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Study on Marketing System and Value Addition of Pineapple Fruit (*Ananus comosus*) in West Bengal§

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Abstract

This paper has analysed the prevailing marketing systems and activities of value-addition in pineapple fruit (*Ananus comosus*) using primary data collected from two major pineapple, growing districts of West Bengal during 2010-11. The study has found that raw fruits are marketed domestically and also exported. The measures of marketing efficiency (Shephard: 8.42 and Acharya : 2.42) have suggested that pineapple cultivation is highly remunerative, but marketing of raw fruits is not done properly (a small number of buyers fixing prices with visual inspection). Therefore, price variations at producers' level are low (CV=8.55%). The producer's share is more than 66 per cent in consumer's price. Out of six marketing channels, two have the complete supply chain mechanism and only one channel is attached contractually with the private processing unit for which information seems to be limited for analysis. The processed products are also exported to the Asian and European countries. The sector has high capacity to provide employment in the rural areas. During lean season, the major demand for pineapple is fulfilled from North-East states, depriving the farmers of West Bengal to take advantage of this sector as reflected in near stagnation of pineapple area (CGR=-1.57%). The paper has suggested formation of pineapple growers' marketing co-operatives, development of infrastructural facilities (transport and communications), primary markets, storage and handling facilities, subsidization of inputs, etc. Besides, appropriate R&D efforts for up-gradation of technology and quality of raw pineapple fruits in the area are needed to ensure sustainability of the sector and augmenting farm income in the area.

Key words: Pineapple, supply chain, marketing efficiency, value addition, West Bengal

JEL Classification: Q13, R11

Introduction

Pineapple (*Ananus comosus*) is a tropical fruit and is commercially cultivated worldwide as a high-value crop. Its food value is very high as it contains vitamins A, B and C and minerals like calcium, potassium, magnesium and iron. It is also a good source of enzyme, bromelain. The fruit is consumed as both fresh and processed forms. A large number of value-added products like, jam, jelly mixed jam, etc. can be produced from it, which will provide remunerative prices to the farming community and will also generate employment for rural people. Considering the economic importance of the crop, Government of India has sanctioned one Agricultural Export Zone (AEZ) for pineapple in West Bengal. Pineapple is cultivated in an area of 89 thousand ha and its total production is

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1,415.00 thousand tonnes. It is abundantly grown in almost entire North-East region, West Bengal, Kerala, Karnataka, Bihar, Goa and Maharashtra states.

The export of pineapples has increased from 3031 tonnes (₹ 3.40 crore) in 2007-08 to 4,195 tonnes (₹ 6.03 crore) in 2011-12. West Bengal is the emerging state for pineapple cultivation, where it is produced in the districts of Darjeeling, Jalpaiguri, Dakshin Dinajpur, Uttar Dinajpur and Coochbehar. Presently, the state has 9900 ha area under this crop and produces 303.70 Mt which is 21.50 per cent of country's total production. The productivity of pineapple is the second highest (30.7 q/ha) in this state after Karnataka (58.2 q/ha).

The area under pineapple cultivation has remained almost stagnant for the past some years. However, from 2008-09, tendency of increasing acreage has been observed. Chakraborty and Bera (2008) showed that cultivation of this crop was highly labour-intensive (156 human days/acre). The viability of fruits largely depends on post-harvest operations and in pineapple, it is less than 10 per cent. In spite of several processed products like like jams, jellies, pickles, sauce, canned sliced fruits and squash, post-harvest scenario of the fruit crop in West Bengal is not yet fully developed (only 0.5 – 1%) (ToI, 2016). The employment generation by this sector accounted for more than 3.5 lakh human-days during 2012-13 (www.foodprocessingindia.com). Only two private companies namely, Dabur India Ltd. and Calypso are involved with processing of pineapple products. In West Bengal, the majority of pineapple cultivators are marginal and small farmers and they cannot undertake value-addition operations. Their income is also restricted due to low selling price of raw pineapple in the existing marketing system. So, considering the economic impact of pineapple cultivation on the farmer-growers, efficient marketing of raw pineapple assumes much importance.

Under the present scenario of pineapple fruit marketing in West Bengal, this study was conducted with the following specific objectives :

- To study the existing marketing system,
- To identify different supply chain mechanisms and examine their marketing efficiency, and
- To find potential of value-addition operations and products marketing.

Data and Methodology

The study has been conducted with the primary level data collected from farmers in two major pineapple growing districts, viz. Darjeeling and Uttar Dinajpur of West Bengal during 2010-11. A total of 204 farmers were selected from six villages of two blocks, viz. Phansidewa of Darjeeling and Chopra of Uttar Dinajpur, from the following catchment areas of markets (APEDA, 2011-12) using multistage random sampling technique.

