

Marketing channels and processing chains of plantain chips in South India

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Résumé – Circuits de commercialisation et chaîne de transformation des chips de plantain en Inde du Sud

Nendran est le cultivar de plantain qui constitue la base de l'industrie des chips dans les états du sud de l'Inde. Bien qu'il soit cultivé sur plus de 25 000 ha dans l'Etat de Tamil Nadu, la consommation locale de la matière première est nulle et sa transformation en chips est limitée à l'état de Kerala, d'où les produits transformés sont distribués à d'autres régions du pays.

La matière première, produite dans un état, gagne l'unité de transformation située dans l'autre état selon trois circuits principaux. Cette étude des circuits de commercialisation et de la chaîne de transformation examine divers aspects tels que les tendances de la production, les problèmes méthodologiques associés au transport, la saturation forcée du marché, les fluctuations du marché et l'efficacité des chaînes de transformation.

Abstract – *Nendran is the popular plantain cultivar forming the basis of chips industry in southern states of India. Though it is grown in more than 25,000 ha in Tamil Nadu State, local consumption of the raw material is nil and its processing into chips is restricted to Kerala State from where the processed products are distributed to different parts of the country.*

The raw material produced in one state reaches the processing unit in the other state through three main channels. This study of marketing channels and processing chain deals with various aspects like production trends, methodological problems associated with transportation, forced glut in the market, market fluctuations and efficiency of processing chains.

Introduction

India has emerged as the largest producer of banana in the world with an annual production of 13.2 mt. from an area of 430,000 ha. (Negi *et al.* 1998). Cavendish clones form the basis of the banana industry, contributing 68.29% of total production, followed by Poovan (16.22%). Plantains have a 5.47% share with production restricted to only two

southern States, Kerala and Tamilnadu (Singh and Uma 1994) with an area of approximately 25,000 ha.

In India, plantains are popular, with the commercial name of Nendran. About 12 distinct ecotypes are reported to be grown in different districts of these two states with Nedu Nendran, an ecotype of French Plantain occupying the lion's share of the acreage (Menon and Aravindakshan 1998, personal communication). As in Africa, plantain forms the staple food in inland Kerala but is popular as a breakfast fruit. Steam boiled rice flour with coconut gratings and just-ripe plantains form the popular breakfast of Keralites. It has become customary to grow a few plantains in the backyard with staggered planting to ensure year-round fruit production. Apart from its dessert use, mature fruits are consumed either after steam boiling or after direct burning on a slow fire with a banana leaf wrapped around it. Of all the plantain products, most popular are the Nendran chips made by deep frying mature fruit in coconut oil seasoned with salt. This contributes to 90% of the processed products of Nendran. The varieties Nendran and Zanzibar are found to be suited for chip preparation, with maximum chip output from cv. Manjeri Nendran, an ecotype.

Though Tamil Nadu has around 10,000 ha. under plantain cultivation with a production of about 23,000 tonnes (Singh and Uma, 1996). Its utilisation is very restricted and whatever is produced is transported to the neighbouring state of Kerala, where it is fully utilised. Processing chips started as a household activity, but as a result of increasing demand it has become a commercial venture, albeit on a small scale. So the purpose of this study was to analyse the channels involved in marketing and the processing chains, so that by revealing failings, the profitability of producers can be enhanced. This paper deals with the production, procurement and marketing of plantains and the people involved in this process. Special reference is made to marketing details in terms of channels and marketing operations.

Plantain production system

Depending on resource availability, cultivars, traditions and marketing, three production systems for plantains are followed in India. In Tamil Nadu, where the plantain production areas are mostly in the plains, garden and wetland cultivation are most common. Garden cultivation is like any other type of production where plants are raised on flat terrain, with basins or drippers for irrigation. Wetland cultivation is a unique system followed in the Cauvery river deltas and in lowlands. For planting, land preparation is carried out by means of puddling and suckers are simply placed in the soil. After about 20-25 days, small 15 cm deep trenches are opened for both irrigation and drainage, so as to retain 6-8 plants in a basin. The same trenches are deepened by 30 cm after 45 days and the soil lifted is thrown onto the basins to raise the soil level. Just before the rains (October-December) the trenches are deepened to 60 cm to facilitate easy drainage. The same trenches are used as irrigation channels during summer. This system makes plantain cultivation highly intensive.

