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Economics of production and disposal of bamboo in Sindhudurg District

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Abstract
Bamboo is one of the commercially cultivated crop in India and it is also considered as a "Poor man's timber". Sindhudurg district was purposively selected for the present investigation. Total sample consisted of 60 bamboo growers. The data was pertains to year 2018-19. The results shows that, per hectare cost of establishment of bamboo was Rs. 55317.00 which is much less as compared to mango and cashew. The average per hectare cost of maintenance of bamboo plantation was Rs. 72469.00 with income of Rs. 182902.00 resulting into benefit cost ratio to Rs. 1:2.52. It was observed that 89.80 percent culms sold to local traders. Damage to tender bamboo by wild animals, difficulties in harvesting by using Koyti and high rhizome cost were major problems faced by bamboo farmers in Sindhudurg district.

Keywords: Bamboo, Sindhudurg, cost, benefit cost ratio

Introduction
Bamboo is a flowering, permanent and evergreen plant, which belongs to the grass family of poaceae. It is a versatile, strong, renewable as well as environment friendly material that can be easily grown for various purposes. Bamboo is also considered as fastest growing woody plant on earth. It is mainly used as construction material, furniture, pulp and ply wood. Bamboo is a cash crop having low gestation period, faster growth and gives economic recurring returns generation after generation. Bamboo is one of the commercially cultivated crop in India and it is also considered as a "Poor man's timber". India is the second largest producer of bamboo in the world after China. Bamboo cultivation in Konkan region of Maharashtra is an age old practice. Various species of bamboo are cultivated in Konkan region. Even though the bamboo has important place in livelihood of the farmers and provide significant income to producers. However, very scanty information is available regarding economics of this crop. Considering importance of bamboo, present study entitled "Economics of production and disposal of bamboo in Sindhudurg district" was carried out.

Materials and Methods
The sampling technique adopted for the study was three stage sampling - Tahsil as a primary unit, village as a secondary unit and bamboo growers as an ultimate unit of sampling. Sindhudurg district was purposively selected for the present investigation, because most of the bamboo cultivation was grown in Sindhudurg district. Two tahsils namely Sawantwadi & Kudal were selected randomly. Then, three villages from each Tahsil were selected randomly. A list of bamboo growers from each village was obtained from the villagers, then 10 bamboo growers from each village were selected randomly. Thus, total sample consisted of 60 bamboo growers. The data were collected by personal interview with the help of specially designed questionnaires which pertains to year 2018-19.

Formation of categories of bamboo growers group
On the basis of number of bamboo clumps, farmers were classified into three groups.

Group	No. of clumps	No. of farmers
I	1 to 50	9
II	51 to 250	30
III	More than 251	21

Simple statistical tools *viz*. mean, percentage, ratios and frequency distribution were used for analysis of data. The standard cost concepts were used for estimation of cost of cultivation.

Results and Discussion
Cultivation of bamboo
It is evident from table 1. That plantation was done by using bamboo rhizome, seedling or culm cutting. However the sample farmers had used only rhizomes for planting

bamboo. It is found that farmers had planted only manga species. Plantation of bamboo on bunds was done by 34 farmers (56.67 percent), plantation as a sole crop by 24 farmers (40 percent) and plantation near house was done by 2 farmers (3.33 percent). At overall level, number of clumps planted by the farmers were 362.00, own planting material was used by 52 farmers (86.66 percent) and 8 farmers (13.34 percent), purchased it from outside. Regarding distance adopted at the time of plantation, it was seen that 45 farmers adopted 2.5x5 meters (75.00 percent) and 15 farmers adopted 3x4 meter distance.