Darjeeling	Takdah, Pedory, Thode, Sivok*, Mirik, Matigara*, Baghdogra*, Ragtong, Sukna, Batasi.
Jalpaiguri	Damdin, Ramshai, Goyerkata, Neora Nadi, Mainaguri.
Dakshin Dinajpur	Kushmandi, Bansihari, Gangarampur, Balurghat, Hilli, Harsura, Patiram, Badalpur.
Uttar Dinajpur	Daspara*, Ramganj, Dhantola*, Panjipara*, Kanki, Karandighi
Coochbehar	Natabari Hat, Jamaldaha Hat, Haldibari, Sitalkuchi,Tufanganj, Bhainkuchi, Dinhata.

**Selected area*

Though the number of sole-producers of pineapple was limited, proportionate representation was considered for three types of farmers: (i) sole pineapple producers, (ii) growers of pineapple along with other crops including tea plantation, and (iii) pineapple growers along with other crops excluding tea plantation. The data pertaining to market information were collected from different market intermediaries.

There are only two privately-owned processing units (Dabur and Calypso) in the area. The officials of these units were consulted to get information about the types of processed products, availability of raw material (pineapple), cost of production (including labour cost), price, profitability, marketing system, etc. The available data, though limited, have been treated as primary data for analytical purpose. The Shepherd and Acharya's approach was used to measure the marketing efficiency (Acharya and Agarwal, 1987).

The Shepherd approach to measure marketing efficiency (ME) can be depicted as :

$$MME = RP \div MC$$

and the Acharya approach to measure marketing efficiency (ME) is depicted as :

$$MME = FP \div (MC+MM)$$

where,

MME = Measure of marketing efficiency

RP = Price paid by the consumer

MC = Total marketing cost

MM = Net marketing margin, and

FP = Farmer's price

A few marketing channels are extended to outside the state or even outside the country. In that case, marketing efficiency was measured based on the purchasing price of final middleman and, for other, it was the consumer's price. Besides, compound growth rate (CGR) and coefficient of variation (CV) were estimated for the time series data and price data, respectively.

Results and Discussion

Existing Marketing System

The variety 'Kew' of pineapple has been found to have high demand in both domestic and international markets. This fruit is big in size, deep yellow to coppery yellow in colour, eyes are broad and flat, flesh colour is pale yellow to yellow, with T.S.S. of 12-14 obrix. The market at Bidhannagar is the chief market for pineapple. Two distinct marketing systems prevail for raw fruit. In the first, the fruits are sold at the orchard field itself. The pineapple-cultivators mainly small and marginal farmers, sell their produce through trade agents (*paikars*/wholesalers) at the village level. This system constitutes the major share of pineapple marketing (90%). In the second system, fruits are brought by the farmers with their own arrangements to the market where various marketing functionaries are involved. A large proportion of the supplied fruits finds its further marketing to different cities like Kanpur, Lucknow, Delhi, Mumbai, Jamshedpur and Ranchi (Chadda *et al*., 1998) and even to the neighbouring countries like Nepal, Bangladesh, etc. (Sarkar and Rahim, 2008).

The price of pineapple is fixed according to its weight and quality. Some buyers (middlemen) fix the price usually through visual inspection only. Without proper grading system, farmers are being affected for not getting appropriate prices.

Marketing Channels

There are six major marketing channels in this area through which pineapple fruits are transacted from producers to consumers. Among these, two are complete and the other four are incomplete in the sense that some stakeholders are not reported. The identified channels are:

Channel-I : Producer→Wholesaler→Outside markets→ *Consumer

Channel-II : Producer→Trade agent → Wholesaler →Outside market→*Consumer

Channel-III : Producer→Wholesaler→Retailer Consumer

Channel-IV : Producer→Trade agent→Wholesaler→ Retailer→Consumer

Channel-V : Producer→Wholesaler→Factory→ Outside market→*Consumer

Channel-VI : Producer→Wholesaler→Middle agent →Outside market→*Consumer

*incomplete channel

The incomplete (or open) channels are extended to the markets in other states like Bihar, Delhi, Uttar Pradesh, Punjab, Haryana, etc. In West Bengal, Kolkata is a good market. Among different channels identified, Channel-II, viz. Producer→Trade agent→ Wholesaler→Outside market→Consumer, is found to be most prominent. This is followed by the Channel-I, i.e. Producer→Wholesaler→Market functionaries→ Consumer, which is the shortest route. In this channel, the fruits are brought directly at wholesaler's go-down at producer's cost. The fruits are then graded into three categories according to their size and vigour, viz. (i) Grade-I, <1.0 kg, (ii) Grade-II, 1.0-1.5 kg, and (iii) Grade-III, >1.50 kg by visual inspection only before sending to the outside market(s) through truckloads. The retail shop owners sell the products in two forms, viz. raw fruit and juice of raw pineapple. Chadda *et al*. (1998) had also reported that pineapple was sold through either trade agents at village level or commission agents at the market.

