Economics of agribusiness in arecanut processing – an analytical study in Terai Zone of West Bengal

G. MULA, S. C. SARKER AND [1]S. MONDAL

Department of Agricultural Economics, [1] Department of Agricultural Extension
Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar - 736165, West Bengal, India

ABSTRACT

The study assessed the economic opportunities in agribusiness of arecanut processing based on primary data collected from 190 processing units from three districts of Terai zone of West Bengal. Both PRA and survey methods were adopted for data collection. The investigation revealed that 77.37% processing units were run by the owners using own land and 63.68% of processing units remained under single ownership. An average fixed investment of ₹ 96595.00 was needed for establishment of a standard arecanut processing unit having capacity of processing 715 qtls raw arecanut. The processing activities are done in two phase viz. early season from Mid-November to Mid-April for the preparation of Tipni, Rota (Red), Rota (white), Sagar etc. grades and late season starting from Mid-April to Mid-June to produce Maza, Fali and Mala grades. In early season, from the processing 625 qtls of green arecanut, 69.825 qtls processed products was obtained of which 43.25% Tipni, 30.04% Rota, 14.21% Sagar and 12.50% other grade. The net return was examined to be highest for Sagar grade (₹ 9977.71 q[-1]) followed by White Rota (₹ 7577.17 q[-1].) with a benefit-cost ratio of 1.56:1 and 1.43:1 respectively and in late season, the Maza grade hold benefit of [1] 1983.50/qtl and for Mala it was ₹ 5991.48 q[-1] The average annual net return of such unit was estimated of ₹ 472760.38 with B: C of 1.30:1 and could generate employment of 1080.50 mandays. The said agribusiness activity may be taken as an important livelihood options for successful entrepreneurship development particularly in group approach.

Keywords: Agribusiness, arecanut, employment, Maza, net return,Tipni

Arecanut commonly known as betel nut and commercially named, as supari is the fruit of arecanut palm (*Areca catechu* L.*)* belong to Palmae family. It has a history of being in use approximately 3500 years in India. It plays a significant role in the religious, social as well as ceremonial purposes in India. It is commonly used for mastication with betel leaves. Arecanut is cultivated in different climatic and soil conditions, particularly in India, Bangladesh, Sri Lanka, Malaysia, Indonesia, Philippines and Myanmar (Jose and Jayasekhar, 2008). India is the largest producer of arecanut in the world according to FAO statistics for 2013, accounting 49.74 per cent of world output and exports to many countries. At present, India has attained self-sufficiency with regard to arecanut production. About three million people are depended either directly or indirectly with production, processing and marketing sectors (Nelliat, 1981) and provide income as well as livelihood security to more than 3 crore people in India (Kammardi, 2012). Major portion of the arecanut production is exported to countries like Singapore, Kenya, Saudi Arabia and United Kingdom in various forms. India exported 1750 tonnes of arecanut and its products to more than 40 countries during 2009-10, (Kammardi, 2012). Within India, as of 2013-14, Karnataka produced 62.69 per cent of the production followed by Kerala (13.77%) and Assam; all three states together accounted 88.59% of total production. The

other major states where arecanut is also grown are Meghalaya, West Bengal, Mizoram, Tamil Nadu and Tripura. From an area of 11.39 thousand hectares West Bengal produced 21.16 thousand tonnes arecanut constituting 2.90 per cent of India's total production in 2013-14 (Mallikarjunaiah and Prakash, 1988).

Arecanut is an important plantation crop of the state of West Bengal. Arecanut kernel thus obtained from the fruit is chewed both as raw nut and in processed form. Fully ripe arecanut is generally used by the consumers of Assam, Kerala and Northern parts of West Bengal for mastication.

The post-harvest processing consists of dehusking of arecanut and its boiling followed by drying of the boiled arecanuts. However, on the farmers' part it requires upfront investment for the process (Kolur *et al., 2012)* Processing of arecanut in West Bengal is a traditional occupation. Grading is usually done by the wholesalers but they generally do not follow scientific method. Grading is done on the basis of size, colour and better quality of fruit (Bhalerao *et al*., 1985). The important factors affecting the quality of arecanut are colour, tenderness, gleam, shape, weight *etc.* (Kolur *et al., 2012*). Danti and Suresha (2012) recently proposed a technique for classification of arecanut based on texture features. Investment requirement for establishment of arecanut processing unit at farm level

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Email : gobindamula@gmail.com

was ₹ 59,481 of which 66% was the cost of building (Chinnappa 2000). Benefit-Cost Ratio (BCR) is one of the common indicators of economic analysis suggested by Gittinger (1984) and was applied by ias (1985), Bhalerao *et al.* (1982) and others to test the economic viability of the investment in arecanut processing. Arecanut processing is an important operation to make it available to the consumers in various processed forms. Therefore, it is important to know the different stages of processing and the cost involved in each stage. The total cost of value addition for one qtl of green arecanut in cooperative unit was ₹ 15,217 and ₹ 15,290 in private units. The net profit earned by processing unit by marketing of one qtl finished product was ₹ 4783 in co-operative unit and ₹ 4218 for private unit (Kolur *et al.,* 2012). In West Bengal Processing of Arincanut is done in two phases *viz.* early season and late season. The early season start from Mid-November to Mid-April for the preparation of Tipni, Rota (Red), Rora (white), Sagar *etc.* grades by using green immatured nuts and late season starts from Mid-April to Mid-June to produce Maza, Fali and Mala grades by using fully ripen nuts.

