of Steeped Ginger

Treatment	pH of the Material	Storage Life (months)	Colour
0.1% KMS+ 2% acetic acid	3.84	2	Light yellow
2.0% salt+1.2% A.A. + 0.1% KMS	3.92	4	Light yellow
4.0% salt+1.2% A.A. + 0.1% KMS	4.10	6	Dull white
5.0% salt+1.0% A.A. + 0.1% KMS	3.90	9	Dull white
5.0% salt+1.2% A.A. + 0.1% KMS	3.86	12	Light yellow

Source: Central Food Technology Research Institute, Mysore 1989.

peeled and they are cut into pieces. The pieces are softened by (i) boiling in 0.5 per cent solution of citric acid (the solution being sufficient to cover the ginger) in a covered aluminum/stainless steel or heavy brass or copper vessel for a period of six hours or (ii) by cooking in 0.5 per cent solution of citric acid at 0.7kg per sq.cm. steam pressure for one hour. Citric acid is used to bleach or whiten the ginger during softening. The ginger is then removed and washed well with cold water. When sufficiently cooled, the softened pieces are pricked with stainless steel or wooden prickers. The pieces are washed again. The ginger is then ready for impregnation with sugar syrup.

A 30 brix syrup is prepared by dissolving three parts of sugar in seven parts of water. This syrup is boiled and filtered through a thick muslin cloth. About one kg of syrup is used for one kg of prepared ginger. The prepared ginger is boiled in the 30 brix syrup for 15 minutes and allowed to stand overnight, taking care that the ginger is completely covered by syrup. After about 24 hours the syrup is drained off and its concentration increased to about 45 brix by adding more sugar and heating the mixture. If necessary, the ginger is boiled with the syrup for 15-20 minutes and kept overnight again, ensuring that the ginger is fully covered by the syrup. This process is re-

peated daily, until the concentration of the syrup is about 60 brix. At this stage, a small quantity (about 0.1% of the total weight of the syrup) of citric acid or tartaric acid is added, or five per cent by weight of invert sugar or corn syrup. A process of absorption by increasing the strength of the syrup by five brix each day is carried out until it reaches 75 brix. The preserve is then ready to be packed.

Ginger Candy (glazed) : A prepared preserve is set aside for two to three months with thorough penetration of sugar into the ginger. It is then boiled for about five minutes. While still hot, the syrup is drained off and the pieces placed on a wooden tray and dried in the shade or at 50°C in a dryer until they are no longer sticky. The syrup left over after drying can be used for preparing more ginger preserve or used as a syrup for flavouring aerated water.

Crystallised Ginger : Crystallised ginger can be made from candied products by coating it with pure white crystallised sugar or by drying the syrup or wet candied fruits. The finished product is translucent and not hard or granular. It should be free from burnt or any objectionable flavours. The term crystallised refers to the sharp crystal coating on the ginger and not the consistency of the ginger pieces. Crystallised ginger thus consists of discrete pieces of gin-

ger in syrup which have been covered in a super-saturated sucrose solution, then coated with a dry slightly hygroscopic layer of crystalline sucrose.

Suitability of Various Species for Processing

The suitability of processing local ginger varieties was evaluated by the CFTRI, and the results are summarised below. The details of the experiment carried out are given in Annex 7. The two commercial varieties, viz., Tura and Nadia, obtained from the Meghalaya region were evaluated.

- The Tura variety was found to be fibrous even when harvested in October. The products made from Tura were not found to be satisfactory in quality.
- The Nadia variety, harvested at three maturity levels, viz., in October, November, and December, were studied for their suitability for processing. The October harvest was found to be less fibrous, soft and crisp in texture, mild in pungency, and had a desirable flavour. The quality of the products prepared from this were superior to those from ginger harvested in November or December and from the Tura variety harvested in October.

Dry Ginger

Dry ginger is the form in which most of the trade in ginger takes place. Additionally, in many states of the country, dry ginger is used for domestic cooking purposes. Fresh ginger has a short shelf life and, unless aired properly, it rots within a few days. Hence, for export and trade wherein the transportation requires a long time, it becomes imperative that ginger is dried to prevent spoilage. However, apart from the various trade reasons for drying spices, drying also helps

the farmer to reduce the loss of produce. Some of reasons for drying ginger and other spices as well are given below.

- It permits an early harvest. The ginger crop can be harvested from the sixth month onwards instead of waiting for ten. This reduces field losses from weather hazards, soft rot, and other diseases.
- Storage time can be increased without deterioration in quality and meets the desired level of moisture content for further processing.
- It ensures the quality in terms of finished product and nutrients.
- It helps farmers obtain higher returns and gives them the choice of time for sale.

Proper management and control of moisture in the product is the most important factor (besides aeration and change in temperature) for maintaining the quality of any spice product. Any delay in drying after harvesting results in rapid deterioration of the market quality of the product.

Ginger Drying Techniques

The common method of drying used for spice crops is open sun drying by spreading the freshly harvested material on the ground in a single thick layer. In Meghalaya, given the uncertain climatic conditions, especially during the ginger harvest months, drying time may vary between a minimum of eight to 10 days to many more. Alternatively, closed chambers can be used, where heated or unheated air (aeration) is passed through/over a thin layer of the product. This saves the crop from being exposed to unfavourable weather conditions and attacks from insects/micro-organisms and dirt, dust, and so on. It also takes less drying time. Proper selection of drying method/

equipment and drying parameters depend upon the end use of the product and the economics involved. In particular, a farmer may choose between solar dryers, gasifiers, or electricity-based drying units. These options are briefly described below.

Traditional Sun-drying : In the traditional practice, mature ginger rhizomes are harvested, the outer skin peeled, and then they are sun dried. It takes about eight to 10 days to sun dry them. On the other hand, if the rhizomes are not peeled and allowed to dry, it takes about 20 days (Natarajan et al. 1972). By peeling and blanching, the drying time decreases considerably but the yield of resin and volatiles is less than with the other treatments. The effects of pre-treatment of fresh ginger on drying time and quality are given in Table 5.2 (Krishnamurthy et al. 1997).

ing an electricity heating coil and a blower. However, part of the West Garo Hills does not have electricity and, in other places, the demand for electricity exceeds the supply. Hence, for this area, it could be more feasible to use other renewable and locally available resources for drying purposes.