Plantains are grown either as a pure crop as in all commercial plantations or interplanted, as in the homestead gardens of Kerala. As a mixed crop, they are grown together with rubber, coconut, pepper, elephant's foot yam, ginger, turmeric, pineapple and legumes. Commercial planting of plantains in Kerala is done just after the S-W monsoon during Aug-October. In Tamil Nadu, March-April planting is in vogue. In homestead gardens, staggered planting is popular so as to maintain a continuous supply for household use throughout the year. In any case, annual planting is mandatory irrespective of the production system, making plantain cultivation highly intensive.

Material and methods

The efficiency of the marketing system depends on the marketing operations followed. For plantains the major operations considered are harvesting, pre-treatment, sorting, packing, assembling and transportation to marketing yards. The participants studied were the growers, pre-harvest contractors, village merchants, wholesale dealers for produce collection, wholesale dealers for distribution, secondary wholesalers, retailers and consumers. The details of the personnel involved in marketing are discussed below. With these human components, five different marketing channels were studied:

I.	Producer	>	Primary wholesaler	>	Secondary wholesaler	>	Retailer	>	Consumer
II.	Producer	>	Pre-harvest contractor	>	Secondary wholesaler	>	Retailer	>	Consumer
III.	Producer	>	Pre-harvest contractor	>			Retailer	>	Consumer
IV.	Producer	>		>				>	Consumer
V.	Producer	>		>			Retailer	>	Consumer

The survey was conducted to examine the efficiency of various marketing channels and the questionnaires were distributed to all the personnel involved in marketing: data were then collected and analysed.

Personnel involved in different marketing channels

1. **Farmer:** the grower or producer. The typical producer is a small-scale operator who grows a mix of field and horticultural crops on a holding of less than two hectares. Only a fraction of his holding is devoted to horticulture. In southern India, especially in Tamilnadu, land leasing is common and may be restricted to 1 crop cycle or 2-3 cycles. Small farmers who either do not own land or possess a small area for cultivation lease land from big farmers at a cost of Rs 15,000 to 18,000 per year.

2. **Pre-harvest contractor (PHC)**: the person who fixes the price for the produce of the farm at the time of shooting or bunch maturation. He advances 50% of the amount, based on his visual rating. He takes on the responsibility of harvesting, shifting, loading and transport, i.e. he delivers the produce to the terminal market. Most of the time one village will be using a number of such contractors competing against each other.

3. **Primary wholesaler (PWS)**: procures the bunches either directly from the farmer or from the pre-harvest contractor, in the market yard. He makes arrangements for sending bunches to secondary wholesalers elsewhere.

4. **Secondary wholesaler (SWS)**: receives the bulk of the bunches from the primary wholesaler in a different place. He takes the responsibility of unloading, smoking for ripening (if necessary) and then sells the bunches to the retailer.

5. **Retailer**: purchases bunches from the secondary wholesaler and acts as an intermediary before the crop reaches the consumer. Retailers, being small, seldom have the purchasing power to purchase directly from the producer. The retailer may buy individual bunches which he sells along with other provisions in a small store or as a fruit hawker who carries several bunches and hands along the road on a wheel cart for sale.

6. **Consumer**: who finally uses the bunches. Consumers may be housewives who purchase plantain hands or fingers for daily use on a small scale or 'chip processors' who purchase in bulk.

Apart from the personnel, some of the marketing terminology used in the text is discussed below.

Marketing channels: these are the routes through which agricultural products move from producers to consumers. According to Moore *et al.* (1973) the chain of intermediaries through whom the various commodities pass from producers to consumers constitute their marketing channels.

On farm receipt received by the farmer: this is the payment received by the farmer, the wholesaler or pre-harvest contractor either after harvest or well in advance at the shooting stage.

Procurement price for the wholesaler or pre harvest contractor. This refers to the total cost involving harvesting of the bunch, shifting, loading, transportation to market yard and unloading.