Table 1: Details of existing method of bamboo cultivation on selected farms

Sr. No.		Group			Overall
		I	II	III	
1	**Type of planting material used (distribution of cultivators)**				
	a) Rhizome (Suckers)	9 (100.00)	30 (100.00)	21 (100.00)	60 (100.00)
	b) Seedling	--	--	--	--
	c) Culm cutting	--	--	--	--
2	Type of species planted (No of cultivators)				
	a) Manga	9 (100.00)	30 (100.00)	21 (100.00)	60 (100.00)
	b) Mesh	--	--	--	--
	c) Kalak	--	--	--	--
3	**Location of clumps (distribution of cultivators)**				
	a) Bunds	7 (77.77)	19 (63.33)	8 (38.50)	34 (56.67)
	b) Separate field	2 (22.33)	9 (30.00)	13 (61.90)	24 (40.00)
	c) Near home	--	2 (6.67)	--	2 (3.33)
4	No. of clumps	43.33	221.00	700.57	362.00
5	**Planting material**				
	a) Own	9 (100.00)	24 (80.00)	19 (90.47)	52 (86.66)
	b) purchased	--	6 (20.00)	2 (9.53)	8 (13.34)
6	**Planting distance**				
	1) 2.5 x 5 meters	7 (77.77)	22 (73.33)	16 (76.19)	45 (75.00)
	2) 3x4 meters	2 (22.23)	8 (26.67)	5 (23.81)	15 (25.00)
7	**Use of fertilizers**				
	Yes	--	--	8 (38.09)	8 (13.34)
	No	9 (100.00)	30 (100.00)	13 (61.91)	52 (86.66)
8	**Use of Manures**				
	Yes	9 (100.00)	27 (90.00)	18 (85.71)	54 (90.00)
	No	--	3 (10.00)	3 (14.29)	6 (10.00)
9	**Use of pesticides**				
	Yes	--	--	--	--
	No	9 (100.00)	30 (100.00)	21 (100.00)	60 (100.00)
10	**After plantation, care taken**				
	Yes	6 (66.66)	17 (56.66)	9 (42.85)	32 (53.33)
	No	3 (33.34)	13 (43.34)	12 (57.15)	28 (46.67)
11	Average Age (Years)	10.78	14.53	13.90	13.75
12	**Harvesting Age at which culm is ready for harvest (No. of cultivators)**				
	a) 2 Years	1 (11.12)	17 (56.67)	3 (14.28)	21 (35.00)
	b) 3 Years	4 (44.44)	10 (33.33)	13 (61.91)	27 (45.00)
	c) 4 Years	4 (44.44)	3 (10.00)	5 (23.81)	12 (20.00)

It is seen from table 1 that none of the farmers had either applied manures for plant protection measures. Only 8 farmers (13.34 percent) in third group applied the fertilizer. For the bamboo plantation, intercultural operation like, cleaning of clump, cutting of branches are necessary. It was observed that 32 farmers (53.33 percent) had followed intercultural operations. This proportion was more or less same in all the groups. Average age of bamboo plantation was 10.78 years, 14.53 years and 13.90 years in group I, II and III respectively. The information on age of first harvest revealed that culms were harvested either after 2 years, 3 years and 4 years. Out of the total sample, maximum 27 farmers started harvesting culms after 3 years followed by 21 farmers 2 years and 12 farmers 4 years.

Establishment of bamboo plantation

The bamboo plantation is generally ready for harvest after six years, from the date of plantation. The bamboo growers have to incur a considerable amount of expenditure on inputs and labour for establishing bamboo plantation up to its cutting stage. During this gestation period, the growers do not get any return from the plantation. Therefore, investment made by the cultivators for establishing bamboo plantation up to cutting stage is considered as capital cost. In the first year, they have to incur expenses on preparation of land, purchase of planting material (Rhizomes), digging pits, application of manures, preparation of dome around clump, etc. from second year to fifth year they have to spend on operations like manuring, gap filling, cutting of branches, cleaning of clump etc. Item wise cost incurred in during five year is discussed below.

Table 2: Per hectare operation wise cost incurred for establishment of bamboo. (Figures in Rs.)

Sr. No.	Operation	Total (N-60)
1	Land Preparation	12726.00 (23.00)
2	Digging pits	2490.00 (4.50)
3	Application of F.Y.M.	4301.00 (7.78)
4	Planting	32714.00 (59.14)
5	Weeding, Watering & earthling up operation	1850.00 (3.34)
6	Gap filling	388.00 (0.70)
7	Fertilizer application	523.00 (0.95)
8	After care operations	325.00 (0.59)
	Total	55317.00 (100.00)

(Cost included labour and physical inputs)

Labour is the major item of cost in all operations of bamboo cultivation. The important operations involved in the establishment of bamboo plantation are land preparation, digging pits, application of F.Y.M., planting, weeding, watering & earthing up, gap filling, fertilizer application, etc. It is seen from the table 2, that total cost incurred for establishment bamboo plantation was Rs. 55317.00. The maximum cost was incurred on planting. It was to the extent of Rs. 32714.00 (59.14 percent) followed by land preparation Rs. 12726.00 (23 percent) and application of F.Y.M. Rs. 4301.00 (7.78 percent). Other important items of cost were digging pits, planting, weeding, watering and earthling up operation, gap filling, fertilizer application and after care operations.

