Original Research Article

Production and Marketing of Betel Leaf in Odisha: An Economic Analysis

ABSTRACT

Betel Leaf is a commercial horticultural crop with unleashed economic potential. It is not only part of our cultural traditions but also has great significance in the Ayurveda. Odisha being one of the prominent betel leaf growing state the crop has economic impact on the betel leaf growers of the state. Multistage random sampling technique was adopted to select 60 betel leaf growers. In the initial first year the cost incurred by respondents is more because of additional cost incurred on baroj construction. Net return was calculated by subtracting total costs from total returns; in the following years it gets amplified with the increase in economic life of the crop. Resource use efficiency was analyzed by examining production by Cobb-Douglas production function. All the resources used are significant but seed is the only resource whose use is being ill afforded. Of the two major marketing channels prevalent in the area, the channel that was comparatively more efficient was Producer-Wholesaler- Retailer – Consumer. The other channel that was prevalent was Producer- Pre-harvest contractor- Wholesaler- Retailer – Consumer. To identify the constraints Garett's ranking method was employed. The prime constraint that caused hindrance in optimum production and marketing of betel leaf were disease severity and price fluctuations respectively. The crop despite the capacity to earn foreign currency has been of less interest to both researchers as well as policy makers. This paper tends to analyze the economic potential of this horticultural crop to enable the policymakers understand its role in the rural economy.

JEL Code – C2, C83, Q10, Q13

Keywords: Betel Leaf, Odisha, cost of cultivation, resource use efficiency, marketing channel

Introduction

Betel vine (*Piper betle*) popularly known as 'pan' in Hindi meaning 'leaf' belonging from Piperaceae family is an important commercial horticultural crop majorly grown in parts of Southern Asia. Betel leaf has an intimate connection with Indian history and culture. This evergreen, perennial heart shaped leaf crop is widely recognized in Ayurveda for its medicinal

properties such as antioxidant, anti-inflammatory, anti-apoptotic, anti-cancer and anti-microbial properties (Das et al, 2016).

Betel vine is an economically significant horticultural crop cultivated for its heart-shaped deep green leaves across the globe. It is consumed annually by 15-20 million Indian and 2 billion foreign consumers (Kathirvel, 2016; Das et al, 2016). Major betel growing countries are Sri Lanka, India, Thailand and Bangladesh. In 2020-21, India exported 6,159.39 MT of betel leaves worth of Rs. 26.18 crores/ 3.55 USD Millions (APEDA, 2022). At an average the market price of betel leaves fluctuate between Rs. 55 to 170 per kg, usually the prices shoots during festivals and wedding seasons providing a good earning to the producers (Kandavel, 2021). But, the crop is majorly cultivated by small and marginal farmers practicing their traditional cropping pattern followed from generations (Guha, 2006). Cultivation of betel vine has immense unleashed economic potential to generate a steady income and employment (Kumar, 2018) because of the perennial nature of the crop. It is estimated that directly or indirectly about 20 million people derive their livelihood from production, processing, handling, transportation and marketing of betel leaves in India (Jana, B. L. 1996; Guha, 2006). This shed loving cash crop is grown across the states of Assam, Andhra Pradesh, Bihar, Gujarat, Odisha, Karnataka, Madhya Pradesh, Rajasthan, West Bengal and Maharashtra (Kar, 2021).

Odisha is one of the major betel vine producing state. The betel cultivation is mostly grown in the coastal districts like Puri, Balasore, Jagatsinghpur, Ganjam and Khurda in Odisha. In the last few years it has been seen that there is a lack of interest among the farmers for the cultivation of betel leaves in Balasore district. Unfortunately, in India very little research is being done on this crop especially on the economic analysis part. Keeping in view the export potential of the crop this paper tends to examine the economics of betel leaf production and marketing in Balasore district and reasons for lack of interest of growers.