Solar Dryers : Solar dryers can be used for drying spices such as ginger and are of two types – direct and indirect. The direct type of solar dryer, developed at Rajasthan Agricultural University (RAU), Udaipur, reduces the moisture content from 82 to 90 per cent in 30 hours (Figure 5.2). The indirect type of solar dryer takes 40 hours in comparison to the 45 to 60 hours using sun drying on a concrete and a mud floor, respectively. A cardamom dryer developed at CPCRI, Kasargod (Figure 5.3), could also be used to dry the ginger on a small scale;

Table 5.2: Effect of Pre-treatment of Fresh Ginger on Drying Time and Quality

Treatment	Drying Time ¹ (days)	Yield% (mfb) ²	Resin % (mfb)	Volatile Oil %(mfb)
Control	23	17.0	6.2	3.1
Hand-peeled	8	17.1	5.8	3.1
3 minute blanched	12	17.7	5.1	3.0
Peeled and 3-min. blanched	6	16.0	4.0	2.9

¹ Sun dried

² mfb - moisture free basis

Source: Central Food Technology Research Institute, Mysore 1989

Bleached ginger can also be prepared by dipping the peeled ginger in a solution of fresh slaked lime and then drying it in the sun. The process is repeated two to three times to arrive at a satisfactory product.

Electrical Dryers : Ginger can be dried by placing peeled ginger in a drying chamber over which hot air (60-80°C) is passed us-

60kg of peeled ginger would take about 22 hours to dry. The optimum temperature for drying ginger recommended is 60°C (Kachru and Gupta 1997).

However, for solar drying, a relationship/design criterion needs to be established for the drying process as a function of ambient conditions and solar radiation, and this

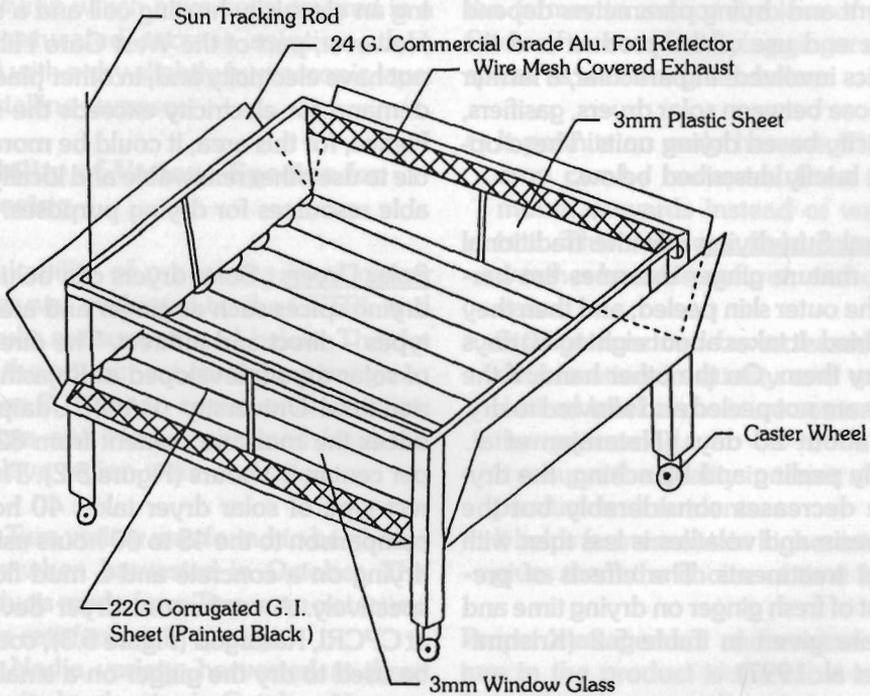


Figure 5.2: Solar Cardamom Dryer

Source: Kachru and Gupta 1997

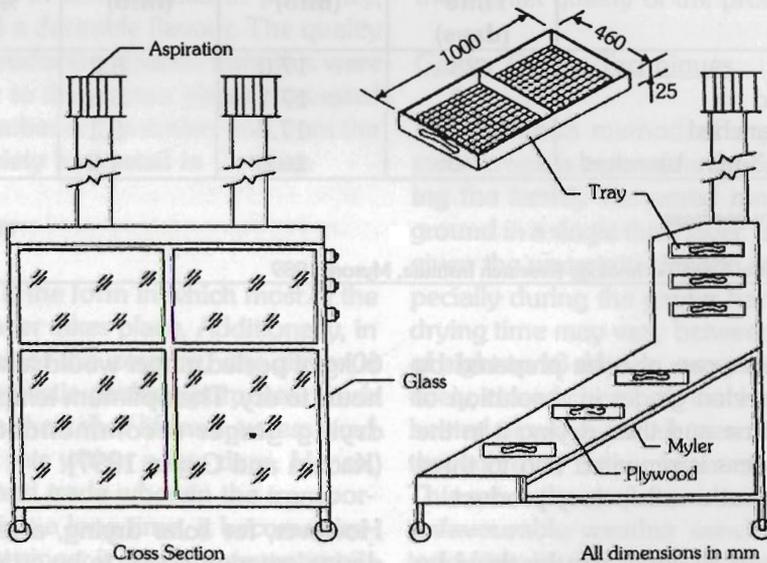


Figure 5.3: Solar Cabinet Dryer

Source: Kachru and Gupta 1997

may vary substantially over different regions and also depend on the loading density of the product. As mentioned earlier, this is especially important as Meghalaya encounters frequent cloudy days. This could make this technology ineffective for intermittent durations. Hence, while this could be a feasible option in other areas, it may not prove effective in the study area.

Gasifiers : Biomass-based gasifiers can be used for drying ginger. These are being used for other spices and are more efficient than traditional methods using firewood. Indirect gasifiers (Figure 5.4) are useful. While infrastructure costs, involving the construction of the heating chamber and the pipes, can vary depending on the type of construction materials used and the capacity, the estimated cost of the gasifier is about Rs 10,000. With an overall efficiency of 30-35 per cent, a maximum of one kg of fuel is needed per kg of fresh ginger. Hence, the maximum processing cost per kg would be Rs 1/kg of fresh ginger or about Rs 5/kg of dry ginger.

Recommendations

Low-cost dryers, involving minimum management and technical inputs, and based on-farm waste/ other biomass (to reduce the operating costs) as fuel sources, should be encouraged and made available to users on a trial basis.

Small farmers should be encouraged to dry ginger in community/NGO/department-owned dryers, or traders can set up small private enterprises as an extension of their fresh ginger storehouses.

Options for the Processing Enterprise

To establish any enterprise, the scale of operations can vary from single household level with limited private resources to a large-scale with government or bank financing. The methodology of implementation should integrate the investment potentials, technological requirements, and aspirations of the entrepreneurs targetted. The ginger processing options and the various levels at which these can be implemented are given in Table 5.3.