Processing units of arecanut generate employment in the rural areas particularly for women and minor labours (age below 18 years) during their leisure time. On an average, each acre of arecanut creates around 250 mandays for cultivation and another 200 mandays for processing annually (Mallikarjunaiah and Prakash, 1988).

The present study was analyzed and examined the agribusiness opportunities in respect of investment requirement, the cost and return aspects of different grades of processed output and employment generation capacity of different processing units in particular. The classification, ownership pattern of processing units as well as the conversion rate from green to processed nuts was also analyzed duly.

MATERIALS AND METHODS

The study was carried out in three districts *viz.*, Cooch Behar, Alipurduar and Jalpaiguri of Terai zone of West Bengal in 2018-19. The studied was conducted based on primary data collected from 190 processing plants from the said three districts using multi-stage sampling with a district as the first-stage unit, a block as the second-stage unit and an areacanut processing plant as the ultimate unit of sampling. The said districts were selected purposively based on maximum concentration of processing unit. Two blocks from each district were selected purposively based on concentration of business activities to get adequate information. The complete enumeration of each block was taken for ultimate units of sampling of 190 for the

study. The primary data was collected with the developed questionnaire from respondents through personal interview method. Out of 190 processing plants surveyed from six developmental blocks, 63.16 per cent was located over two blocks of Alipurduar districts, 26.16 per cent over two blocks of Jalpaiguri district and rest 10.53 per cent was established over two blocks of Cooch Behar district (Table-1). The clusters were being developed within contiguous villages having due favour of raw material availability, labour supply and market access.

Table 1: Distribution of arecanut processing plants in the study areas

Districts	Block (business cluster)	No. of processing units
Cooch Behar	Dinhata -I	15
	Cooch Behar-I	5
	Sub-total	20 (10.53)
Alipurduar	Kumargram	65
	Falakata	55
	Sub-total	120 (63.16)
Jalpaiguri	Dhupguri	35
	Maynaguri	15
	Sub-total	50 (26.31)
Grand Total		**190 (100.00)**

Analytical techniques

Descriptive statistical analysis such as mean, percentage *etc.* were employed in order to present the basic characteristics of sample arecanut processing unit and also to compute cost of production and return from output. The efficiency measures particularly net return and Benefit-Cost ratio were also estimated to examine the stability and sustainability of the agri-business in arecanut processing. To estimate the gross return from marketing of output the ongoing market price of different grades of processed arecanut was taken.

In order to estimate the magnitude of fixed cost associated with arecanut processing, the annualized depreciation of implements, machinery and farm buildings was done. The Straight Line Method was followed to calculate annualized depreciation. The formula of Straight Line Method is appended below

Annualized depreciation =

$$\frac{\text{Purchase Value} - \text{Junk Value at the life end}}{\text{Economic life in years}}$$

RESULTS AND DISCUSSION

The classification of arecanut processing units in the study areas on the basis of number of oven possessed by owner is presented in table 2. The capacity of processing unit was measured by number of oven it possessed locally known as 'chulli', made of clay soil and iron rod. The volume of business operated by the processing units depend not only on the availability of green arecanut but also the number of oven operated by processing unit for boiling of green arecanut. One oven can boil upto 4.8 qtl of green nut in a day. The single oven processing unit was generally managed under individual capacity with low business strength. The number of oven may be taken as an indicator of processing unit size. We can say that unit with less than 3 chulli indicating small size, while those having 3-5, 6 -8 and more than 8 numbers of chulli, may be named as medium, large and larger unit respectively. The results showed that out of 190 processing units in the study area 21.05, 26.32, 31.58 and 21.05 per cent belonged to small, medium, large and larger category respectively. In two blocks of Cooch Behar no small processing units were found while other two districts more that 50% processing units were of large and larger category. The reason could be the huge production and adequate local supply of green arecanut to the processing units, supplemented by adequacy of local labour.

The ownership pattern of arecanut processing units is delineated through table 3. Processing units were operative both under single proprietorship and multimember partnership. From the analysis of the ownership it was found that out of 190 processing units 63.68 per cent run under single ownership and 36.32 per cent with partnership approach. One of the primary impediments of establishing processing plant is the availability of an open yard required for sun drying of decorticated nuts after boiling. The face value of such yard adjacent to market fringe is quite high. Hence the entrepreneur having such land enjoy added opportunity to establish a processing unit either by his own or through augmenting working partnership with any other landless one. Sometimes such land may also be given on lease either to a single person or to a group of entrepreneurs. Hence there existed four types of arrangement, single owner processing unit with own yard, single owner processing unit with leased-in yard, multi owner partnership processing unit where land owner as a partner and multi owner partnership processing unit with leased-in yard. Under single proprietorship out of 121 processing units 90.91per cent had own yard out of which 63.64 per cent belonged to two blocks of Alipurduar district. On the contrary under partnership business 53.62 per cent processing units

were established by partnership with land owner and rest upon leased in land only. It can be concluded that availability of processing yard with self-ownership of the proprietor plays the key role behind the establishment and prosperity of such processing unit.