METHODOLOGY

Primary data collected through directly interviewing the betel leaf farmers of the area builds the ground for the analysis. Multistage random sampling technique was adopted to select the farmers. The data was gathered from the selected farmers during the agricultural year 2021- 22, starting from June, 2021 to May, 2022 for all seasons. In Odisha Balasore district was selected purposively because it has predominance of betel leaf farmers which prompted the selection of this district as study area. Out of 12 blocks in the district Bhograi and Baliapal blocks were selected randomly. Three villages from each block were selected randomly and from each village ten growers were randomly selected. Thus, for the study, 60 growers were selected. The analytical tools used for the analysis are:

Costs and returns in field crop enterprise:

Total costs were calculated by the sum of variable costs and fixed costs. Variable costs include cost incurred on seed, manures and fertilizers, plant protection chemicals, expenses on

irrigation, labour charges, interest on working capital and miscellaneous charges, whereas fixed cost include land revenue, depreciation on farm implements and interest on fixed capital investment. Net return is the amount of money received from an investment after deduction of all costs.

Resource Use Efficiency

Resource use efficiency for betel leaf production is examined by using Cobb Douglas production function. The expenditures taken for resource use efficiency are of the inputs used by the growers in betel leaf cultivation. The function is as follows:

$$\mathbf{Y = a}\, X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5}$$

Where,

Y =Yield
X_1 =Expenditure on Seed
X_2 =Expenditure on manure
X_3 = Expenditure on fertilizers
X_4= Expenditure on labour
X_5= Expenditure on irrigation

Statistical significance of estimates

To test statistical significance, t- value of the estimates was worked out at (n-k) degrees of freedom. The t- value of regression coefficient (bi) were worked out as:

$$\mathbf{t} = \frac{b_i}{S.E.(bi)}$$

Where,

S.E. = Standard error

Marketing Efficiency

The extent of market performance is known as market efficiency. Traditionally, market efficiency is calculated as the ratio of output to input (Acharya & Aggarwal, 2020). The calculated total marketing cost includes margins of intermediaries.

$$E = \frac{O}{I} \times 100$$

where,

E = Index of marketing efficiency
O = Output of the marketing system
I = Input of the marketing system

Producer's share in consumer's rupee

It is the price earned by the producer/farmer expressed as a percentage of the retail price (i.e. price paid by the consumer), mathematically expressed as:

$$P_s = \frac{P_F}{P_r} x\ 100$$

where,

P_s = Producer's share in consumer's rupees
P_r = Retail price
P_f = Price received by farmer

Garett's ranking

Garett's ranking technique was used to rank the constraints associated with the production and marketing of betel leaf in the study area (Garett, 1969). In this method, respondents were asked to rank the particular problems encountered by them according to their perception. The assigned rank was transformed into a percentage position which was subsequently transferred into Garett score using Garrett's table (Rao et al, 2019).

$$\textbf{Percentage position} = \frac{100\ (Rij - 0.5)}{Nj}$$

where,

R_{ij}= Rank given for the i^{th} item by the j^{th} respondent

N_j= Number of items ranked by the j^{th} respondent

RESULTS AND DISCUSSION

The results obtained from the present analysis and their in-depth discussion have been précised under the following headings:

Cost and Return from betel leaves cultivation

The cost and return structure per acre of agricultural production helps farmer in mapping the adjustment in the cultivation process and thereby secure the optimum level of production and income. The improved method of growing betel leaf is a capital and labour intensive process that requires sound investment decisions. The estimated cost and returns per acre from betel leaf are presented in tables below.

Betel leaf cultivation was cultivated inside artificially-created shed known as "baroj". Table 1. depicts the costs incurred on various components required in baroj construction. Total cost incurred on baroj construction was Rs. 289300. Highest cost was incurred on seedlings i.e. Rs. 80000. Table 2. represents the annual costs and returns involved in betel leaf cultivation. Annual maintenance and operational costs are needed over the cultivation of betel leaf because it is a

perennial crop and average economic life of betel leaf is 8 years. The production of betel leaves was calculated to be around 98 Pona (1 Pona comprised of 4000 betel leaves) from an average area of one acre in the study area per year. Total cost acquired by the farmers was Rs. 90007 and the net returns earned was Rs. 146072. Major annual cost was incurred in the land preparation (Rs. 13748) and fertilizer application (Rs.14177).