Total cost of marketing is the total cost incurred during marketing either in cash or in kind by the producer, seller and of the various intermediaries involved in the sale and purchase of the crop till it reaches the consumer. It is measured as follows:

$$C = C_f + C_{m1} + C_{m2} + C_{m3} \dots + C_{mi}$$

where

C = Total cost of marketing of the commodity

C_f = Cost paid by the producer from the time the produce leaves the farm till it is sold

C_{mi} = Cost incurred by the ith middle man in the process of buying and selling the product.

Total marketing cost (TMC) of different channels is summarised as follows:

$$Ch-1 = C_F + C_{PWS} + C_{SWS} + C_R$$

$$Ch-2 = C_F + C_{PHC} + C_{SWS} + C_R$$

$$\text{Ch-3} = C_F + C_{\text{PHC}} + C_R$$

$$\text{Ch-4} = C_F$$

$$\text{Ch-5} = C_F + C_R$$

where

C_F = Cost incurred by the producer from the time the produce leaves the farm till he sells it, which includes harvesting, transporting, loading and unloading costs.

C_{PWS} = Cost incurred by the primary wholesaler in the process of buying and selling (usually nil).

C_{SWS} = Cost incurred by the secondary wholesaler in the process of buying and selling the produce, which normally includes wastage, cost of smoking the bunches and an overhead charge.

C_{PHC} = Cost incurred by the preharvest contractor in the process of buying and selling the produce, which may be the advance given to farmer which includes the cost of harvesting, transportation, commission and loading charge.

C_R = Cost incurred by the retailer in the process of buying and selling the produce involving loading cost, transport and wastage.

Absolute marketing margin of i^{th} middle man is calculated as:

$$A_{\text{mi}} = P_{\text{Ri}} - (P_{\text{pi}} + C_{\text{mi}})$$

where

P_{Ri} = Total value of receipts per unit (sale price)

P_{pi} = Purchase value of goods per unit (purchase price)

C_{mi} = Cost incurred on marketing per unit

Percentage margin of the i^{th} middle man (P_{Mi}) is calculated as:

$$P_{\text{Mi}} = \frac{P_{\text{Ri}} - (P_{\text{pi}} + C_{\text{mi}})}{P_{\text{Ri}}} \times 100$$

Farmer's share in consumer rupee (Fs)

$$\text{FS} = \frac{\text{RP} - \text{MC}}{\text{RP}} \times 100 = \frac{\text{PF}}{\text{RP}} \times 100$$

where

FS = Farmers share in the consumer rupee expressed as percentage.

RP = Retail Price

MC = Marketing Costs, including margins

PF = Price received by the farmers

Price spread (%)

$$\frac{\text{Price paid by consumer} - \text{Price received by producer}}{\text{Price paid by the consumer}} \times 100$$

Marketing efficiency (ME):

$$\text{ME} = \frac{\text{Output}}{\text{Input}}$$

where

Output = Retailer price

Input = Total cost of marketing including margin

Results and discussion

Most of the plantains are sold through the private sector. Most of the produce flows through the wholesale markets on its way to the consumer. Also, all the five channels involve different kinds of intermediaries in delivering commodities from the producer to consumer. While doing so, these intermediaries make some profit to remain in the trade after meeting the cost of the function performed. While making profit, they have to bear the cost of some operations, which differs with each intermediary (Figures 1 and 2). The cost details are summarised in Table 1.

In channel 1, the complete tasks of harvesting of bunches from the field, shifting them to the main road, and transportation to the primary assembling unit are undertaken by the grower/farmer/producer. While doing so, he also bears the overhead charges. In the case of banana marketing, the primary assembling unit is also the local marketing yard where the bunches are auctioned. The minimum rates are fixed by visual observation depending on the size and quality. The bunches are purchased by the primary wholesaler in the auction. In this process the producer incurs a marketing cost of 17.02% with a margin of 51.52% (Figure 1). After the auction, bunches are sold by the primary wholesaler to a secondary wholesaler located elsewhere in a distant place with a margin of 6.08%. In this transaction the marketing cost borne by the primary wholesaler is nil. Following transportation to the destined market the bunches are collected by the secondary wholesaler. After collection, money is invested on smoking (if necessary), wastage, storage and for overhead charges which amount to 6.95% to the secondary wholesaler. After a gap of 1-2 days, the bunches are sold to the retailer and in this transaction the secondary wholesaler gets a margin of 6.46%. After this stage, bunches are sold by the retailer either whole or as hands or fingers to the consumer, earning a market margin of 21.39% and with a marketing cost of 19.22% which includes the cost of loading, transport and wastage. In this whole process, channel 1 incurs a total market