The average estimated investment for establishment of standard arecanut processing units having 5 ovens is presented in table 4. The estimation was prepared for a 5 oven processing unit exclusive of lease value of land and interest on fixed capital. The working capacity of a standard processing unit is 25 packet green arecanut (each packet 80 kg in net weight) per processing cycle and average 32 cycles covered in early season (November to April). The input items required for establishing the unit are mud oven (made of clay and iron rod), processing yard *i.e.* brick floor with metal shed (partly shaded open floor), vessel made of copper or aluminium for boiling, ladle for stirring (made of wood), knives (locally called Zati used for decortications), processing fork (used for Tipni grade), polythene wrapper, gunny bag, gas chamber (made of bamboo and plastic used for fumigation), tarpaulin, hand tube well (for water supply) and carrying van (for carrying the goods ready to use as and when required). The table gives an average static review of respective costs based on 2018-19 market prices; however the same may change marginally from place to place according to local adjustment. Over time costs may increase but the quantity of inputs remain same. At 2018-19 market prices, the estimated establishment cost was found to be ₹ 96595.00 of which 56.94 per cent expenditure incurred for construction of building *i.e.* brick floor with metal shed, durable for about 11 years. The above finding is also analogous to the study of Chinnappa (2000). It was important to note that no new investment for fixed assets was required except for small repairing for about 3 years. The other major investment expenditure was made for purchase of boiling equipment such as two large vessel locally called Deski, van for carrying arecanuts, preparation of oven, purchase and installation of hand tube-well with plastic pipe, construction of gas chamber, and purchase of tarpaoulin used for sun-drying arecanut to the tune of 14.23, 5.22, 4.87, 4.66, 3.99 and 3.88 per cent respectively. The average economic life of major capital items *viz.* vessel, oven, van and hand tube-well was found 4.5 years for each. The annualized depreciated value of capital inputs for a standard processing unit to be regarded as fixed cost component for the processing of 625 qtls raw arecanut was also calculated and shown in table 4. The total estimated value of annualized depreciation of capital items was found to be ₹ 7932.32. It is pertinent to note that all such capital inputs are basically used during early activities of the season and thus said cost

component was accounted with for the preparation of processed products *viz.* Tipni, Rota, Chickini (Sagar) etc grades only. The processed products (grades) obtained during late phase of the production season hardly demand any use benefit out of such capital inputs.

The clarity about the possible product mix and their conversion rate from green to processed dry nuts in early season activity of a standard processing plant is presented through table 5.1. From the operational point of view the whole processing season needs to be observed in two phases *viz.* early and late. The former exists between Mid-Novembers to Mid-April, relates with harvested premature fruits processed through pre-boiling before sun drying and the later exists from Mid-April to Mid-June consisting of the preparation of Maza, Fali and Mala grade from fully matured arecanut. The commercial grades obtained in early season activity are Tipni with fumigation (TFG), Tipni without fumigation (TFWG), Rota Red, Rota White, Chickni which is also called Sagar and others. Here other grade includes Paniwala, Maradana, Chur, Tukari, Gunglee *etc*. It is noticed from the table 5.1 that conversion rate is varied over the time in early season processing. It is generally increasing as the season proceeds. On an average 9.50 kg, 11 kg and 12.75 kg of dry processed product may be obtained from 100 kg of immature green fruits during the period of November to December, January to February and March to April respectively. The productivity is less during early months because of high moisture content in premature fruits. Although the trend of conversion rate of TFG, TFWG, and Sagar is decreasing as the season proceeds but for Rota Red, Rota White and others grades it is increasing trend. The grade TFG, TFWG, Chickni (Sagar) are mainly processed from comparatively more premature nuts but Rota Red, Rota White are prepared from half matured nuts particularly Rota White. Accordingly a standard processing plant could produce 69.825 qtls dry processed products using 625 qtls green nut over the period of six months *i.e.* from early season processing activity. Out of 69.825 qtls of processed product 23.31% TFG, 19.94% TFWG, 14.21% Chickni, 14.80% Rota Red, 8.84% Rota White and 12.50% others grades could be produced (vide table 5.2.1). It is to be noted here that other grades *viz.* Paniwala and Gunglee are produced in option only and also based on specific demand come from the consumers while Maradona, Chur and Tukari are basically by-products of the processing operations. It was also investigated that about 45.60 per cent green arecanut was processed only in two months (January to February) and 87.41per cent raw material (green arecanuts) of total volume of business (715 qtls) was processed in early season drawing prime focus of the enterprise. The dry sunny weather with moderate temperature prevailing during winter period in the said zone plays a key role for conduction of the whole process.

The business summery of the late season activity, undertaken between Mid-April to Mid-June is delineated in table 5.2.2. The late seasons processing activities deals with fully matured or ripen nuts only. The fruits are dried under scorching sun light, prevails during this period to produce Fali and Mala grades. For the preparation of Fali grade, on an average 14.50 kg. and for Mala grade, 11.50 kg. of good quality and 2.00 kg of low quality dry processed product can be obtained from 100 kg of ripen nut. Over ripen fruits obtained at the end of harvesting season is preferably chosen for producing Maza grade through partial fermentation. This activity is matched with onset of monsoon rain, required for sub-surface soil moisture where the fruits are to be kept buried for partial fermentation for a specified period of 90 days. The late season processing activities are traditional and may be regarded as compensatory as a whole. Such activities are optional to provide job opportunities to associated labourer, recovery of fixed cost as well as to keep the unit active.