Table 1: Cost of baroj construction for betel leaf cultivation in the study area (per acre)

S.No	Particulars	Quantity	Value (in Rs.)	Total value (in Rs.)
1.	Pond excavation, raising land and field preparation	100 man days	350	35000 (12.10)
2	Small bamboo	500 number	50	25000 (8.64)
3	Large bamboo	100 number	120	12000 (4.15)
4	Jute stick	35 bundles	500	17500 (6.05)
5	Nylon net	4000sq. meter	18	72000 (24.89)
6	Straw	30 bundles	200	6000 (2.07)
7	14 no GI iron wire	80 kg	80	1600 (0.55)
8	Seedlings/vines	20000 number	4	80000 (27.65)
9	Knapsack sprayer	2 number	350	700 (0.24)
10	Labour for baroj construction	40 number	300	12000 (4.15)
11	Labour for vine plantation	40 number	300	12000 (4.15)
12	Manure	100kg	40	4000 (1.38)
13	Oil cake	200 kg	20	4000 (1.38)
14	Rope (kg)	40 kg	100	4000 (1.38)
15	Fertilizer and pesticide	-	-	2500 (0.86)
16	Miscellaneous	-	-	1000 (0.35)
	Total			**289300 (100)**

(Values in parenthesis represent the percent of the particular input cost to the total cost)

Table 2: Annual costs and returns for cultivation of betel leaf (per acre)

S. No	Particulars	Value	Percent
1	Land preparation	13748	15.27
2	Vine tying and lowering	8934	9.93
3	Intercultural operation	5843	6.49
4	Jute stick	7343	8.16
5	Fertilizer	14177	15.75
6	Pesticide	1873	2.08
7	Manure	2904	3.23
8	Irrigation	7428	8.25
9	Annual repairing cost	5823	6.47
10	Harvesting	7725	8.58
11	Packaging	4954	5.50
12	Transportation	2975	3.31
13	Interest on working capital (7.5%)	6280	6.98
14	**Total cost**	**90007**	100.00
15	**Return**	**236079**	
16	Betel vine production (in Pona)	98.36	
17	**Net return**	**146072**	

Table 3. indicates the costs and returns acquired during the whole economic life cycle of the crop. With each passing year the net return earned by the farmers was higher. Initial cost is very high but total cost get reduced from 2nd year onwards. Farmers incurred a loss in first year because of high cost and low return but it gets compensated with higher returns in the coming years.

Resource Use Efficiency

To test the resource utilization efficiency in betel leaf cultivation the production function analysis was performed. Table 4 depicts the resource utilization efficiency in betel leaf cultivation. Gross income is considered as a dependent variable and the input factors, namely the cost of seed, the cost of manure, the cost of fertilizer, the cost of human labour and the cost of irrigation are taken as independent variables. High value of coefficient of multiple determination (R^2) indicates that the fitted functions seem to be a good fit. The estimated R^2 value 0.927 which indicated that 92.7 percent of variation in the total income of betel leaf production was explained by the independent variables included in this analysis. The regression coefficient of all the variables is significant but only expenditure on seed is found to be negative implying that any increase of this input item can be ill afforded. Thus, seed is used in excess.

Table 3. Costs and returns acquired in different operations during the economic life of betel vine

S.No	Particulars	Economic Life of Betel vine							
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year
A.	**Fixed cost**								
i.	Construction of baroj	174300	0	0	0	0	0	0	0
ii.	Cost of vine	80000	0	0	0	0	0	0	0
	Total Fixed Cost	254300	0	0	0	0	0	0	0
B.	**Variable cost**								
i.	Land preparation	35000	14300	15000	11200	17670	15770	17300	18100
ii.	Vine tying and lowering	11680	12650	12500	11400	15350	12500	10000	11140
iii	Intercultural operation	6500	7640	8320	9220	10300	7220	8280	6500
iv	Jute stick	19825	9100	7760	6900	10850	6480	6150	9900
v.	Fertilizer	18674	19170	19350	18820	19900	20900	18350	20200
vi.	Pesticide	1216	2400	2420	3410	3590	3430	2360	2010
vii.	Manure	4170	3500	3220	4300	4520	4340	4060	3760
viii.	Irrigation	8491	10025	10800	11500	9825	10700	9800	10450
ix.	Annual repairing cost	0	7870	11000	10000	9300	9570	8950	9550
x.	Harvesting	9729	10800	11350	10290	9850	11450	9900	11260
xi.	Packaging	5750	6350	7310	5330	8270	5800	8240	7900
xii.	Transportation	3120	4810	4170	5070	3170	4050	4180	3980
	Total Variable cost	125755	108615	113200	107440	122595	112210	107570	114750
	Total cost	**378455**	**108615**	**113200**	**107440**	**122595**	**112210**	**107570**	**114750**
C.	Return	264443	282005	311750	327500	350000	339000	348750	408000
D.	**Net Return**	**-114012**	**173390**	**198550**	**220060**	**227405**	**226790**	**241180**	**293250**

