

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

serves, 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

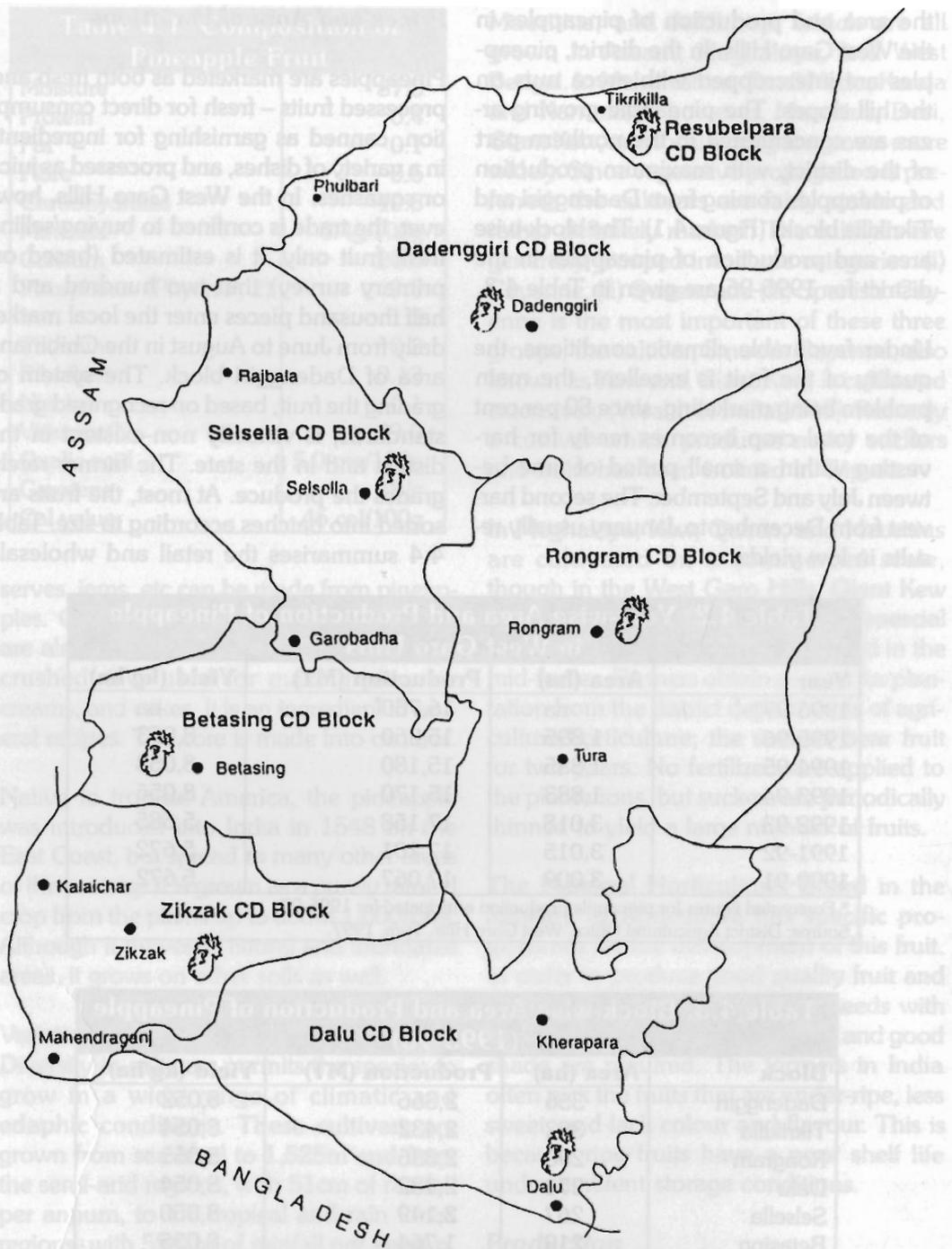


Figure 4.1: Location of the Main Pineapple Producing Areas in the West Garo Hills

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 *Embilica 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.

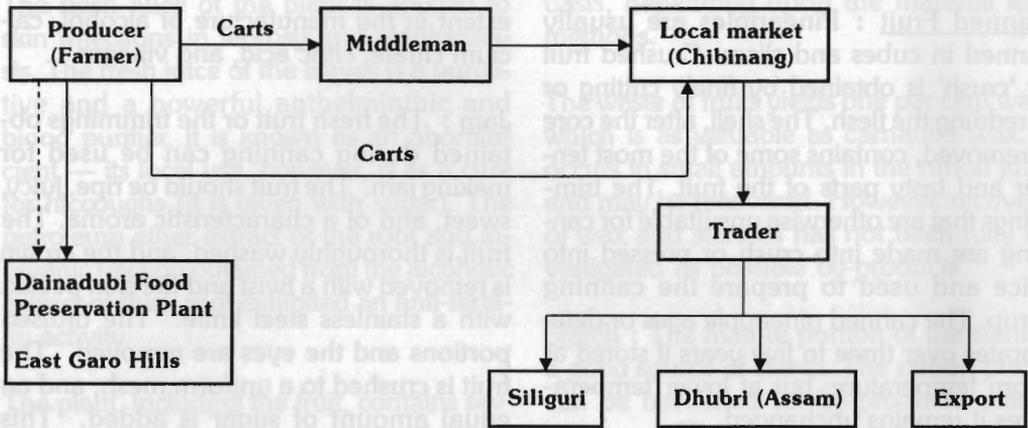


Figure 4.2: Marketing Channels for Pineapples

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.