Table 1. Marketing cost incurred in different channels and by different personnel.

	Harvesting charges	Loading and unloading	Overhead charge	Wastage	Commission charges	Smoking cost	Transport cost
Channel 1	+	+	+	+	-	+	+
Channel 2	++	+	+	+	+	+	+
Channel 3	+	+	-	+	-	-	+
Channel 4	+	+	-	-	-	+	+
Channel 5	+	+	-	+	-	+	+
Farmer	+	+	+	+	-	-	+
PHC	+	+	+	+	+	-	+
PWS	-	-	-	-	+	-	+
SWS	-	+	+	-	+	+	-
Retailer	-	+	+	+	-	+	+
Consumer	-	-	-	+	-	-	-

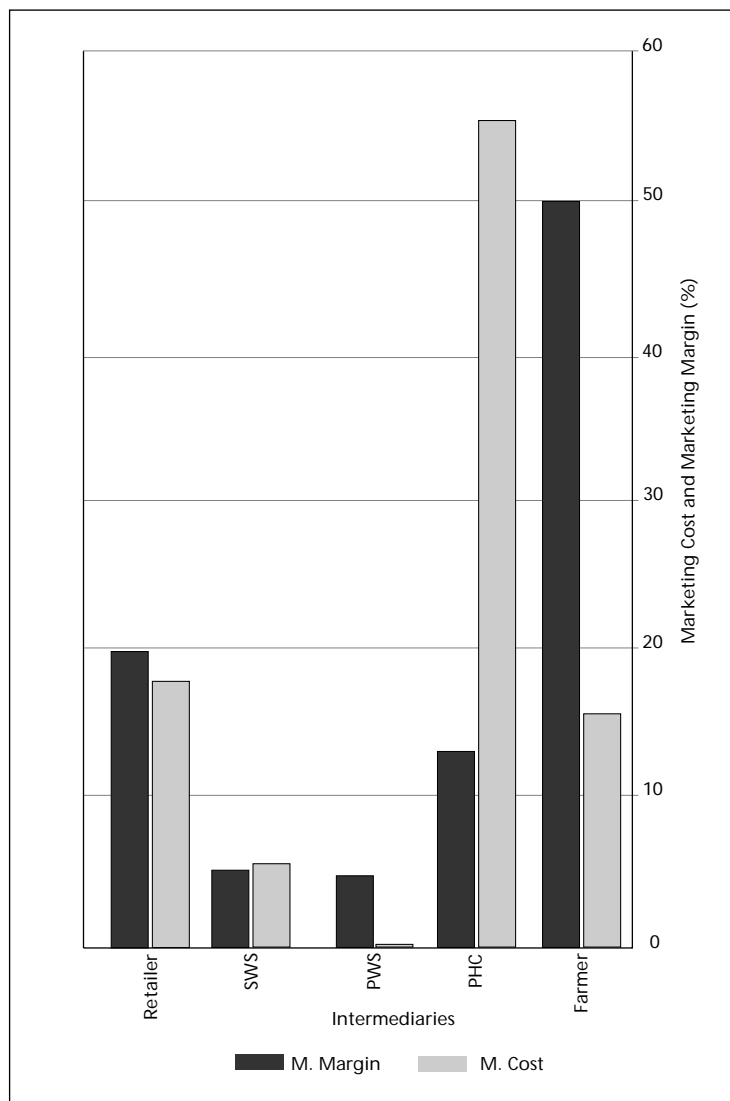


Figure 1. Market cost and market margin of different intermediaries.