Table 4. Estimates of multiple regression fitted for betel leaf production

Variables	Coefficients	Standard Error	t Stat	P-value
Expenditure on seed (vine cutting)	-0.87***	0.243	-3.604	0.001
Expenditure on manure	5.272**	2.258	2.334	0.023
Expenditure on fertilizers	5.152**	2.323	2.217	0.030
Expenditure on labour	0.606**	0.229	2.641	0.010
Expenditure on irrigation	3.652***	1.278	2.857	0.006

R^2=0.927

***Significant at 5 percent level of probability*

****Significant at 1 percent level of probability*

Marketing of betel leaf

There are two marketing channels used by the producers to sell their produce to the consumers. The analysis was done on the seasonal price of summer season. Net price received by the producer was noted to be higher in channel 2. Farmers in channel 2 earn lesser returns i.e. Rs. 2500 per 4000 leaves as they bear extra costs in harvesting, transportation and loading and unloading thereby reducing the income. Marketing cost was higher in channel 1 due to an additional intermediary i.e. Pre-harvest contractor and also in channel 2 farmer himself harvest and transport the produce to the local markets. The producer's share in consumer's rupee is higher in case of channel 2 i.e, 59.52% whereas it was 43.63% in case of channel 2.The difference can clearly be seen due to higher total marketing margin in case of channel 1 which is Rs. 3100. Channel 2 is more market efficient because of low marketing cost and marketing margin. The two marketing channels are depicted below:

Channel 1: Producer ➡ Pre-harvest contractor ➡ Wholesaler ➡ Retailer ➡ Consumer

Channel 2: Producer ➡ Wholesaler ➡ Retailer ➡ Consumer

Table 5. Marketing efficiency of channel 1 and 2

S.No	Particulars	Average cost (Rs./ Pona)	
		Channel 1	**Channel 2**
1.	Net price received by farmers	2400	
2.	Marketing cost incurred by Farmers		150
	(a)Harvesting		60
	(b)Loading and Unloading		20
	(c)Transportation		70
2.	Producer's sale price/pre-harvest contractor's purchase price	2400	
3.	Marketing cost incurred by pre-harvest contractor	150	
	(a) Transportation charges	100	
	(b)Harvesting, Loading and Unloading	50	
4.	Pre-harvest contractor's margin	450	
5.	Pre-harvest contractor's sale price/purchase price of wholesaler	3000	2650
6.	Marketing price incurred by wholesaler	250	170
	(a) Transportation charges	150	100
	(b) Loading and Unloading	50	20
	(c) Miscellaneous	50	50
7.	Wholesaler's margin	750	680
8.	Sale price of wholesaler/purchase price of retailer	4000	3500
9.	Marketing cost incurred by retailer	170	140
	(a) Transportation charges	100	100
	(b) Loading and Unloading	20	20

	(c) Miscellaneous	50	20
10.	Retailer's margin	1330	560
11.	Retailer's sale price/Consumer's purchase price	5500	4200
	Total marketing cost	**570**	**460**
	Total absolute marketing margin	3100	1550
	Total Net margin	**2530**	**1240**
	Producer's share in consumer's rupee (%)	**43.63**	**59.52**
	Marketing efficiency (%)	**149.86**	**208.95**

Constraints in betel leaf production and marketing

Various constraints restricts or prevents the optimum production and marketing of betel leaves in the study area. Table 6 and 7 represents the list of constraints faced by betel leaf growers during production and marketing respectively. The major issue faced by farmers during production was disease severity while during the marketing process it was price fluctuation. In production the other major issue that was a cause of distress among betel leaf growers was high initial cost of establishment and natural disasters like cyclone and storms. In marketing of the leaves the problems namely involvement of middlemen and inadequate storage facility were a cause of concern to the farmers.