The economics (cost and return analysis) of a standard processing unit is delineated through table 6.1, 6.2 and 6.3. The table 6.1 explores the activity wise variable cost requirement to run a processing unit from Mid-October to Mid-April to produce 69.825 qtls of dry (processed) arecanut from 625 qtls of green immature nut. Ten different activities related with processing *viz.* procurement of green nut, staking, boiling, grading, de-husking, pressing for preparation of Tipni grades, gas treatment, sun-drying, packing and finally marketing were identified. From the study, it was observed that the apportioning of business (625 qtls) in a season amongst the above grades accounts as 23.31% for TFG, 19.94% for TFWG and 56.75% for Rota (both Red and white), Sagar and other grades (vide Table 5.2.1). The preparation of Tipni grades starts from Mid-November and is continued upto Mid–February in West Bengal because production of this grade needed immature nut (30% to 50% mature) while the preparation of Rota needs half matured nuts and its period of operations is March to Mid-April. For Sagar or Chickni grade, the period of operation generally starts from Mid-November and continued to Mid-April. It is observed from the table 6.1 that the major operational costs are the cost of raw material and labour cost accounting around 80.84 and 16.22 per cent respectively. The overall average total cost of preparation for one qtl processed nut of different grades found to be ₹ 18107.32 of which only 0.63 per cent belonged to fixed cost. The result is also analogous to the study of Kolur *et al.* (2012) for the above grades. The average fixed cost per qtl for

Table 2: Classification of arecanut processing unit based on numbers of oven

No. of Chulli (oven)	Cooch Behar			Alipurduar			Jalpaiguri			GrandTotal
	DIN-I	COB-I	Sub total	KMG	FLK	Sub total	DPG	MNG	Sub total	
<3	-	-	-	30	3	33(27.50)	4	3	7 (14.00)	40 (21.05)
3-5	8	2	10 (50.00)	15	10	25 (20.83)	10	5	15(30.00)	50 (26.32)
6-8	7	3	10(50.00)	10	22	32(26.67)	11	7	18 (36.00)	60 (31.58)
>8	-	-	-	10	20	30(25.00)	10	-	10 (20.00)	40 (21.05)
Total no. of units	15	5	20(100.00)	65	55	120(100.00)	35	15	50(100.00)	190(100.00)

Note: DIN = Dinhata, COB-I = Cooch Behar, KMG = Kumargram, FLK = Falakata, DPG = Dhupguri, MNG = Maynaguri, figure in the parentheses indicate percentage of respective totals.

Table 3 : Ownership pattern of arecanut processing units in the study areas

District	Blocks	Single ownership			Partnership			Grand Total
		O	L	Total	O	L	Total	
Cooch Behar	Dinhata -I	7	0	7	7 1	8	15	
	COB-I	3	1	4	0 1	1	5	
Alipurduar	Kumargram	40	5	45	10	10	20	65
	Falakata	30	4	34	10	11	21	55
Jalpaiguri	Dhupguri	24	0	24	2 9	11	35	
	Maynaguri	6	1	7	8 0	8	15	
Total		**110**	**11**	**121(63.68)**	**37**	**32**	**69(36.32)**	**190(100.00)**
Percentage		**90.91**	**9.09**	**100**	**53.62**	**46.38**	**100**	**-**

Note: O = Owned land;   L = Leased-in land.

processing of the above individual grades slightly differs from each other as all the activities are not required for producing each grades. Among the mentioned ten activities gas chamber treatment is not required for TWFG preparation where as for Rota (both red and white), Sagar and for others grades, labour cost for pressing of tipni is not needed.

From the assessment of processing cost (Table 6.2) for the preparation of Maza, Fali and Mala in late season, it was observed that there were eight different types of activities *viz.* procurement, fermentation, dehusking, framing of garland, cutting, sundrying, packing and marketing. But all the activities are not required to produce above each grade. The activities like fermentation, framing of garland and cutting are exclusively needed producing of Maza, Mala and Fali respectively whereas cutting and sun-drying activities are not required for Maza. The average volume of business for the said above grades in late season was found 90 qtls, out of which 11.11per cent went for the preparation of Maza grade, 61.11per cent for Fali grades and 27.78 per cent for Mala grade. The productions of different grades partially varied with respect to the demand as well as availability of the raw material as mentioned earlier. The above grades are produced in non-chemical way and production continues between

Mid-April to Mid-June. The average cost of preparing for one Pan (80 nos) of Maza revealed ₹ 120.42 while for Fali and Mala grades, the average cost of preparation was ₹ 3390.45/qtl and ₹ 3231.95/qtl respectively.

The return analysis of a standard processing unit was assessed and presented through table 6.3. The said analysis was done in two section based on two phases of seasonal processing activity *viz.* early season processing and late season processing. It was revealed from the return analysis that the gross return constitutes of two parts – major contribution from marketing of main product *i.e.* processed product and a very negligible income from the selling of by-product *i.e.* the husk of arecanut fruits). The overall contribution to gross return from selling of main processed grades accounts 98.22 per cent and rest 1.78 per cent from selling of by product. In early season activity the gross return found to be highest for TFG (₹ 419422.50) might be due to the processing of more volume of product than any other grade. On the contrary, the net return per qtl of dry processed nuts revealed highest for Sagar grade followed by Rota White, TFG, Rota Red and TFWG accounting to ₹ 9977.71, ₹ 7577.17, ₹ 6978.14, ₹ 5588.57 and 4010.25 respectively with benefit-cost ratio of 1.56:1, 1.43:1, 1.37:1, 1.31:1 and 1.22:1 respectively. The above findings are also comparable to the study of Kolur *et al.*

Table 4: Average investment of a standard arecanut processing unit in the study areas