Item wise cost of cultivation

The item wise cost of maintenance of bamboo plantation is worked out and presented in table 3.

It is seen from the table 3 that at overall level per hectare cost of maintenance worked out to Rs. 72469.00, out of which Rs. 28693.00 (39.60 percent) was cost A and Rs. 63069.00 (87.03 percent) was cost B. Among different items of cost, rental value of land was maximum 30483.00 (42.06 percent) followed by hired human labour Rs. 19084.00 (26.34 percent), use of manures Rs. 7346.00 (10.14 percent), family labour Rs. 6706.00 (9.25 percent) and amortization cost Rs. 3510.00 (4.84 percent).

Table 3: Item wise per hectare cost of cultivation of bamboo plantation (Figures in Rs.)

Sr. No.	Item	Group			Overall (N=60)
		I (N=9)	II (N=30)	III (N=21)	
1	Hired human				
	i) Male	943.00 (1.80)	1248.00 (1.66)	2873.00 (4.25)	2666.00 (3.68)
	ii) Female	5943.00 (11.36)	9392.00 (12.49)	16854.00 (24.95)	16418.00 (22.66)
		6886.00 (13.16)	10640.00 (14.15)	19727.00 (29.2)	19084.00 (26.34)
2	Bullock labour	--	--	--	--
3	Manures / F.Y.M.	1922.00 (3.68)	8206.00 (10.91)	7494.00 (11.09)	7346.00 (10.14)
4	Fertilizers	--	--	619.00 (0.92)	511.00 (0.70)
5	Land revenue	--	--	--	--
6	Depreciation and repairing charges	221.00 (0.42)	323.00 (0.43)	93.00 (0.14)	136.00 (0.19)
7	Interest on working capital @ 6% for one year	528.00 (1.02)	1131.00 (1.50)	1670.00 (2.47)	1616.00 (2.22)
	Cost 'A'	9557.00 (18.28)	20300.00 (26.99)	29603.00 (43.82)	28693.00 (39.60)
8	Interest on fixed capital @ 10%	323.00 (0.62)	667.00 (0.89)	288.00 (0.43)	383.00 (0.53)
9	Rental value of land	27736.00 (53.04)	39508.00 (52.54)	26806.00 (39.68)	30483.00 (42.06)
10	Amortization cost	3510.00 (6.71)	3510.00 (4.67)	3510.00 (5.20)	3510.00 (4.84)
	Cost 'B'	41126.00 (78.65)	63985.00 (85.09)	60207.00 (89.13)	63069.00 (87.03)
11	**Family labour**				
	i) Male	3962.00 (7.58)	2184.00 (2.90)	822.00 (1.22)	1791.00 (2.47)
	ii) Female	6321.00 (12.09)	7145.00 (9.50)	3739.00 (5.53)	4915.00 (6.78)
		10283 (19.67)	9329.00 (12.40)	4561.00 (6.75)	6706.00 (9.25)
12	Supervision charges	881.00 (1.68)	1885.00 (2.51)	2784.00 (4.12)	2694.00 (3.72)
	Cost 'C'	52290.00 (100.00)	75199.00 (100.00)	67552.00 (100.00)	72469.00 (100.00)

(Figures in parentheses indicated percentages to total (Cost- c)

Profitability of bamboo plantation

The profitability is computed by deducting costs from gross returns. The profitability is worked out for different groups and is given in Table 4.

Table 4: Profitability of bamboo plantation.

(Figures in Rs.)

Sr. No.	Particulars	Group			Overall (N=60)
		I (N=9)	II (N=30)	III (N=21)	
1	Gross returns (Rs)	166415.00	237050.00	160838.00	182902.00
2	Cost of cultivation	52290.00	75199.00	67552.00	72469.00
3	Net returns	114125.00	161851.00	93286.00	110433.00
4	Benefit Cost ratio	3.18	3.15	2.38	2.52

Table 4 revealed that per hectare net income at cost 'c' was Rs. 114125.00, 161851.00 and Rs. 93286.00 in group I, II and III, respectively. At overall level, the per hectare net income was Rs. 110433.00. Benefit cost ratio was 3.18, 3.15 and 2.38 in group I, II and III, respectively. At overall level, benefit cost ratio was 2.52.