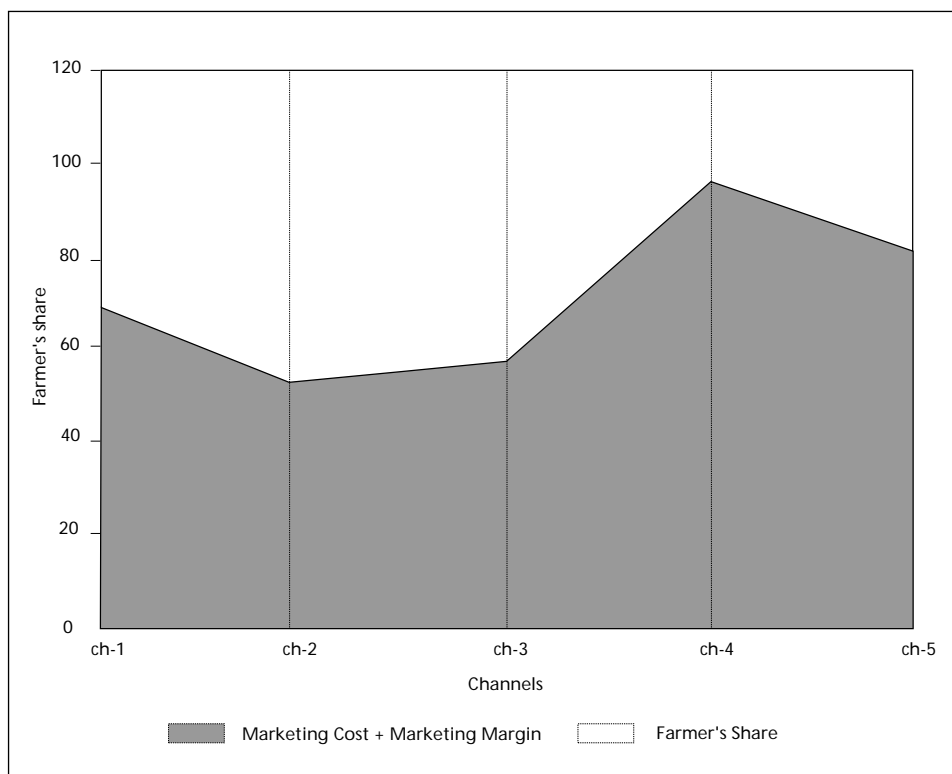
cost of 8.91%, with a market margin of 23% and a producer's share (Farmer's share) of 68.09% (Table 2).

In channels 2 and 3, the preharvest contractor is the main intermediary, rates being fixed on the farm itself by the preharvest contractor either at the shooting stage of the plant or at bunch maturation. 50% of the price is paid in advance to the farmer and harvesting is done as and when the bunches mature. The cost of harvesting, transport to the yard, loading and overhead charges are borne by the preharvest contractor. Bunches are sold to the primary wholesaler with a profit margin of 14.54% after incurring a market cost of 56.8%. The farmer is paid the remaining 50% of the cost of the produce

Table 2. Farmer's share, price spread and marketing efficiency in different channels.

	Marketing cost (%)	Marketing margin (%)	Farmer's share in consumer rupee (%)	Price spread (%)	Marketing efficiency
Channel 1	8.91	23.00	68.09	31.60	3.16
Channel 2	20.00	28.77	51.23	48.76	2.05
Channel 3	18.64	24.36	57.00	43.00	2.32
Channel 4	4.60	-	95.40	13.00	2.97
Channel 5	7.20	11.50	81.30	18.35	4.59

after all the bunches are sold. In channel 2, the bunches are sold by the primary wholesaler to the secondary wholesaler in a distant market, who in turn sells it to the retailer. The marketing cost in channel-2 is 20% with a marketing margin of 28.77% while the farmer gets back a share of 51.23% for every rupee spent on the bunches. In channel 3, bunches are sold by the preharvest contractor to the retailer directly instead of through the secondary wholesaler. Hence, a reduction in the marketing cost of 1.64% is observed with a marketing margin of 24.36. The farmer's share is also higher, at 57%. These channels are common in interstate marketing of bunches.