Wastage during Marketing

The marketing of fresh pineapple poses a serious problem due to its high perishability. According to

Table 1. Loss in quantity of pineapple fruit (raw & ripen) during transportation

Market intermediatory	Marketing loss (%)		No. of days for which fruit remains	
	Ripened fruit	Raw fruit	Ripened fruit	Raw fruit
Wholesaler	13.00	1.07	1.20	2.53
Retailer	7.40	0.90	1.60	3.20
Trade agents	12.80	1.40	2.00	2.40
Total (%)	29.55	2.50	4.80	8.13

Central Food Technological Research Institute (CFTRI), Mysore (2007), losses due to spoilage in transit were as high as 48 per cent while bringing fruits from Agartala to Kolkata. In Bidhan Nagar market, total losses for raw and ripened fruits were 2.50 per cent and 29.55 per cent, respectively. The major part of loss (1.4%) occurs during transportation of raw fruits and for ripened fruits, it is 13 per cent which occurs in wholesalers' store. The Table 1 presents the extent of loss at different stages of marketing functions.

Marketing Margin and Marketing Costs

The difference between the price paid by consumer and the price received by the producer for an equivalent quantity of farm produce is known as farm-retail spread, or price spread or marketing margin (Acharya and Agarwal, 1987). Of the two concepts, viz. *concurrent margin* and *lagged margin*, concept of concurrent margin was used in this study. The major components of marketing cost usually consist of transportation, spoilage, market fee, commission, etc. The marketing margins have been estimated in the range ₹ 4,449 (channel-I) to ₹ 5,000 (channel-II) in Uttar Dinajpur and ₹ 4,156 (channel-III) to ₹ 4,656 (channel-V) in Darjeeling district (Table 2). Price variation remains insignificant in all the channels which commemorates with the CV (coefficient of variation) value 8.55 per cent.

The marketing cost is slightly lower in Darjeeling than in Uttar Dinajpur due to locational advantage. Hadi (1994) had also revealed that the transportation cost was the major cause of increasing marketing margin. The profit margins were in highest and also same in Channel-V in both the markets. Steps like regulation of markets for pineapple and integration of production, marketing and processing activities would go a long way in lowering the marketing cost and thereby encouraging the cultivators for self-marketing. In recent times, grower marketing co-operatives have come into service in Kerala, Karnataka, Odisha, Assam and Manipur to undertake marketing of fresh pineapple (APEDA, 2011-12).

Of the total marketing margin, about 57- 64 per cent goes to the (profit) margin of the market intermediaries and 36–43 per cent remains as marketing cost. Out of the 3-4 main market intermediaries (*paikars*/trade agent, wholesalers, retailers, trade agents), wholesalers take the lion's share (70-80%) of total profit. Yosoff *et al*. (2010) have also found that the biggest share of value chain is occupied by the wholesaler in the Malaysian pineapple market. The

Table 2. Marketing margin, marketing cost and profit margin

(in ₹)

Channel	Uttar Dinajpur market			Darjeeling market		
	Total margin	Marketing cost	Profit margin	Total margin	Marketing cost	Profit margin
I	4,449	1,906	2,543	4,206	1,663	2,543
II	5,000	2,106	2,893	4,450	1,870	2,579
III	4,399	2,123	2,276	4,156	1,880	2,276
IV	5,000	2,323	2,676	4,400	2,087	2,312
V	4,899	1,906	2,993	4,656	1,663	2,993
VI	4,419	1,906	2,513	4,176	1,663	2,513

Table 3. Percentage profit of different marketing agents in pineapple

Channel	Agent	Profit margin (₹)		Profit margin (%)	
		Uttar Dinajpur	Darjeeling	Uttar Dinajpur	Darjeeling
Channel -I	Wholesaler	2,543	2,543	100.00	100.00
Channel- II	Trade agent	413	99.27	14.29	3.85
	Wholesaler	2,480	2,480	85.71	96.15
Channel- III	Wholesaler	1,993	1,993	87.57	87.57
	Retailer	283	283	12.43	12.43
Channel -IV	Trade agent	463	99.27	17.32	4.29
	Wholesaler	1,930	1,930	72.11	83.47
	Retailer	283	283	10.57	12.24
Channel -V	Wholesaler	2,993	2,993	100.00	100.00
Channel -VI	Wholesaler	2,513	2,513	100.00	100.00

details of estimates of profit margin are presented in Table 3.