Sl. No.	Item of costs (Fixed)	Avg. Economic life/yrs*	Qty./ Kg./p	Rate (₹)	Cost (₹)	Salvage value (₹)	Annualized depreciated value (₹)
1	Preparation of oven	4.5	5	950	4700.00 (4.87)	1200	777.78
2	Building (Brick floor with tinshed) for one	11	-	-	55000.00 (56.94)	35000	1818.18
3	Vessels made of copper / aluminum	4.5	5 p	2750	13750.00 (14.23)	8500	1166.67
4	Ladles (String implements)	3.5	7 p	105	735.00 (0.76)	350	110.00
5	Knives (Locally known as 'Zhati')	8.5	12 p	160	1920.00 (1.99)	1500	49.41
6	Sarasi (For pressing Tipni grade)	3.5	30 p	45	1350.00 (1.40)	950	114.29
7	Plastic wrappers	2.5	12 kg	45	540.00 (0.56)	0	216.00
8	Gunny bag (general quality)	2.5	50 bag	28	1400.00 (1.45)	0	560.00
9	Gas chamber for fumigation (made of bamboo & plastic)	2.5	1 p	-	3850.00 (3.99)	800	1220.00
10	Tarpaulin (18^t×10^t)	2.5	3 p	1250	3750.00 (3.88)	1250	1000.00
11	Hand tube-well (with plastic pipe)	4.5	2 nos.	2250	4500.00 (4.66)	2250	500.00
12	Van for carrying arecanut	4.5	3 nos.	1700	5100.00 (5.22)	3300	400.00
	TOTAL				**96595.00 (100.00)|**		**7932.32**

*Source : As reported by the different owners of the processing plants.,   *P = Piece, nos. = Number*
Figure in the parentheses indicate percentage of respective totals.

Table 5.1: Conversion rate of green arecanut to processed nuts in a standard processing unit

Sl. No.	Period	QPP/ QRA*	TFG	TWFG	Name of the grades (Kg.)			
					Sagar/ Chickni	Rota (Red)	Rota (White)	Others**
1	Nov -Dec	9.5	3.25	2.00	2.50	1.00	0	0.75
2	Jan-Feb	11	3.00	2.50	1.50	2.00	1.00	1.00
3	Mar. to April	12.75	1.50	2.00	1.00	4.00	1.75	2.50

*QPP/QRA = quantity of processed products from per quintal of raw arecanut.
TFG= Tipni with fumigation, TWFG = Tipni without fumigation
**Others means Maradona, Gunglee, Paniwala, Chur etc

(2012). In late season processing activity the gross return was highest for Fali grade (₹ 213055.00) followed by Mala grade (₹ 101020.00) and Maza grade (₹ 50000.00) as the volume of business also follow the same pattern. But the net return per qtl found to be highest for Mala grade (₹ 5991.48) followed by Fali grade (₹ 3332.92) and Maza grade (₹ 1989.50) with benefit cost ratio of 1.25:1, 1.14:1 and 1.66:1 respectively. It was observed that although the net return per qtl was higher for Mala grade grades but the benefit-cost ratio was highest for Maza grade. One of the major findings is that the total net income of the entrepreneur from the early season processing activity found to be ₹ 406124.18 with an average benefit–cost ratio of 1.32:1 and from late season activity it was ₹ 66636.20 with benefit-cost ratio of 1.22:1. Accordingly, an entrepreneur could earn a net income to the tune of ₹472760.38 over the whole season

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Table 5.2.1: Business summery of a standard processing unit in early season (Mid-November to Mid Arpil)

| Period | Volume of green nut (qtl) | QPP/QRA* | Volume of processed products (qtls) | | | | | | |
			TFG	TWFG	Sagar/Chickni	Rota (Red)	Rota (White)	Others	Total
Mid-Nov. to Dec.	150 [24.00]]	9.5	4.875	3.000	3.750	1.500	0.000	1.125	14.250 (20.41)
Jan. to Feb.	285 [45.60]	11	8.550	7.125	4.275	5.700	2.850	2.850	31.350 (44.90)
March to Mid-April	190 [30.40]	12.75	2.850	3.800	1.900	7.600	3.325	4.750	24.225 (34.69)
Total	625 [100.00]	-	16.275 (23.31)	13.925 (19.94)	9.925 (14.21)	14.80 (21.20)	6.175 (8.84)	8.725 (12.50)	69.825 (100.00)

Note: *QPP/QRA = quantity of processed products from per quintal of raw arecanut.
Figure in the parentheses indicate percentage of respective totals
Figure in the third brackets indicate percentage of respective totals

Table 5.2.2: Business summery of a standard processing unit in late season (Mid-November to Mid Arpil)

Season	Fruit Type	Grades produced	Volume of green fruit	QPP/QRA*	Volume of processed product
Late season (Mid-April to Mid-June.)	Fully matured or ripen	Maza Fali	10 qtl or 250 pan	-	250 pan
		Mala	55 qtl	14.50	7.975 qtl
			25 qtl	11.50	2.875 qtl
				2.00	0.50 qtl
	Sub-total =		90 qtl		-

Note: *QPP/QRA = quantity of processed products from per quintal of raw arecanut.
In case of Fali 1 qtl green areacanu (fully matured or ripen) = 14.5 kg dry processed arecanut, and
for Mala one qtl green areacanu = 13.5 kg dry processed arecanut of which 11.5 kg of high quality

for the total volume of business of 715 qtls of green arecanut.