**Figure 2.** Farmer's share, marketing cost and marketing margin of different channels.

In channel 4, the marketing operations like harvesting, loading, transportation etc are carried out by the producer himself and the entire cost is borne by him. The bunches are sold directly to the consumer without any intervention by the intermediaries. Hence, the marketing cost in this channel is the lowest at 4.6% and the farmer gets the lion's share of 95.4% of the money spent on producing the bunches. This kind of 'farmer to consumer' situation is seen in villages where there is always a risk of incomplete marketing of the bunches and reduced demand.

Channel 5 resembles channel 4 in that harvesting, loading, transportation etc. are carried out by the producer himself who bears the entire cost. The only intermediary (between the producer and consumer) is the retailer. The marketing cost incurred in channel 5 is conspicuously less at 7.2% and the marketing margin lowest at 11.5%. The farmer gets 81.3% of the total money spent.

Price spread

A study of price spread involves not only ascertaining the actual prices at various stages of the marketing channel, but the costs incurred in moving the bunches from the farm to the consumer and the margin of various intermediaries. A higher price spread indicates reduced profit to the grower since there is a dilution of net profit obtained among the different middlemen in the channel. Price spread is observed to be highest in channel 2 (48.76%), followed by channel 3 (43%), channel 1 (31.6%), channel 5 (18.35%) and channel 4 (13%).

In channel 2 and 3, it appears that the farmer/producer is in an advantageous position since he gets 50% of the amount long before the harvest of bunches. Though he need not take the risk of harvesting, transporting and marketing, he will still lose as indicated by the lower farmer's share in the consumer rupee. In channel 2, the producer gets only 51.23% of what the consumer pays and this view is supported by the higher price spread of 48.76%. Even in channel 3, though the price is less widely spread than in channel 2 (43%), the farmer gets 57% of the total consumer price. Hence in these two channels, though the intermediaries spend money on marketing, the level of marketing margin is high, thus reducing the profit for the farmer. The only advantage to the farmer is that, irrespective of price fluctuations, he is assured of a reasonable price for the bunches he produces. Though the number of intermediaries involved is high in channel 1, the total marketing cost involved and margin obtained are less than in the 2nd and 3rd channel, thus increasing the farmer's share to 68.09%. This is confirmed by the decreased price spread of 31.6%.

The marketing system in which the grower directly harvests his bunches and transports and sells them to the retailer is more efficient, followed by channel 1. In this system, though the number of intermediaries is greater, the marketing system is efficient with respect to the share of the producer and consumer. In Channel 4, though the farmer gets the highest share, the system is not very efficient (2.97%). This may be due to the limited area of marketing and less demand. However he has other benefits such as not having to go too far away to sell his crop, which he usually sells on his farm or in the village market at a much lower cost, when compared to what he sells through

intermediaries. Hence his profit or income margin and his costs are all much lower, thus reducing the efficiency of the marketing system. In channels 2 and 3 the producer gets a lower price compared to the retail price to the consumer, thus making these systems also less efficient.

With only one middleman in the channel, price spread is reduced radically to 18.35% in channel 5 and the farmer's share increases to 81.3%. This is mainly due to reduced marketing costs and the reduced margin of the intermediaries. In channel 4, with no involvement of intermediaries in the whole marketing process, the farmer gets the lion's share of 95.4%, thus reducing the price spread to 13%.

Market efficiency

An efficient market is one where the movement of goods from producer to consumer takes place at the lowest possible cost consistent with the provision of the services desired by the consumer. According to Khol & Uhl (1980), marketing efficiency is the ratio of market output to market input. In the present study, the efficiency of different channels appears to be in the order, channel 5 (4.59) followed by channel 1 (3.16%), channel 4 (2.97%), channel 3 (2.32%) and channel 2 (2.05%).

Three basic components of marketing efficiency have been identified, namely, (a) The effectiveness with which a marketing service is performed, (b) The cost at which the service is performed and (c) The effect of this cost and the method of performing the service on production and consumption. With regard to these points, channel 5 appears to be the most efficient channel, involving no intermediaries or commission agents, with an efficiency score of 4.59%, followed by channel 1 (3.16%).