Per culm costs and returns

Table 5: Per culm cost and returns

Sr. No.	Particulars	Group			Overall (N=60)
		I (N=9)	II (N=30)	III (N=21)	
1	No. of culm / clump	17.00	15.00	9.00	10.00
2	Income / culm (Rs.)	53.00	51.00	52.00	51.00
3	Per Culm cost (Rs.)	17.00	16.00	22.00	20.00
4	Net Profit. (Rs.)	36.00	35.00	30.00	31.00

Per culm cost and returns were estimated and same is depicted in Table 5. At overall level it was observed that farmers harvested 10 culms from each clump. Per culm cost incurred was Rs. 20 and returns of Rs. 51 were realised. The net profit per culm was Rs. 31.

Disposal of bamboo

Table 6: Per farm disposal of bamboo

Sr. No.	Particulars	Group			Overall (N=60)
		I (N=9)	II (N=30)	III (N=21)	
i	Total quantity produced (culms)	733 (100.00)	1396 (100.00)	4998 (100.00)	2557 (100.00)
ii	Quantity retained for				
	a) Home use	5 (0.68)	6 (0.43)	17 (0.34)	10 (0.39)
	b) New plantation	34 (4.64)	49 (3.51)	19 (0.38)	36 (1.41)
	c) Local traders	642 (87.58)	1273 (91.18)	4466 (89.36)	2296 (89.80)
	d) Direct sale	52 (7.10)	68 (4.88)	496 (9.92)	215 (8.40)

(Figures in parentheses indicate percentage to total quantity produced)

Group wise disposal of bamboo is given in table 6. At overall level, 2557 culms were harvested. Out of which 2296 culms were sold to local traders (89.80 percent) followed by 215 culms (8.40 percent) to direct sale, 36 culms (1.41 percent) for new plantation and 10 culms (0.39 percent) were used for domestic purpose.

Problem faced by bamboo growers

The information regarding the problems experienced by the bamboo growers in cultivation and disposal, their suggestions are presented in table 7.

Table 7: Problems of farmers regarding production & disposal – frequency Distribution

Sr. No.	Particulars	Group			Overall (N=60)
		I (N=9)	II (N=30)	III (N=21)	
	Production				
1	**Regarding availability of planting Material**				
	a) Not available in time	2 (22.23)	5 (25.00)	4 (19.05)	11 (18.34)
2	**Regarding prices of planting material**				
	i) Rhizome a) High	6 (66.66)	26 (86.66)	21 (100.00)	53 (88.32)
	ii) Seedlings a) High	7 (77.77)	16 (53.33)	7 (33.33)	30 (50.00)
3	Damage to clums (tender bamboo) by wild animals and stray cattle.	8 (88.88)	27 (90.00)	18 (85.71)	53 (88.33)
4	Difficulties in harvesting by using Koyti	6 (14.28)	22 (73.33)	14 (66.66)	42 (70.00)
3	**Disposal**				
1)	Low price	2 (22.22)	3 (10.00)	5 (23.80)	10 (16.67)
4	**Suggestions**				
1)	Research required for spacing.	3 (33.33)	18 (60.00)	8 (38.09)	29 (48.33)
2)	New bamboo variety demonstration.	3 (33.33)	14 (66.66)	8 (38.09)	25 (41.66)

It is revealed from the Table 7 that at overall level, 18.34 percent cultivators opined that planting material was not available in time. Regarding prices of planting material, 88.32 cultivators opined that the price of rhizome was high. Regarding prices of seedlings, 50 percent farmers opined that price of seedlings was high. Damage to tender bamboo by wild animals and stray cattle was reported by 88.33 percent farmers. At the time of harvesting, 70.00 percent cultivators faced the difficulties in harvesting by using koyti. Low price is given to producer by local traders as mentioned by 16.67 percent farmers.

Conclusion

Planting of bamboo by using rhizomes is popular method in sindhudurg district. The per hectare cost of establishment of bamboo was Rs. 55317.00 which is much less as compared to mango and cashew. The average per hectare cost of maintenance of bamboo plantation was Rs. 72469.00 with income of Rs. 182902.00 resulting into benefit cost ratio to Rs. 1:2.52. It was observed that 89.80 percent culms sold to local traders. Damage to tender bamboo by wild animals, difficulties in harvesting by using Koyti and high rhizome cost were major problems faced by bamboo farmers in Sindhudurg district. Among 60 bamboo growers, 29 growers (48.33 percent) suggested that research required for spacing, 25 bamboo growers (41.66 percent) stated that, university should develop new varieties of bamboo suited to

Konkan region and conduct demonstration of bamboo plantation to create awareness among the farmers. So as to increase the income of farmers from Konkan region.