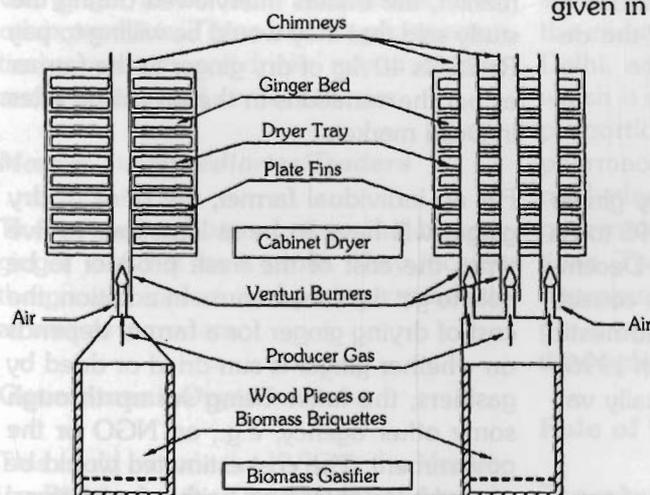


Figure 5.4: Biomass Gasifier for Ginger

A ginger drying unit could be set up in the yard at Garobadha, and the farmers can be given the option of drying the ginger before selling. Hence, after grading the produce at the yard, it could be segregated into different categories as per their suitability for fresh consumption, dried products, or processed fresh products. The main advantage of this option is that it facilitates marketing. The marketing division of the Department of Agriculture also receives export contracts.

Table 5.3: Ginger Processing Options on Various Scales of Operation

Product	Household ¹	Community ²	Cooperative /NGO ³	Private Entrepreneur ⁴	Govt. Dept. with Private Lease ⁵
Ginger in brine	✓	✓			
Ginger preserve*	✓	✓			
Ginger candy*	✓	✓			
Crystallised ginger*	✓	✓			
Ginger drying					
Sun drying	✓	✓	✓	✓	✓
Gasifier based drying			✓	✓	✓
Solar drying			✓	✓	✓

* The present variety was found unsuitable for these products (CFTRI 1989).

¹ **Household** - Family unit wherein the profit will accrue to the individual households

² **Community** - This could imply a group of farmers within a village or within a group of villages who form a formal or informal group to invest in and manage the operations. Women especially could be encouraged to form groups to undertake processing activities.

³ **Cooperative / NGO** - Any formal organization, such as a registered society or a local NGO, could initiate infrastructural development for processing activities with mechanisms for individual member participation.

⁴ **Private entrepreneur** - Individuals who are currently in the trade, such as the present ginger traders or other small entrepreneurs who are involved in the agro processing trade (crops other than ginger tea, cotton, cashew), could initiate ginger drying activities.

⁵ **Government department with private lease**- As suggested by the local community, the Department of Agriculture/Horticulture or other interested government departments could establish the infrastructural facilities. However, operation and management could be leased to private entrepreneurs, since past experiences in the area indicate that success of such ventures is dependent on initiative and profit motives.

Micro-enterprise in Ginger Drying

Among the various options mentioned, one of the most feasible enterprises is based on drying ginger using traditional methods or biomass-based gasifiers. Some of the details for this are as follow.

Prices

With the international price of dry ginger varying from Rs 66 in January 1995 to Rs 110/kg in June 1995 and Rs 68 in December 1995, the earning potential is considerable. At the same time, the domestic prices were about Rs 47.5/kg (March 1996). In the Delhi market, the price usually varies from Rs 45/kg to Rs 75/kg.

Being smaller in volume, the cost of transportation per kg of dry ginger is consider-

ably less than the cost for fresh ginger. Hence, for the trader-middleman, the returns vary depending on the amount paid to the farmer. Given the prices of dry ginger in the Delhi market, the traders interviewed during the study said that they would be willing to pay Rs 25-Rs 40 /kg of dry ginger to the farmer as per the variations in the prevailing rates in Delhi markets.

For an individual farmer, the price of dry ginger will have to be at least four to five times the cost of the fresh product to be able to get the same return. In addition, the cost of drying ginger for a farmer depends on whether ginger is sun-dried or dried by gasifiers; the latter being set up through some other agency, e.g., an NGO or the government. The cost estimated would be a maximum of Rs 5/kg (with infrastructural facilities being made available to him/her

and the farmer being required to pay for the processing only).

Hence, the minimum price of dry ginger would have to be Rs 20/kg. Given the national prices for dry ginger, the actual price received by local entrepreneurs should be more than this break-even price.

Markets

As outlined in Chapter 3, the present trade in the district is restricted to fresh ginger. The market for dry ginger has not been explored by the people as yet, and is hence subject to risks accompanying the creation of new marketing channels and markets. Market development becomes one of the most important prerequisites for the micro-enterprise project. This could be taken up by the Spices' Board. However, the broad categories for the types of markets available for dry ginger and the possible outlets are summarised below.

Manufacturers

This would include all the industries that use ginger as an input in manufacturing other products. These include pharmaceutical companies, soft drinks' manufacturers, and bakeries and confectioneries.

Market Intermediaries/Traders

These include all organizations that buy dry ginger to sell it for a profit. They include the present traders in dry ginger products as well as exporters.

Government Organizations

This could include the KVIC or the Marketing Division of the Department of Agriculture and Horticulture which could act as

an intermediary for local producers and exporters or other wholesalers outside the state. This function could also be carried out by the marketing board once it begins functioning. It could act as a centralised place for processing, grading, and selling processed ginger.

For local producers, the Marketing Board or the market intermediaries might be a more feasible option as direct marketing for industrial buyers (manufacturers) would require greater infrastructural development. The local producers would have to depend on intermediaries in order to create a market for the new product. This is essential as individual farmer's produce would not be in marketable quantities and some form of aggregation would be needed.

Marketing Channel

A marketing channel has to be set up for the transport and sale of the new product. The options available and the decision about the type of channel that could be tried would depend on the target market for the produce. While the existing channel could serve the purpose for trade in dry ginger, the end markets that they serve, except for Delhi, are for fresh ginger only, most of which is consumed in a raw form, a small proportion only being picked up by the pharmaceutical or other companies. The marketing channel could be through the government or through private organizations. The government channel would be appropriate and/or mandatory if dry ginger is one of the crops that is notified by the Marketing Board.

Role of Women

The primary occupation of the inhabitants of West Garo Hills is agriculture, i.e., *jhum*

and settled (valley) cultivation. The importance of agriculture as the main occupation cannot be overemphasised as a large proportion of men and women earn their livelihoods through farm-based activities. All of the adult population is virtually engaged as cultivators. However, given the traditional status of women in *garo* society, the activities of women have not been restricted only to farm-based activities, often extending to shopkeeping, handicraft making, weaving, areca nut processing, etc. They have enjoyed the support of the community for such activities.

However, over the years, the traditional organizational structure of communal land ownership and individual or family-based farming has begun to disintegrate, with erosion of women's land rights. The equality in class, gender, and economic terms, which the *garo* women have always enjoyed by virtue of their matrilineal society, also faces a threat from changing social values. From a society completely dependent on forest-based *jhum*, the district has witnessed a shift to wet rice cultivation (partly) in the recent past and is now going through a transitional phase of weaning away from *jhum* to commercial farming, leading to increased privatisation of land. This results in gender differentiation in access to land and control of produce by males.