Table 6. Constraints faced by the betel leaf farmers in production

Constraints	Average score	Rank
Disease severity	69.55	1
High Initial cost of establishment	65.57	2
Cyclone and Storms	57.87	3
Inappropriate management of fertilizer and pesticides	52.82	4
Lack of Govt. support	48.52	5
Water supply for irrigation	37.53	6
Lack of skilled Labour supply	34.57	7
Non-availability of good planting material	32.82	8

Table 7. Constraints perceived by the betel leaf farmers in marketing

Constraints	Average score	Rank
Price Fluctuation	62.70	1
Involvement of middlemen	54.35	2
Inadequate storage facility	50.42	3
Lack of Market information	47.27	4
Inadequate market facility	46.97	5
High Transportation cost	37.30	6

Conclusion

Betel vine is a crop of economic as well as cultural significance. The crop has the potential to generate foreign revenue for the country and thus can be regarded as the "neglected green gold of India". Betel leaf cultivation in India is majorly done by small and marginal farmers as part of their heritage. In the initial year the one-time cost of baroj construction for the betel growers of Balasore district was Rs. 289300. The annual cost of cultivation was Rs. 90007 and the net returns earned was Rs. 146072 signifying that the crop is a profitable venture for the respondents. High value of R^2 value indicates that 92.7 percent of variation in the total income of betel leaf production was explained by the independent variables. The variable that was being used in excess was seed. The most efficient marketing channel of the study area was Producer-Wholesaler- Retailer – Consumer. Disease severity and price fluctuation are the major constraints faced by growers during production and marketing respectively. The crop despite having substantial capacity of economic growth has failed to derive the attention of policymakers and researchers. Thus, with proper policy interventions and advancement in technology production of betel leaf in the study area can be enhanced and improvement in marketing strategy could help the crop to reach beyond domestic boundaries.

References

Acharya, S.S. and Agarwal, N.L. 2020. Agricultural Marketing and Development. Agricultural Marketing in India (pp. 48). CBS Publishers & Distributors. New Delhi, India.

Agricultural and Processed Food Products Export Development Authority 2022. Ministry of Commerce and Industry, Government of India.

Das, S., Parida, R., Sandeep, I. S., Nayak, S., & Mohanty, S. 2016. Biotechnological intervention in betelvine (Piper betle L.): A review on recent advances and future prospects. *Asian Pacific journal of tropical medicine*, *9*(10), 938-946. https://doi.org/10.1016/j.apjtm.2016.07.029

Garrett, H., and Woodworth, R.S., 1969. Statistics in psychology and education. *Vakils, Feffer and Simons Pvt.Ltd., Bombay*, Pp. 329

Guha, P. 2006. Betel leaf: the neglected green gold of India. *Journal of Human Ecology*, *19*(2), 87-93.

Jana, B. L. (1996, June). Improved technology for betel leaf cultivation. In *A paper presented in the "Seminar-cum-Workshop on Betel leaf Marketing", held at State cashew nut farm, Directorate of Agricultural Marketing, Digha, Midnapur (WB), India*.

Kandavel, S. (2021, 26 October). GI sought for famous Sholavandan betel leaf. *The Hindu*. https://www.thehindu.com/news/national/tamil-nadu/gi-sought-for-famous-sholavandan-betel-leaf/article37229420.ece

Kar, R. K., Saha, P., Upadhyaya, K., & Mohanty, S. K. 2021. Betel Vine (Piper betel L.): The Neglected Green Gold Claims Livelihood and Health Security in Rural India. *National Seminar on Management of Natural Resources for Sustainable Development: Challenges and Opportunities, 167-176.*

Kathirvel, N. 2016. Cost and Returns of Betel leaf Cultivation in Tamil Nadu with special reference to Karur District. *Asia Pacific International Journal of Engineering science*, *2*(1), 20-27.

Kumar, A. 2018. The size and employment pattern in betel vine cultivation: An empirical study of Bihar. *Journal of Pharmacognosy and Phytochemistry*, *7*(2), 397-400.

Rao, S. H., Kalvakolanu, S., Sarma, U. K., & Kumar, K. S. V., 2019. Application of Henry Garrett ranking method to determine dominant factors influencing smartphone purchase decisions of customers. *Journal of Advanced Research in Dynamical and Control Systems*, *11*(6), 213-218.