Producer's Share in Consumer's Price

The producers sell their crop mainly through trade agent at village or through commission agents at the market. Direct selling to the processing industries (value-addition) is negligible; though pineapple is used mostly for processing purposes resulting in long chain intermediaries in the marketing process. Table 4 shows the estimates of producers' shares in different supply chains. It shows that producer's price is in the range ₹ 8,500 - ₹ 9,100 per tonne of raw pineapple, which is more than 66.74 per cent of consumer's price for both the complete channels.

The producer's share in consumer's price is lower in Uttar Dinajpur (62.96 - 67.41%) compared to in Darjeeling (66.74-69.21%). The produce's share is found to be highest in Channel-III in both the districts and lowest in Channel-IV of Uttar Dinajpur and Channel-V of Darjeeling. This low share is due to small size of intermediaries and low marketing functions. A higher share is derived for relatively large size of intermediaries with more marketing functions.

Several studies have revealed that most of the profit is pocketed by the intermediaries (Chadda *et al*., 1998). The producer's share in consumer's rupee may be increased by decreasing the number of intermediaries in the existing marketing system (Sharma and Singh, 2006). Ladaniya *et al. (*2003) have found that retail level marketing or producers' cooperatives can provide higher net returns to the producers and can help in minimizing exploitation of the producers.

Marketing Efficiency

The marketing efficiency is the ratio of market output (satisfaction) to marketing input (cost of resource). An increase in this ratio implies improved marketing efficiency and vice-versa. Or, it is the effectiveness or competence with which a market

Table 4. Producer's shares in consumer's price in different marketing channels in West Bengal

Channel	Consumer's price(RP) (₹ /tonne)	Farmer's price (FP) (₹ /tonne)		Producer's share (%)	
		Uttar Dinajpur	Darjeeling	Uttar Dinajpur	Darjeeling
Channel-I	13,550	9,100	9,343	67.16	68.96
Channel-II	13,550	8,550	9,100	63.10	67.16
Channel-III	13,500	9,100	9,343	67.41	69.21
Channel-IV	13,500	8,500	9,100	62.96	67.41
Channel-V	14,000	9,100	9,343	65.00	66.74
Channel-VI	13,520	9,100	9,343	67.31	69.11

Table 5. Marketing efficiency for different marketing channels

Particulars	Channel-I (open)		Channel-II (open)		Channel-III	
	Uttar Dinajpur	Darjeeling	Uttar Dinajpur	Darjeeling	Uttar Dinajpur	Darjeeling
Sepherd's method (ME) ½	7.11	8.15	6.43	7.24	6.36	7.18
Acharya's method (MME) 4/(2+3)	2.05	2.22	1.71	1.77	2.07	2.25
	Channel-IV		Channel-V (open)		Channel-VI (open)	
	Uttar Dinajpur	Darjeeling	Uttar Dinajpur	Darjeeling	Uttar Dinajpur	Darjeeling
Sepherd's method (ME) ½	5.81	6.47	7.34	8.42	7.09	8.13
Acharya's method (MME) 4/(2+3)	1.70	2.07	1.86	2.01	2.06	2.24

structure performs its designed function (Acharya and Agarwal, 1987). Details of estimated marketing efficiency in pineapple have been presented in Table 5.

A perusal of Table 5 reveals that Channel-V is the most efficient marketing channel having Sheperd's Index values of 7.34 and 8.42 for Uttar Dinajpur and Darjeeling districts, respectively. But when judged from the farmers' prices, i.e., using the Acharya's Index, marketing efficiency was better in Channel-III for both the districts.

Value Addition and Marketing

In India, the proportion of fruits used for processing is less than 10 per cent and in the study area, it is only 0.5% (APEDA, 2011-12). Kumar *et al*. (2011) have estimated that income elasticity is lowest for cereal groups and highest for horticultural and livestock products. Three types of processed products are mainly prepared from pineapple, viz. (a) juice or concentrates, (b) jam, and (c) tit-bits/canned pineapple.

In the study area, two private sector processing units, namely, Dabur India Ltd. and Calypso deal with pineapple products. The Dabur produces juice and canned pineapple. Its processing capacity is around 100 tonnes/day (vegetable pastes and fruit juice and concentrates) and the total volume produced per day is around 8 tonnes. The Calypso processes 80 tonnes of pineapple/day and markets its products in Europe and Japan. However, no information about the quantity exported was available. We have calculated the cost and return of pineapple juice based on information collected from both the units and the same is presented in Table 6.