Hence, it becomes increasingly important to complement changes in agricultural patterns with changes in other fields, so that the women are not adversely affected and are able to maintain their traditional equality with men. With the shift towards cash

and plantation of crops, setting up micro-enterprises becomes the only way to augment household incomes from the sale of crops only and provide income earning opportunities for women, providing them with the opportunity to be self-sufficient in monetary terms. The enterprises could be based on the agro-processing of crops such as ginger, areca nut, cashew, turmeric, and pepper, undertaken by individual households or the community. Most of the fresh ginger products could be prepared by women. In addition, the preparation of ginger before drying requires thorough cleaning and scrubbing. These activities can be carried out by women. However, an important prerequisite would be to create an awareness and motivation among them to use such opportunities and the necessary knowhow should be provided.

There are government programmes and financial institutions in the district that are willing to give credit for development of such enterprises. At present, the households are dependent on intermediaries for trade in cash crops. If women could be motivated to form self-help groups for sale and processing of agricultural produce, they can reduce their dependence on intermediaries and receive remunerative prices in the open market. With the existence of active NGOs, such as the Mothers' Union, which is primarily an association of women implementing several training and development programmes for women in the district, such enterprises and initiatives for women should be actively promoted and could become extremely important in shaping the future of *Garo* women.

Chapter 6

Credit Availability and Government Programmes

Micro-Enterprise Development Programmes

The government has several poverty alleviation programmes based on providing the people with wage employment and development of self-employment opportunities. However, the emphasis on the creation of wage employment has been more than creation of sustainable self-employment opportunities. Between 1980 and 1995, two-thirds of the rural development budget of Rs 523 billion⁷ was allocated for generation of wage employment under schemes such as the *Jawahar Rozgar Yojana* and Employment Assurance Scheme (GOI). On the other hand, the national self-employment programme, namely, the Integrated Rural Development Programme (IRDP), had a total budgetary allocation of Rs 99 billion for subsidies which was to be matched by a bank credit of Rs 176 billion.

Training of Rural Youth for Self-employment (TRYSEM), a component of IRDP conceived with the objective of equipping rural youth from poor households with basic entrepreneurial and technical skills and extending the necessary support in terms of project counselling, credit, and market assistance in order to enable them to seek self-employment was provided at a cost of under Rs five billion.

Efforts to encourage micro-enterprises often resulted in a lower level of success than expected. It is often because of lack of assistance from the banks, or due to use of the bank loans for non-project purposes. The enterprises are found to have a short lifespan, often closing down within a year or two of establishment due to causes such as the lack of appropriate markets, labour problems, etc. Hence, one of the biggest challenges for any micro-enterprise devel-

⁷ There are 42.10 Indian rupees to the U.S. dollar (April 1999).

opment project is correct assessment of the availability of financial credit and support from government departments/ other agencies in the initial phases of the enterprise. The following section analyses the availability of credit and support for the micro-enterprises proposed in the West Garo Hills.

Government Programmes

The District Rural Development Agency (DRDA) at Tura is a society registered under the Societies' Registration Act 19 and functioning under the Community and Rural Development Department, Government of Meghalaya. The Agency has been implementing a number of self- and wage-employment schemes such as the Integrated Rural Development Programme (IRDP), Training for Rural Youths for Self Employment (TRYSEM), Development of Women and Children in Rural Areas (DWCRA), supply of modern kits and tools to Rural Artisans, *Jawahar Rozgar Yojana* (JRY), *Indira Awas Yojana* (IAY), Million Well Scheme (MWS), Operation Black Board, and Employment Assurance Scheme. Besides these regular schemes, some special task schemes, such as the Rural Sanitation and Construction of low-priced schools under the 8th and 9th Finance Commission, are being implemented.

IRDP is one of the main poverty alleviation programmes taken up by the Government to directly tackle poverty in rural and semi-urban areas by providing income-generating assets to families below the poverty line. The programme assists a target group of families in procuring economic assets from government subsidies and term credits from the banks. The families assisted are expected to generate income and eventually cross the poverty line of Rs 11,000/-

per annum. The subsidy varies from 25 per cent to 50 per cent with a maximum limit of Rs 6,000/-. For growing pineapple plantations, the subsidy offered is Rs 5,650 per person.

The DWCRA, a sub-component of IRDP, commenced with the primary objective of focussing on the rural and semi-urban women and families below the poverty line and providing them with means of self-employment on a sustained basis. Strategic groups of 10 - 15 women are formed and assisted through the creation of a revolving fund used for the procurement of productive assets. Under this programme, a one time grant of Rs 25,000/ per group is provided.

The TRYSEM is another supporting component of the IRDP. It was launched by the government to provide technical training to rural youths between the ages of 18-35 years from poor families to provide them with technical and entrepreneurial skills to facilitate self-employment in the field of industry, agriculture, and allied activities. However, independent research studies suggest that the success rate in this programme has been only between 12-16 per cent (Galab 1993, Purushotham 1990, Soundarapandyan 1991).

The JRY aims to generate additional employment for unemployed and under-employed persons in rural areas and to ensure community assets to help improve the overall quality of life in rural areas. The IAY provides free housing to members of the scheduled castes and scheduled tribes. The MWS was launched with the objective of providing open irrigation wells free of cost to poor, small, and marginal farmers belonging to the scheduled castes and scheduled tribes.

Under various programmes, funds are available for both cultivation and processing of crops. At present, however, there are no entrepreneurs using such funds for value-adding activities for ginger or pineapple. The district administration and the project director (DRDA), however, support the concept of developing ginger-based enterprises, especially at the community level. As per the availability of funds under the various schemes, there would be sufficient financial support for such enterprises, if implemented properly. Implementation through societies or cooperatives could be encouraged.

Government Organizations

District Industries' Centre

The DIC has been in existence since 1978, and it endeavours to raise the standard of living by setting up small-scale industrial (SSI) units as well as village industries. Its main role is to create awareness about the importance of industries. Several government-sponsored and bank-funded micro-enterprise development programmes, such as Self-employment for Educated Unemployed Youth (SEEUY) and the Prime Minister's *Rozgar Yojana* (PMRY) are implemented throughout the country by the District Industries' Centre (DIC). To achieve its goal, the DIC organizes Entrepreneurship Development Programmes and assists beneficiaries under the PMRY scheme.

For manpower development in technical areas, the DIC carries out training at various training institutes within and outside the state. A minimal assistance of Rs 180-250 per month is given to the trainees. The areas in which training is provided include carpentry, cane and bamboo craft, knitting, tailoring, beekeeping, woollen carpet weaving, etc.

Credit assistance of Rs 100,000 under the PMRY is made available to youths generally in the age group of from 18-35 years, with prescribed educational qualifications and incomes below Rs 24,000 per annum. The DIC also assists new entrepreneurs with marketing through exhibitions and through the North Eastern Handloom and Handicraft Development Corporation.