The employment opportunities in arecanut processing unit have been explained in table 7. There is an operational sequence of the process and for each step some sort of specialization is also required. The sequence constitutes a set of activities namely, collection of green fruit, staking in peal, boiling of green fruit, grading (sorting), decortications of boiled green fruits (de-husking), cutting, pressing of half dried nut for Tipni grade, gas chamber treatment for fumigation, preparation of low height bamboo roof for sun-drying of green nut, packaging of products and also disposal for the market. Most of the activities were performed by hired casual labour with ongoing market wage rate in the study areas. For decortications of boiled green fruit and pressing of half dried nut for 'Tipni' grade, grading and dehusking local female labour and their grown up minors (age below 18 years) were generally engaged on contract basis in the study areas. For

decortications job, the unit require one basket full fruit i.e. around 15 kg of green fruit. A standard skilled women labour can decorticate 30-35 basket in a day. The minor can also decorticate 17-20 baskets in a day along with their elders. The quantitative requirement of labour input for running a five oven processing unit having a standard operational turnover of average 715 qtl green fruit for average of nine months processing season has been delineated in the said table. From the given data it was observed that a standard processing unit could generate 1080.50 mandays over the season of which 31.65 per cent require for sun-drying, 16.20 per cent for dehusking of fruits, 11.57 per cent for pressing for 'Tipni', 11.50 per cent for collection of green arecanut, 6.02 per cent for fumigation, 13.74 per cent for packaging, grading and marketing and rest 9.67 per cent for boiling of green fruits, staking, cutting and digging of hole and de-holing purposes. On the basis of different grades of processed nuts out of total employment (mandays) generation, 81.07 per cent

Table 6.1: Analysis of cost associated with processing of green arecanut to produce Tipni, Rota, Sagar and other grades during early season (Mid -November to Mid -April)

Sl. No.	Item of costs	Amount/ number/ MD	Rate (₹)/ unit	Cost (₹) of processing of different grades			
				Total cost	TFG.	TWFG	RRSO*
1	Procurement of green arecanut						
	a. Raw materials (625 q)	625 q	1625/q	1015625	236724.62	202543	576357.19
	b. Labour for collection	62 MD	250/MD	15500	3612.78	3091	8796.10
2	Staking (labour)	18 MD	250/MD	4500	1048.87	897	2553.71
3	Boiling						
	a. Chemicals (kg) (Khaier)	8 Kg	175/Kg	1400	326.32	279.20	794.49
	b. Fuel (Firewood & others)	22 q	330/q	7260	1692.18	1447.84	4119.98
	c. Labour	48 MD	250/MD	12000	2796.99	2393.13	6809.88
4	Grading (sorting)	40 MD	220/day	61600	2051.13	1754.96	4993.91
5	De-husking (labour)	140 MD	250/day	35000	8157.89	6979.95	19862.16
6	Labour for Preparation & Pressing of Tipni	125 MD	250/day	31250	16840.85	14409.15	–
7	Gas Chamber treatment						
	a. Sulphur	70 Kg	115/Kg	8050	2343.72	–	5706.28
	b. Labour	65 MD	300/day	19500	5677.33	–	13822.67
8	Sun drying						
	a. Bamboo dhara (Mat)	130 p	65/p	8450	1969.55	1685.16	4795.29
	b. Labour	280 MD	220/day	61600	14357.89	12284.71	34957.39
9	Packing						
	a. Bamboo basket	62 p	48/p	2976	693.65	593.50	1688.85
	b. Labour	70 MD	250/day	17500	4078.95	3489.97	9931.08
10	Marketing	28 MD	250/day	7000	1631.58	1395.99	3972.43
	Total variable costs for 625q of green arecanut (₹)			**1256411**	**304004.32**	**253245.28**	**699161.40**
	Fixed cost (₹) vide Table 6.1			**7932.32**	**1848.89**	**1581.92**	**4501.51**
	Total Cost (₹) (TVC+TFC)			**1264343.32**	**305853.20**	**254827.20**	**703662.91**
	Quantity of processed product (qtl)			**69.825**	**16.275**	**13.925**	**39.625**
	Average Total cost per qtl (processed product)			**18107.32**	**18792.82**	**18299.98**	**17758.05**

*RRSO = Rota (Red), Rota(White), Sagar & Others. The other grades obtained as off quality named Paniwala, maradona, chur, tukary, gunglee etc

TVC = Total Variable Cost, TFC = Total Fixed Cost., MD= Mandays q = quintal, p = piece, Fixed Cost is fully considered for early season activity only.

created through the preparation of Tipni, Rota, Sagar and other grades, 15.36 per cent from Fali grade preparation, 3.24 per cent from Mala grade and 0.32 per cent came from Maza processing. Regarding gender distribution of total labour, the percentile share of male, female and grown up minors was found to be 53.17, 41.18 and 5.65 per cent respectively. Males were generally engaged in collection of green fruits, staking, gas chamber treatment, preparation of bamboo roof and marketing while female and minor reserved their dominance upon dehusking, cutting, boiling, grading and preparation for 'Tipni'. The remarkable observation of the said information states that the given enterprise provides a holistic support to the job starved society of the area to sustain upon family income leads to augment their livelihood status..