Processing chains of plantain chips

Plantain chip processing involves a big network in Kerala with thousands of workers including housewives, who routinely take up retail processing and distribution. The bunches are purchased by the wholesale or retail processing units from any of the three sources – primary wholesaler, secondary wholesaler or retailer – as shown in the flow chart (Figure 3). But purchase from a retailer is rare except for household purposes. Wholesale processing units are run by small scale entrepreneurs employing 8-10 workers with output depending on the daily demand, while small scale processing units are run by shops or restaurants along with other products.

Grading is done manually and 3-4 grades are maintained: very fine, good and undergrade. Prices are based on the grades and the chips are sold in different market strata. Packing in attractive covers is undertaken before distribution to retailers. The survey suggested a margin of 20-38% to the processor, depending on the size of the unit.

Problems associated with plantain supply channels

The basic problem lies with the production system without a spatial distribution of the harvesting season. As Figure 4 indicates, the peak harvesting season of commercial plantains is September-October, which coincides with the major annual festival of

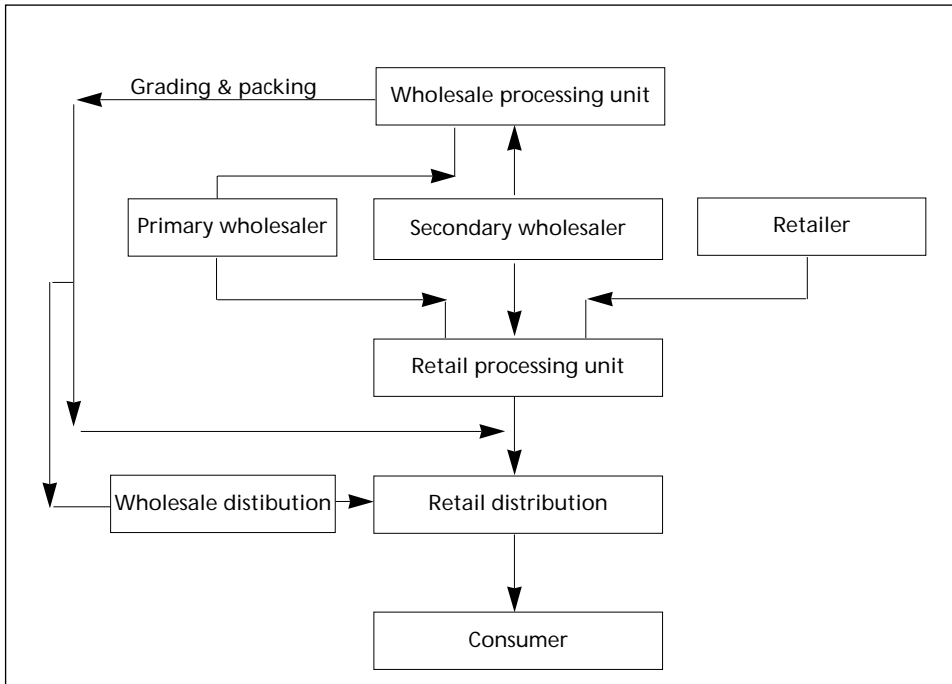


Figure 3. Flow chart depicting processing chains of plantain chips.

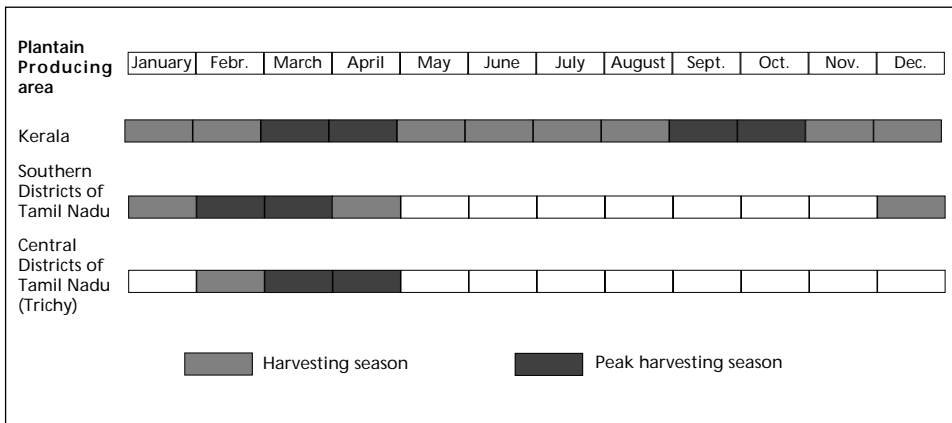


Figure 4. Spread of plantain harvesting season.