References

1. Ajith Kumar CS. A Study on the Production and Marketing of Thorny Bamboo (*Bambusa bambos*) in Sambalpur Region of Orissa. J Bamboo Rattan. 1996;6(8):67-72.
2. Anitha V, Muraleedharan PK. Economics of Bamboo Cultivation in Homestead Agro Forestry Systems of Kerala. Ninth Kerala Science Congress. Trivandrum; 1994. p. 27-29.
3. Chinnappa B, Nagraj R. An Analysis of Practices, Costs and Constraints in Marketing of Arecanut. J Plantation Crops. 2009;37(1):80-83.
4. Desai AP. Economics of Production and Marketing of Arecanut in Ratnagiri District. M.Sc. (Agri.) Thesis, Dr. B. S. K. K. V., Dapoli; c2000.
5. Jangam PS. Economics of Production and Disposal of Coconut in Ratnagiri District. M.Sc. (Agri.) Thesis. Dr. B. K. K. V., Dapoli; c2008.
6. Jha RK, Yadava JN. Economic Potential and Marketing Trend of Bamboo in Nepal: A Case Study from Rautahat District. Banko Janakari. 2010;25(1):63-75.
7. Krishnankutty CN. Socio-economic and Ecological Aspects of Developing Bamboo Resources in Homesteads of Kerala-Part II, Economic and Management Aspects. KFRI Research Report. 1998;125(2):62.
8. Liese W. Opportunities and Constraints for Processing and Utilization of Bamboo and Rattan in North-East India. International Fund for Agricultural Development, Report No. 1145-IN; c2001.
9. Manas D. Socio-economic Dimension and Economic Analysis of Production and Value Addition Process in Bamboo Trade in Kerala. M.Sc. (Agri.) Thesis, G. B. Pant University of Agriculture and Technology, Pantnagar; c2005.
10. Mekonen Z, Worku A, Yohannes T, Alebachew M, Teketay D, Kassa H. Bamboo Resources in Ethiopia: Their Value Chain and Contribution to Livelihoods. Ethnobotany Res Appl. 2014;12:511-524.
11. Naik HS. Economics of Production and Disposal of Coconut in Raigad District. M.Sc. (Agri.) Thesis, Dr. B. S. K. K. V., Dapoli; c2000.
12. Pande VC, Kurothe RS, Rao BK, Kumar G, Parandiyal AK, Singh AK, Kumar A. Economic Analysis of Bamboo Plantation in Three Major Ravine Systems of India. Agric Econ Res Rev. 2012;25(No.1):49-59.
13. Shah H, Sharif M, Joyia MF. Economics of Bamboo Cultivation: A Case Study from Punjab, Pakistan. 10.13140/RG.2.2.21765.45286; c2013.
14. Shanmugavel PT, Francis CN. Economic Analysis of Non-Timber Forest Products: A Study on Bamboo Production in Tamil Nadu. Discussion Paper No.-2; 1993. p. 17.
15. Sieb SE, Zucc AY. A Commentary on the Bamboos (Poaceae: Bambusoideae). Biotropica. 1979;11(3):161-172.
16. Sit AK, Ghosh A. Problems of Arecanut Cultivation in Sub Himalayan Terai Region of West Bengal. Indian J Arecanut Spices Medicinal Plants. 2005;7(3):91-95.
17. Subbanna S, Syam V. Economic Analysis of Cultivation of Bamboo (*Bambusa balcooa Roxb.* and *Dendrocalamus stocksii Munro.*) in Konkan Belt of Maharashtra, India. J Bamboo Rattan. 2018;17(2):36-52.
18. Subrahmaniam S. Strengths and Weaknesses of Traditional System of Bamboo Cultivation in Bangalore District of Karnataka. Agro-forestry Forum. 1998;7(2):23-26.
19. Torane SR. Socio-economic Aspects of Production and Marketing of Bamboo Poles in Ratnagiri District of Maharashtra. J Tropical Forestry. 1994;7(9):193-196.
20. Walosangla Ao, Kilangla Jamir B. Economic Analysis of Bamboo Cultivation in Nagaland. Int. J Econ Commerce Res (IJECR). 2021;11(1):1-10.