Arecanut is a traditionally chosen plantation crop mainly grown in homestead orchards of Terai farmers of Terai Zone of West Bengal. The development, potentiality and opportunities of agribusiness through green nut processing relied upon assured local supply of primary input required for running the unit with little interruption. The seasonal processing activities continue from November to June with a peak concentration during January to February. The size of business of a processing unit is directly related with number of oven it possesses. Nearly 80% of processing units had more than 3 ovens and 63.68% units were single ownership and the rest

Table 6.2: Analysis of variable cost to associated with processing of ripen arecanut to produce Maza, Fali and Mala grade in 2nd phase of the season (Mid-April to Mid-June)

Item of costs	Maza Pan/ MD/No.	Maza Rate (₹)	Maza Cost (₹)	Fali Pan/ MD/No.	Fali Rate (₹)	Fali Cost (₹)	Mala Pan/ MD/No.	Mala Rate (₹)	Mala Cost (₹)
1. Procurement									
a. Green Arecanut	250 pan	115/pan	28750.00	1375 pan	100/pan	137500.00	625 pan	100/pan	62500.00
b. labour for collection	1MD	250/day	250.00	55 MD	250/day	13750.00	2.5 MD	250/day	625.00
2. For Fermentation of maza									
a. Labour for Digging of hole	1 MD	250/day	250.00	–	–	–	–	-	-
b. Plastic for covering	0.6 kg	175/kg	105.00	–	–	–	-	-	-
c. Turmeric dust for colour	0.6 kg	125/kg	75.00	–	–	–	-	-	-
d. De-holing	0.5MD	250/day	125.00	–	–	–	-	-	-
3. De-husking (labour)	–	–	–	25 MD	250/day	6250.00	10 MD	250/day	2500.00
4. Framing of garland of fruit	–	–	–				625 pan	4.75/pan	2968.75
5. Cutting (labour charge)				37 MD	250/day	9250.00	–	–	–
6. Sundrying									
a. Labour	–	–	–	43 MD	220/day	9460.00	19 MD	220/day	4180.00
b. Bamboo dhara for drying (mat)	–	–	–	115 p	65/p	7475.00	62 p	65/p	4030.00
7. Packing									
a. Gunny bag (good quality)	6 nos.	50/bag	300.00	27 nos.	50/bag	1350.00	63 nos.	50/bag	3150.00
b. Labour requirement	0.5 MD	250/MD	125.00	4 MD	250/MD	1000.00	2 MD	250/MD	500.00
8. Marketing	0.5 MD	250/MD	125.00	2 MD	250/MD	500.00	1.5 MD	250/MD	375.00
Total cost (TC)	**–**	**–**	**30105.00**	**–**	**–**	**186475.00**	**-**		**80798.75**
TC/q, (TC/pan for Maza)	**–**	**–**	**120.42**	**–**	**–**	**3390.45**	**-**		**3231.95**

*Note : *The average volume of business of sampling processing unit for the grades of Maza, Fali and Mala = (10+55+25) = 90 qtl in a season, nos. = number*

MD= Mandays q = quintal, p = piece, 1 pan = 80 nos. of maza arecanut, 1 quintal of Raw arecanut H 25 Pan

were with partnership approach in the study area. Under single proprietorship 90.91% had own yard while under partnership business 53.62 per cent units established by partnership with land owner and rest upon leased in land only. The estimated cost for the establishment of a standard processing unit with five ovens found to be ₹ 96595.00 at 2018-19 prices where as the average volume of business of such unit revealed 715qtls. The entire processing activity is done in two phases- one in early season (Mid-November to Mid-April) by using premature nut to produce Tipni, Rota and Sagar grades and another in late season (Mid-April to Mid-June) to produce Maza, Fali and Mala by using fully ripen arecanuts. In early season on an average, one qtl of premature nut gives 9.5 kg dry processed products of different grades during the initial period (November to December), 11 kg during mid period (January to February) and 12.75 kg at late period (March to April). The percentile share of total processed product production (69.825 qtl) among TFG, TFWG, Chickni, Rota Red, Rota White and other grades found to be 23.31, 19.94, 14.21, 14.80, 8.84 and 12.50 respectively. But in late season activity, the conversion rate is 15 kg

and 14 kg for Fali and Mala grades respectively. The major operational costs were the cost of raw material and labour cost accounting 80.84 and 16.22 per cent respectively. Although the average total cost (₹ 18107.32) for preparation of Tipni, Rota, Sagar and other grades observed to be more or less same but net return per qtl from marketing of above grades was different from each other *viz.* ₹ 6978.14 for TFG, ₹ 4010.25 for TFWG, ₹ 9977.71 for Chickni (Sagar), ₹ 5588.57 for Rota Red, ₹ 7577.17 for Rota White and ₹ 937.93for other grades. In late season, out of three grade of processed nut (Maza, Fali and Mala), the highest volume of business was being contributed by Fali grade followed by Mala but the net profit per qtl stood ₹ 3332.92 for Fali and ₹ 5991.48 for Mala with a benefit-cost ratio of 1.25:1 and 1.14 respectively. An entrepreneur could earn a net income to the tune of ₹ 472760.38 with overall B:C of 1.30:1 in a whole season of which 85.90 per cent is contributed from early season processing activity. It was revealed from the study that a standard processing unit could generate average employment of 1080.50 mandays for various activities of which nearly 46 per cent belonged to female and minors lanour. An analytical