An entrepreneur wanting to start an industry has to register it with the District Industries' Centre. However, no clearance is required from authorities where capital investment does not exceed Rs 50,000 in towns and Rs 100,000 in rural areas. Industrial units beyond this limit of capital investment have to obtain clearance from the Deputy Commissioner, District Council/Municipality/Associate Town Planner and Civil Surgeon.

Meghalaya Industrial Development Corporation (MIDC)

The MIDC provides technical consultancy as well as financial assistance. A branch of MIDC has been set up in Tura in order to provide financial assistance and technical guidance to local entrepreneurs. The areas in which help is provided include:

- preparation of schemes,
- sponsoring bank loans,
- training facilities,
- managerial problems, and
- selection, purchase, and installation of machinery.

Financial assistance from the MIDC is provided to local entrepreneurs to acquire fixed assets such as plants and machinery, factory sheds, and power connections and also to provide them with working capital.

The SISI

A branch of the Small Industries' Service Institute (SISI), Government of India, Ministry of Industries was set up at Tura during 1993 with the aim of accelerating industrial growth in the district through Small Scale Industrial (SSI) units. The principal services offered by this Institute are:

- consultancy (technical, managerial and economical),
- training (motivation programme, entrepreneurial development, and short-term practical training),
- assistance to state development agencies (implementing the PMRY, JRY, and IRDP),
- economic and statistical (product feasibility study, industrial potential survey),
- technical (preparation of project profile/report / status report, and detailed feasibility report), and
- modernisation (technical assistance to small-scale units, organization of workshops/ seminars).

The Khadi and Village Industries' Commission (KVIC)

The KVIC is responsible for planning, promotion, organization, and implementation of programmes for the development of *khadi*⁸ and other village industries in the rural areas in coordination with other agencies engaged in rural development activities. It keeps a reserve of raw materials and implements for supply to producers, creating a common service facility for production of raw materials as semi-finished goods and provision of facilities for marketing

KVIC products. In addition, it organizes training for artisans engaged in these industries. To promote the sale of village industries' products, KVIC also builds a link with established marketing agencies.

The KVIC can also provide financial assistance to institutions or persons engaged in development and operation of village industries, guiding them through the supply of designs, prototypes, and other technical information.

The following industries are under the KVIC.

- Mineral-based industries: cottage pottery, limestone, stone cutting, fuel briquetting, paints and pigments, slate and pencil making, etc
- Forest-based industries: hand-made paper; manufacture of gums and resins; bamboo and cane work; match industry; and manufacture of plates, bags, and other paper containers, etc
- Agro-based and food industries: processing, packing and marketing of cereals, pulses, spices, beekeeping, fruit and vegetable processing, preservation and canning, cashew processing, collection of forest plants and fruits, etc
- Polymer and chemical-based industries: flaying; curing and tanning of hides, skins, and ancillary industries; soap industry; manufacturing of rubber goods; etc
- Engineering and non-conventional energy: carpentry, forges, biogas, solar and wind energy implements, bell metal utensils, stoves, pins, clips, motor winding, rural transport vehicles, etc.

⁸ *Khadi* = handloom

- Textile industries: hosiery, poly *vastra*, readymade garments, fibre yarn, cotton and silk or woollen yarns, etc
- Service industries: laundries, barbers, plumbing, etc

The KVIC provides financial assistance to these activities and the various categories under which assistance is made available are as follow.

- Capital assistance for purchase of land, construction of godowns, worksheds, buildings, tools and implements, working capital assistance, etc
- Managerial and technical assistance
- Training: assistance in the form of grants is provided to training institutions
- Marketing: funds are sanctioned in the form of grants and loans for non-recurring expenditure. In addition, recurring grants to meet management expenses are sanctioned on a decreasing scale. The rate of grants vary according to the category of sale depot.

Currently, there are no ginger or pineapple products being marketed by KVIC outlets. However, it would be willing to provide financing and marketing support, especially for dry ginger, ginger candy, pickles, etc.

Banking Institutions

Among the credit institutions in the district are several banks and cooperative societies with different mandates. There are 26 branches of the State Bank of India, two branches of the Union Bank, and one Central Bank. In addition, there are 10 branches of the Meghalaya Cooperative Apex Bank Ltd and 152 cooperative societies in the district. Some of these institutions described

below have within their mandate credit facilities for small-scale entrepreneurs and business activities.

The State Bank of India and the Union Bank

The State Bank of India and the Union Bank and their branches offer the usual banking facilities on receipt of deposits in savings and government bills. It also provides loans to small business concerns and agriculturalists as well as personal loans. Since the experience of the banks in loan recovery has not been very encouraging, they are reluctant to provide assistance without sufficient guarantee.

Meghalaya Cooperative Apex Bank (MCAB)

The MCAB bank provides the usual banking facilities to the public in addition to financing trade and agriculture. It is also playing a vital role in giving credit to cooperative societies. The loans to cooperative societies are channellised through the Cooperative Department after the loan applications are thoroughly examined by the department or through the person deputed by the bank. The bank thereafter forwards the applications to the head office located in Shillong.

Cooperative Credit Societies

With the use of the Credit Revitalisation Scheme by the State Government, assistance to Cooperative Societies is provided through contribution of shares and various types of loans, grants, subsidies, etc. State assistance has been provided to industrialists and agriculturists through the district authorities by means of agricultural and industrial loans.

The different types of society include Consumer's Cooperative Societies, Handloom Cooperative Societies, Credit Cooperative Societies, Thrift Cooperative Societies, Multi-purpose Cooperative Societies, Farming Cooperative Societies, etc.

Marketing Units for Agro-Products in the State

Tribal Cooperative Marketing Development Federation of India Limited (TRIFED)

The TRIFED is an apex-level federation of the State Tribal Development Cooperative Federations and the State Forest Corporations. Its headquarters are in Delhi, and there is a branch office at Guwahati for the North Eastern Region. The TRIFED has its own national network for procurement, processing, and marketing of forest and agricultural commodities produced in tribal areas and aims to establish a comprehensive marketing network for natural produce in tribal areas by improving the marketability, providing better earnings and employment, and also by generating awareness of market forces in order to optimise incomes.

The TRIFED has undertaken procurement and marketing of 50 items from minor forest products and from surplus agricultural products. Minor forest products include *Shorea robusta* (sal) seed, *Schleichera oleosa* (kusum) seed, *Azadirachta indica* (neem) seed, *Pongamia pinnata* (karanj) seed, mango kernel, cashew, large cardamom, and bayleaves and surplus agricultural products such as soyabeans, mustard seed, sunflower seed, sesame seed, castor seed, maize, pulses, red chilli, turmeric, ginger, etc.