Table 6. Cost and return in production of pineapple juice

Major items	Total value (₹)	Per litre cost (₹)
Cost of production		
Fruit	40000	12.50
Labour	30000	9.375
Other costs	160000	50.00
Total	230000	71.87
Selling price	272000	85.00
Net price received	32000	13.13

The processing sector is connected with other units located at Jaipur, Faijabad and Nepal. The products are also exported to other Asian as well as European countries. The sector has high capacity to employ labour in production of pineapple products.

Major Constraints in Marketing System

- Weak forward and backward linkages.
- Supply of quality pineapple is for a short period due to poor storage and cool-chain facilities.
- Infrastructure for grading and standardization not available.
- Pricing mechanism is not scientific (based on visual inspection only).
- Lack of cooperative approach for improving bargaining power.

Conclusions

The study has found that pineapple cultivation is highly remunerative and has high potential for value-addition and export, but the marketing of raw fruits is done in a nearly imperfect manner (few buyers fixing prices). The price variation is low (CV=8.55%), but pricing system of pineapple is not yet developed. The poor processing facilities restrict the expansion of acreage of this crop. The study has also found that out of six marketing channels followed in the study area for pineapple marketing, only one is linked through contract with the private processing units. The supply of raw materials for value-addition in pineapple fruit (juice) is usually met from North-East states, depriving the local producers. The sector has high potential to generate employment in the rural areas. The study has found that processed products of pineapple are exported, though in small volume, to Asian and European countries. The lack of infrastructural facilities discourages the resource-poor farmers from expansion of area under this crop. Hence, more investment in infrastructure development and R&D for upgrading the quality of fruits is needed to ensure sustainable income for the farmers.

Recommendations

- Pineapple being a highly sensitive fruit to atmospheric temperatures, there is an urgent need to develop infrastructural facilities (transport, communications, storage, etc.), primary markets, cool chain facilities, subsidization of inputs, etc.
- There is a need to form pineapple growers' marketing co-operatives.
- The Special Committee for Pineapple Development (SCPD) needs to play a more active role.
- Since the area falls under AEZ, it is suggested to use appropriate R&D for upgradation of technology and quality of raw pineapple fruits of the area.

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References

Acharya, S.S. and Agarwal, N.L. (1987) Marketing efficiency, marketing costs, margins and price spread. *Agricultural Marketing in India*, **4**(1): 385-396.

APEDA (Agricultural and Processed Food Export Development Authority), Ministry of Agriculture, Govt. of India : Various Reports including for the years 2011-12 & 2012-13.

Chadda, K.L., Reddy, B.M.C and Shikhamani, S.D. (1998) *Pineapple*. Indian Council of Agricultural Research, New Delhi. pp. 14-99.

Chakraborty, A.J. and Bera, B. (2008) A study on structure of costs and returns of pineapple cultivation in Darjeeling district of West Bengal. *Journal of Crops and Weeds*, **4**(2): 24-30.

Hadi, P.U. (1994) Effect of supply on marketing margins: The case of South Sumatra's fresh pineapple. *Acta Horticulture*, **369 :**180-198.

Kumar, P., Kumar, A., Shinoj, P. and Raju, S.S. (2011) Estimated demand elasticities of food commodities in India, *Agricultural Economics Research Review*, **24** : 1-14.

Ladaniya, M.S., Wanjari, V. and Mahalle, B.C. (2003) Price spread of pomegranate. *Indian Journal of Agricultural Economics*, **58**(4): 800-811.

CFTRI (Central Food Technological Research Institute) (2007) *Annual Report*. Available at: www.pbplanning.gov.in

Sarkar, D. and Rahim, K. (2008) *Production Economics and Marketing of Fruits and Vegetables*, Springers Publication, New Delhi. pp. 35-124.

Sharma, D.K. and Singh, K.V. (2006) Marketing of mango in Haryana. *Agricultural Marketing*, **L**(1) : 32-36.

Times of India (2016) Pineapple farmers in West Bengal under deep crisis. August 11.

Case Study in Rubber, Pineapples, Vegetables and Paddy Industries Yosoff, Md. and Rohani Md. Yon (2010) Case Study in Rubber, Pineapples, Vegetables and Paddy Industries A case study in rubber, pineapple, vegetables and rice Industries in Malaysia. Available at : www.academia.edu.

Websites

www.idiastat.com

www.aximbankagro.com

www.pineappleindia.com

www.westbengalonline.com

www.e.wikipedia.org/wiki-Uttar_Dinajpur_District

www.foodprocessingindia.com

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