Table 6.3: Return analysis of a standard processing unit of arecanut in a season

Grades	Quantity		Market price		Return (₹)		Gross Return (₹)	Total Cost (₹)	B:C ratio	Net Return (₹)	Net Return (₹/q)
	Main Product (qtl)	By-product (bag)	Main Product (₹/qtl)	By-product (₹/bag)	Main Product	By-product					
TFG	16.275	49	25500	90	415012.50	4410.00	419422.50	305853.20	1.37	113569.30	6978.14
TWFG.	13.925	48	22000	90	306350.00	4320.00	310670.00	254827.20	1.22	55842.80	4010.25
Sagar	9.925	26	27500	90	272937.50	2340.00	275277.50	176248.69	1.56	99028.81	9977.71
Rota (Red)	14.80	57	23000	90	340400.00	5130.00	345530.00	262819.21	1.31	82710.79	5588.57
Rota White	6.175	23	25000	90	154375.00	2070.00	156445.00	109655.99	1.43	46789.01	7577.17
Others	8.725	19	18500	90	161412.50	1710.00	163122.50	154939.04	1.05	8183.46	937.93
Sub-Total	-	-	-	-	**1650487.50**	**19980.00**	**1670467.50**	**1264343.32**	**1.32**	**406124.18**	
Maza	250 pan = 10 qtl	-	200 /pan	-	50000.00	-	50000.00	30105.00	1.66	19895.00	1989.50
Fali	7.975	152	25000	90	199375.00	13680.00	213055.00	186475.00	1.14	26580.00	3332.92
Mala	2.875	28	30000	90	86250.00	2520.00	101020.00	80798.75	1.25	20221.25	5991.48
	(high quality) 0.50										
	(low quality)		24500		12250.00						
Sub-Total	-	-	-	-	**347875.00**	**16200.00**	**364075.00**	**297438.80**	**1.22**	**66636.20**	-
Grand Total	-	-	-	-	**1998362.50**	**36180.00**	**2034542.50**	**1561782.12**	**1.30**	**472760.38**	-

Table 7: Employment generation in a standard processing unit in a season

Sl. No	Name of the activities	Employment (no. of Mandays) for processing of different grades					Division of Labour		
		TRSO* (625q)	Maza (10q)	Fali (55q)	Mala (25q)	Total (MD)	Male	Female	Minor
1	Collection of raw materials	62	1	55	2.5	120.50 [11.50]	120.50	-	-
2	Staking	18	-	-	-	18 [1.67]	18	-	-
3	Boiling	48	-	-	-	48 [4.44]	18	30	-
4	Grading (sorting)	40	-	-	-	40 [3.70]	-	32	8
5	De-husking	140	-	25	10	175 [16.20]	17	125	33
6	Cutting	-	-	37		37 [3.42]	-	37	-
7	Preparation and pressing of Tipni	125	-	-	-	125 [11.57]	40	65	20
8	Gas chamber treatment	65	-	-	-	65 [6.02]	65	-	-
9	Sun drying	280	-	43	19	342 [31.65]	214	128	-
10	Digging of hole & de-holing	-	1.5	-	-	1.5 [0.14]	1.5	-	-
11	Packaging	70	0.50	4	2	76.50 [7.08]	48.50	28	-
12	Marketing	28	0.50	2	1.50	32 [2.96]	32	-	-
	Total employment (Mandays)	**876 (81.07)**	**3.5 (0.32)**	**166 (15.36)**	**35 (3.24)**	**1080.5 [100]**	**574.50 (53.17)**	**445 (41.18)**	**61 (5.65*)**

Note : *   Figures in the parentheses indicate percentage of respective totals.
          Figures in the third bracket indicate percentage of respective totals.
    *   Average volume of business 715 qtls per unit processing plant per annum
        TRSO* = Tipnis, Rota, Sagar & Others grades, MD = Mandays,
    *   The percentage of Minor labour is calculated in respect of work efficiency as 1Male labour =
        1 female labour = 2 Minor labour (age below 18 years)

review of the study indicates that there is a huge potentiality in agribusiness through processing of green arecanut - opens up a vista for generation of profitable income and employment and complementary synergy between farm and non-farm sector of rural economy.

Notes

1. **Maza:** The matured ripen arecanuts are put into a soil chamber (underground pit / hole). Plastic or bamboo mat locally called dhara are wrapped around the pit so that the soil would not come in direct contact with nuts and then covered with polythene for retting for a minimum period of 90 days to make the arecanut soft and also to bring a smell. After 90 days the partly fermented arecanuts are taken out, are known as Maza supari and packed for marketing without decortication.

2. **Fali:** The matured fully ripen arecanut are just cut into halves in length and sun dried. After drying husking is done and same is being packed.

3. **Mala:** The fully ripen arecanuts are stitched with plastic twine and then sundried for a period of 90 days. The husking is done thereafter.

4. **Tipni:** Firstly, green arecanut along with husk is to be boiled for half an hour. After subsequent dehusking the nuts the same should be boiled for

another half an hour. Now, the boiled arecanut have been sundried for 4-5 days. In between, the soft arecanut are pressed to give button like shape called Tipni.

5. **Rota:** Single boiled nuts are dehusked and dried gradually to turn into deep red colour (Red Rota). In second method, green arecanut fruits are partially boiled for half an hour then dehusked and put into 2nd boiling with one chemical, locally called 'hydro' for another half an hour. The product colour would be white while dried and is called White Rota.

6. **Chur:** Broken, off size, small particles of dried nut residues obtained at the time of processing Tipni.

7. **Maradana:** During the preparation of Tipni, some low grade low quality products of light black colour is obtained due to improper processing and are known as Maradana.

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