North Eastern Regional Marketing Corporation Ltd. (NERAMAC)

The NERAMAC has its headquarters in Guwahati and is under the administrative control of the Department of Food, Government of India. It is funded through the North Eastern Council (NEC). The NERAMAC has taken up marketing of fruits and vegetables to encourage the small fruit and vegetable growers in the region. Procurement of agro products is carried out through private suppliers, cooperative societies, and at times through its own network. At present the NERAMAC has leased three cold storage units in Assam from the government to improve its marketing facilities.

To support pineapple growers in Tripura, the NERAMAC has set up a fruit juice concentration plant at Nalkata within the pineapple and orange growing belt. The estimated cost of the project is about 375 hundred thousand rupees. The plant is capable of consuming about 2,000 pineapples per hour, the end product being pineapple juice concentrate of 65 degrees Bx .

Pineapples are fed to an in-feed conveyor which takes them to a washing machine where they are thoroughly washed and then passed through an inspection conveyor. They are then taken to the extractor through a flight elevator. The extractor cuts the pineapples into halves and extracts the juice. Coarse juice and skin are automatically separated out. The fine juice is then extracted in a helicoidal extractor, the juice is clarified by Alfa-lava VNPX separators, de-aerated, and pasteurised in the Alfa-Lava pasteuriser. After pasteurisation the juice goes either to the aroma recovery unit or

to the centritherm or to the bulk aseptic packing machine.

Recommendations of the TRIFED and NERAMAC for the Promotion of Ginger and Pineapple Processing Enterprises

- Time lag between harvests and market supplies must be kept to a minimum, possibly to within a day.
- Infrastructure, which may be in the form of cold storage, drying units, or processing units, has to be set up by the government. Such units should be handed over on lease to private parties for operations in order to lessen the overhead costs of production and for smooth functioning.
- Establishment of a mother unit within satellite units for marketing at the local level. These mother units should be responsible for marketing and should tie up with the international market.
- There should be strict adherence to quality as the international market requires quality products.
- Given the present uncertain political environment, private investment may not be forthcoming; the government needs to look into this.
- Because of the absence of specific future plans for the development of agro-based enterprises, organized planning for

production and marketing needs to be initiated.

Prerequisites for Financial Assistance

While financial resources for an individual enterprise could be available from a number of sources, as mentioned in the preceding sections, the actual use of funds is subject to several prerequisites. Some of them are summarised here.

Processes under the proposed activity would have to be based either on proven technologies, or a demonstration project undertaken to evaluate the same under local conditions. This is especially important for food products, as the technology used would determine whether the quality of the finished product is acceptable or not. The activity would have to be undertaken on a minimum scale – either by a single enterprise or by sufficient a number of people on small scales — to ensure a market for the output, as characteristically a single average farmer's ginger produce would be insufficient to constitute a marketable lot. Hence, the funding agency would normally prefer such an activity to be implemented through cooperatives or through NGOs such as the Mothers' Union. Alternatively, the Department of Agriculture could provide the infrastructure for large-scale operations of processing units and the local people could use it by paying for the processing costs.

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In another programme (Food and Nutrition Programming of the Government of Andhra Pradesh), a three-year action research project was initiated by the Central Industries Development Bank of India. Their findings were that, even in the regions of high incidence of poverty where low

development was the main objective, the prerequisites that would be required for a micro-enterprise development programme based on ginger drying

Chapter 7

Micro-Enterprise Development and Prerequisites

Introduction

There are several government programmes to promote self-employment as a means of reducing poverty. However, success rates are low. Therefore, it is imperative that the lessons learned about the drawbacks to developing these enterprises are kept in mind. For example, while official statistics regarding the TRYSEM suggest that, between 1980 and 1995, 3.24 million youths were trained for self-employment, only 44 per cent of them were actually self-employed. Independent research studies have indicated a success rate of only 12-16 per cent (Galab 1993, Purushotham 1990, Soundarapandyan 1991).

In another programme (Rural Industries' Programme of the Government of Andhra Pradesh), a three-year action research project was initiated by the Small Industries' Development Bank of India. Their findings were that, even in the regions of high incidence of poverty where low in-

come and low demand usually do not provide avenues for micro-enterprises, with innovative approaches promotion is feasible. However, the project experience also indicates that, even with the best post-assistance, follow-up, and export services, success cannot be uniform in all product lines. Markets being highly dynamic, enterprises are also under constant risks. The risk is posed by a business environment that is characteristic of intense competition due to the relative ease of entry and exit conditions. Nearly three years of regular follow-up indicates that a success rate above 40 per cent seems to be unrealistic and unsustainable.

Keeping these experiences in mind, it appears imperative that the micro-enterprise development initiative is preceded and followed by activities that could determine the success of the initiative. This chapter highlights some of the prerequisites that would be needed for a micro-enterprise development programme based on ginger drying,

either at the household level (sun drying) or at the community level (gasifier based drying process).

Prerequisites

The basic plan for developing the 'backward and forward linkages' in the ginger trade is summarised in Figure 7.1.

Supply of Improved Ginger Varieties

One of the most important interventions for 'backward linkages' required by the Department is the promotion of improved varieties such as Nadia and Suprabha, which are more suitable for processing into value-added products. One of the reasons that these have not been taken up by the peo-