Kerala. Although in the lean periods of harvest i.e, the beginning and end of the season, bunches fetch very high prices in the market, a glut is a common feature in peak season. This brings down the price of fruits drastically since plantains have no market other than in Kerala State for distribution and consumption. Another glut is during March-April when it is a peak harvesting season in neighbouring Tamil Nadu. The annual planting

season of April-March is mandatory for plantain cultivation in Tamil Nadu because of the climate. The impact of glut is so great that the purchase price of plantains falls from a normal Rs 10-12 per kg to Rs 6-8 at wholesale markets. Producers and primary wholesalers are sometimes forced to go in search of remunerative markets but by that time fully matured bunches start ripening.

The glut was at a peak and producers were badly hit when a nation-wide truck strike was observed in 1997. The unfortunate coincidence of the strike with the peak plantain harvest season left the growers with no alternative than to dump the produce in manure pits. Though railways made arrangements for wagon transportation, it did not prove a successful alternative to truck transportation. Apart from such man-made calamities, at times natural calamities like whirlwinds and floods during bunch maturation change the complete supply scenario, and eventually force the grower to shift to other non-perishable local cash crops like sugarcane and cotton.

Conclusion

Plantain is one of the major crops of Tamil Nadu and Kerala, being grown on an estimated area of more than 25,000 ha. A restricted harvesting season and its perishable nature makes the crop highly risky. This situation is accentuated by natural and man-made calamities. More than six marketing channels were found to be operating, of which channel 5, where the crop passes directly from producer to retailer, was found to be efficient with reduced price spread and increased farmer's share, suggesting that co-operative marketing by banana growers directly to retailers is most efficient. This ensures a better share to the producer both for fresh consumption and for processing.

Processing of plantains as chips was found to be mainly operating on a small scale with completely manual operation with the processed chips being sold directly to the consumer. Processing of chips on a larger scale has a channel of wholesaler-retail distributor-consumer. There is a need for increased efficiency of chip processing units by mechanisation. A steady supply of plantains all the year round is an important factor in processing, as significant production is restricted to the months of October-November and February-April. Augmentation of the plantain production system and the introduction of suitable cultivars are required for a regular supply of plantains so that processing units are made more profitable. Meanwhile growers' co-operatives have proposed projects for developing small scale processing units near production sites to facilitate conversion of the raw material into its end products. This would reduce the risks involved in transportation and minimise the deterioration in quality.

References

- Acharya S.S. & N.L. Agarwal. 1987. *Agricultural Marketing in India*. Oxford and IBH publishing co., New Delhi, India. 380 pp.
- Anonymous 1994. *Annual Report of National Research Centre on Banana (ICAR)*, Trichy. 52 pp.

- Kohls R.L. & J.N. Uhl. 1980. Marketing of Agricultural Products, Macmillan Publishing Co inc., New York. 589 pp.
- Menon Rema & Aravindakshan. 1998. Collection, Characterization and Documentation of Plantains in Kerala State. Annual Report of the BIP Project. 27 pp.
- Moore J.R., S.S. Johl & A.M. Khusro. 1973. Indian Foodgrain Marketing. Prentic Hall of India Pvt. Ltd., New Delhi.
- Negi J.P., L. Mitra & H.K. Dabas. 1998. Indian Horticulture Database. National Horticulture Board, Ministry of Agriculture, Government of India, Gurgaon 122 015. 490 pp.
- Singh H.P. & Uma S. 1996. Banana cultivation in India - published by Directorate of Extension, Ministry of Agri. & Coop., New Delhi. 102 pp.