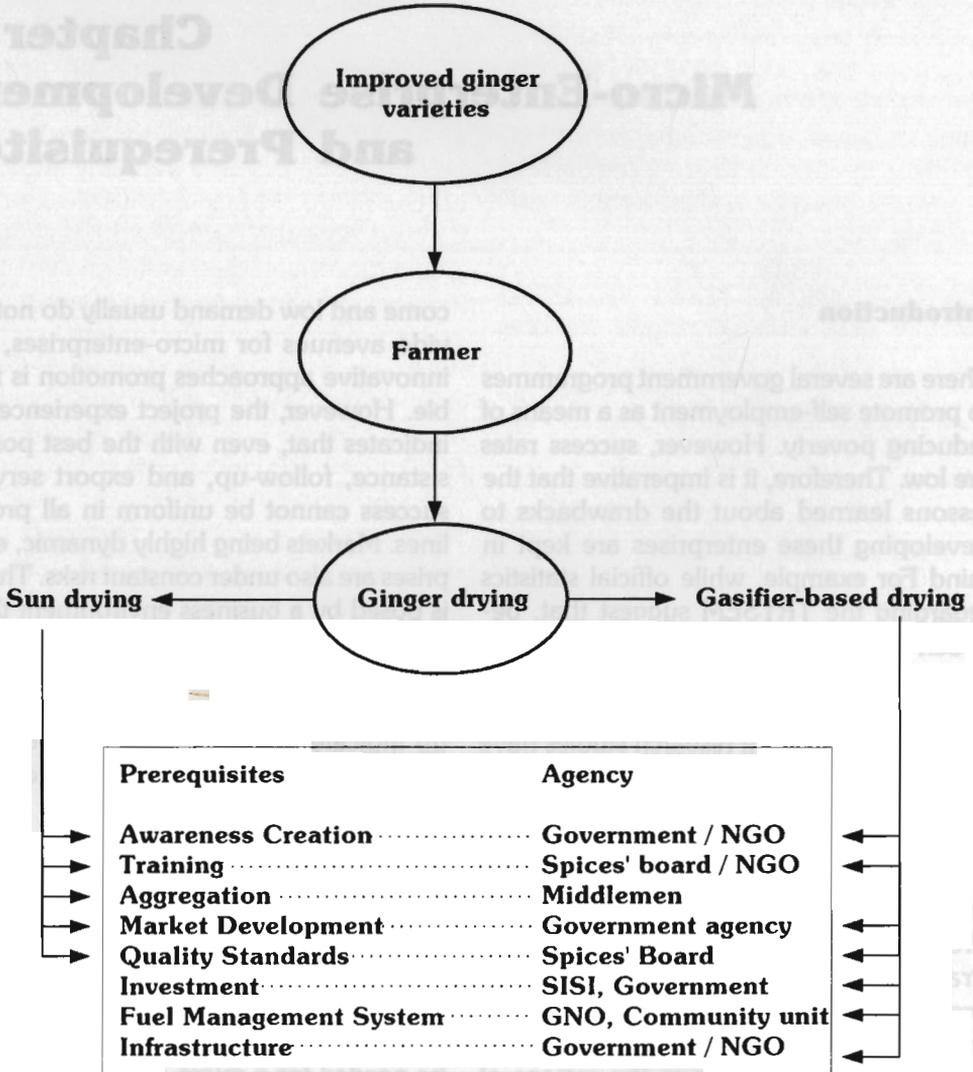


Figure 7.1: Micro-enterprise Options and Prerequisites

ple is the absence of increased returns from growing these improved varieties. However, if these are promoted with the twin benefits of being hardier varieties and disease resistant, at the same time ensuring that the farmer has a choice of processing them to make value-added products and /or sell them at higher returns by appropriate grading facilities in market yards, these would certainly be used by farmers.

Awareness Creation

Efforts need to be undertaken to create awareness among growers about the possibilities and methods of value addition to their farm produce. Specifically, the benefits from ginger drying could be summarised as follow.

- The lack of wastage from the rotting of fresh produce
- Freedom from fluctuations in demand
- Early harvesting of ginger, shortened rotation of the ginger crop – this would reduce natural climatic hazards and pest infestation possibilities.
- Much higher returns from value-added produce than from unprocessed produce

Training

The growers would need to be trained to ensure that they understand the technology and also the desired standards. Training for proper pre-harvest and post-harvest care (Annex 8) for ginger drying could be carried out by the Horticulture Department/ Spices' Board. Additionally, young men and women could be trained in management and maintenance of gasifier units.

Aggregation

The problem of aggregation arises in cases of sun-drying of wise production of household ginger, as the quantity of ginger that can be dried is small. Hence, apart from the collection system, which would have to involve middlemen, institutionalised mechanisms are needed in order to ensure that the supply of dry ginger is regular enough to constitute truckloads (approximately 10 tonnes in capacity) at regular intervals. Unless this is achieved, there might be problems in the transportation and storage of non-tradable quantities.

Market Development

As mentioned in Chapter 5, the initial market development for processed products would require specific attention. The Marketing Board of the Meghalaya Government or the Spices' Board (for dry ginger) could take positive steps in this direction. Price regulation, especially in the initial phases, may be needed to ensure that the farmer gets a fair share of the profits and that the minimum local price remains in excess of Rs 20/kg (if the gasifier technology is used by the enterprise).

Quality Standards

This is extremely important as the standards of quality for dry ginger prescribed by various trade regulation organizations (Annex 9) determine the extent of the market for the product as well as the price it can fetch. Hence, it is important that local growers are aware of these standards and take an interest in grading the products at their level. The Spices' Board would be able to disseminate information and provide training for grading products at the growers' level.

Investment and Credit

The avenues for small amounts of credit available within the district are often not known to the people, or not used because of fear of long institutional procedures. The government or local NGOs could create awareness and enterprise development seminars, specifically aimed at ginger growers. Easier credit terms could be offered to pioneering farmers. However, if infrastructural facilities are developed by the government, then credit for the farmers would not be essential. Alternatively, the SISI could help individual entrepreneurs with initial investments to install ginger processing units.

Fuel Management System

The use of gasifiers for the drying of ginger requires a fuel management system whereby a continuous supply of the biomass required is available. The maximum fuelwood required would be one kilogramme of fuelwood per kilogramme of green ginger, although experiments with cardamom drying (TERI 1996, TERI 1997) have indicated greater levels of efficiency and, hence, lower fuelwood requirements. Participatory management approaches could be tried with users of the drying unit and mechanisms for the management of the plant implemented. Alternatively, a commercial system could be tried with individuals paying a certain amount per kilogramme of ginger dried, and the management left to a single individual on lease basis. Other requirements would be storage for fuelwood and manpower while the unit is in operation.

Conclusions

The distribution of fresh ginger from the district to the final consumer is being at-

tended to by a chain of middlemen at different stages, eroding the producer's share in the consumer's rupee. With the provision of regulated markets, the surplus middlemen would be eliminated. Experience in other regulated markets, however, suggests that regulation is often not enforced in many of the fruit and vegetable markets in the strict sense as many of the traditional practices, allowances, and deductions still continue. It is observed in certain regulated markets that produce is sold to traders by producers on a traditional lot basis and not on a unit weight basis. Also, most often, markets are located in big cities and towns. Though equipped with necessary infrastructural facilities to meet the volume of business, the participation of farmers in these markets is negligible due to the distances involved.

Hence, while the introduction of regulated markets in the district would help to ensure fair returns to the individual farmer, the promotion of micro-enterprises would provide farmers with a choice of adding value and securing better returns from products. The very availability of an alternative method of earning from the present products would also increase the farmer's bargaining power and reduce the short-term risks arising from uncertain markets and traders' collusion.

Among the options evaluated, the most feasible is that of drying ginger using gasifier-based dryers. At the household level, ginger could be dried in the sun. The latter option does not involve any additional costs for the farmer, though the time required for drying would be between 10-12 days in bright sunshine. The accompanying prerequisites are arrangements for aggregation of small quantities of dry ginger into marketable quantities.

The other option of using gasifiers would reduce drying time to a maximum of two to three days, with larger quantities being processed simultaneously. Hence, the product would be in marketable quantities. The accompanying prerequisites involve the research/development of appropriate technology and infrastructure, training local people, and market development.

While the emphasis on development of processing opportunities would be a definite step towards assuring higher returns to farmers, the importance of the corresponding prerequisites cannot be under-

estimated. Especially important among them is the promotion of improved varieties of ginger, leading to greater productivity and making processing more viable. It is essential that a sustained supply of good quality ginger as raw material is ensured to make the dry processing of ginger an economical and technically feasible enterprise in the region. Hence, any development initiatives should incorporate an approach integrating both the 'backward and the forward linkages'. The absence of the former would render efforts towards micro-enterprise development unsuccessful.

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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)

- GROUP 1**
- (1) Mandarin oranges
 - (2) Oranges
 - (3) Other citrus fruits
 - (4) Pineapples
 - (5) Bananas
 - (6) Papaya
 - (7) Peas
 - (8) Plums
 - (9) Peaches
- GROUP 2**
- (1) Potatoes
 - (2) Sweet potatoes
 - (3) Tomatoes
 - (4) Leafy and fresh vegetables
 - (5) Yams
- GROUP 3**
- (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 1**
- (1) Jute (baled and unbaled)
 - (2) Cotton (ginned and unginned)
 - (3) Mesta
- GROUP 2**
- (1) Paddy
 - (2) Rice
 - (3) Chena (beaten rice)
 - (4) Khat (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

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 decortication 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 decortivating 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 com-

pared 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 SO₂
- 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 SO₂ 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 syrumping.

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) shreadings 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; preferably 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 4	by mg/lb 3.0	by mg/lb 3.0	% by wt*	% by wt*	% by wt 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 deleterious 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
<i>Phosphor pesticides</i>	
Diazinon	Less than 0.01mg/kg
Methyl Parathion	Less than 0.005mg/kg
Malathion	Less than 0.01mg/kg
<i>Chlorinated pesticides</i>	
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

Max. Quantity in mg. per kg.
0.1
0.01
1.0
0.01



Women De-husking Paddy



**Harvesting Ginger
from *Jhum* Fields**



**Farmers Transporting
Ginger to Market**



**Trading Ginger in the
Local Market**

**A Typical Goro
Dwelling**



**Storage of Seed
Ginger in Pits**



Pineapples Ready for Harvest



A New Pineapple Plantation

ICIMOD

ICIMOD is the first international centre in the field of mountain development. Founded out of widespread recognition of environmental degradation of mountain habitats and the increasing poverty of mountain communities, ICIMOD is concerned with the search for more effective development responses to promote the sustained well being of mountain people.

The Centre was established in 1983 and commenced professional activities in 1984. Though international in its concerns, ICIMOD focusses on the specific, complex, and practical problems of the Hindu Kush-Himalayan Region which covers all or part of eight Sovereign States.

ICIMOD serves as a multidisciplinary documentation centre on integrated mountain development; a focal point for the mobilisation, conduct, and coordination of applied and problem-solving research activities; a focal point for training on integrated mountain development, with special emphasis on the assessment of training needs and the development of relevant training materials based directly on field case studies; and a consultative centre providing expert services on mountain development and resource management.

MOUNTAIN ENTERPRISES AND INFRASTRUCTURE DIVISION

Mountain Enterprises and Infrastructure constitutes one of the thematic research and development programmes at ICIMOD. The main goals of the programme include i) gainful enterprise development and income generation; ii) harnessing mountain specific advantages; iii) infrastructural development (social and physical); iv) sustainable energy resources for mountain development; and v) capacity building in integrated mountain development planning.

Participating Countries of the Hindu Kush-Himalayan Region



Afghanistan



Bangladesh



Bhutan



China



India



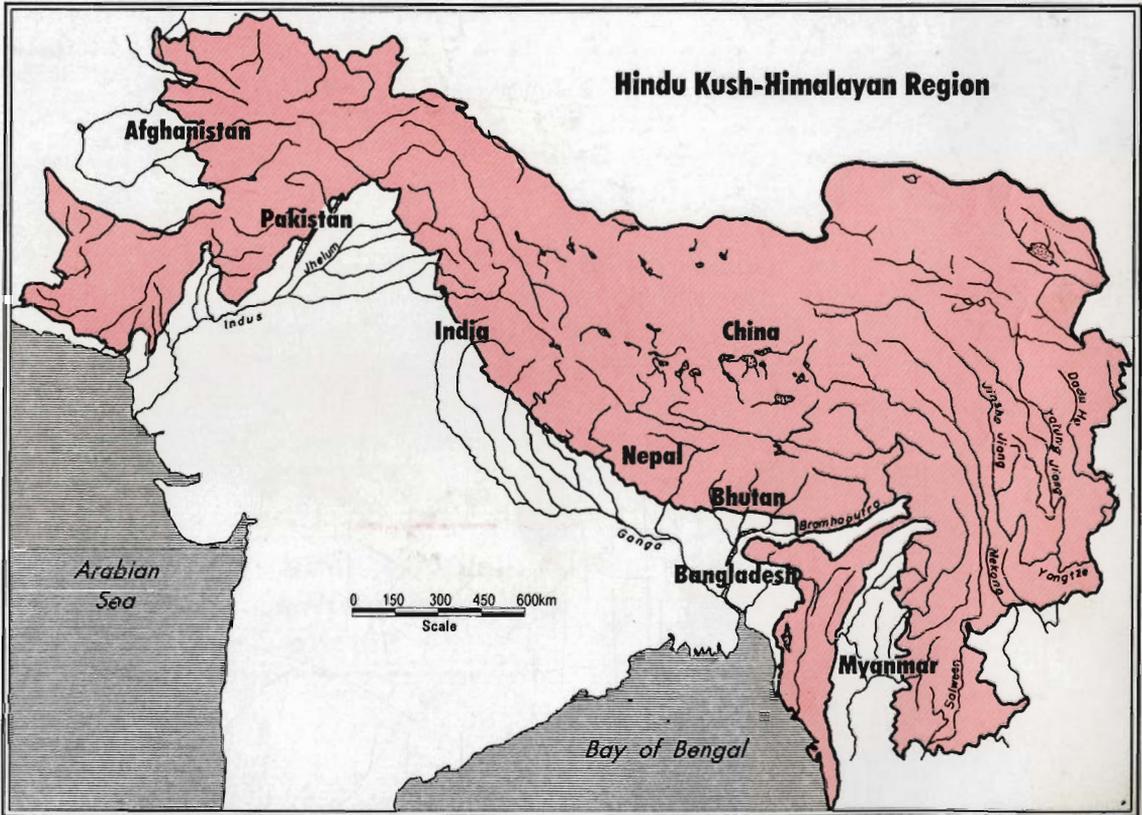
Myanmar



Nepal



Pakistan



International Centre for Integrated Mountain Development

4/80 Jawalakhel, G.P.O. Box 3226, Kathmandu, Nepal

Telephone : (977-1) 525313
e-mail : distri@icimod.org.np
Web site : <http://www.icimod.org.sg>

Facsimile : (977-1) 524509
: (977-1) 536747
Cable : ICIMOD NEPAL