



RESOURCE USE EFFICIENCY IN COCONUT PRODUCTION OF RATNAGIRI DISTRICT (M.S)

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Abstract: The coconut cultivation is the main farming occupation in coastal part of the study area and the resource optimization will maximize the income of the coconut grower. The per hectare gross returns realized from coconut plantation were Rs. 148315 from matured nuts. The bearing trees (X_1), manures (X_2), nitrogen (X_3) irrigation cost (X_4) and labours were the major recourse used in the production process. value of coefficient of multiple determinations (R^2) was 0.89 indicated that 89 per cent variations in coconut production were explained by variables included in the function. The sum of production elasticity was 0.954, indicating decreasing returns to scale in coconut production. It is also revealed that the elasticity coefficient for bearing trees (X_1), manures (X_2), were positive and statistically significant at 5 per cent level. However irrigation factor was found positive and statistically significant at 1 per cent level of probability indicated significant effect on production of the coconut orchard.

Keywords: Resource use efficiency, coconut.

Introduction:

Coconut is a benevolent crop and a perfect gift to mankind. Every part of the coconut tree is of great utility and hence it is rightly called as 'Kalpavriksha' or the 'Tree of Heaven'. India is the largest coconut producing country in the world contributing 31.02 per cent of the world production. World production decreased from 70931.79 million nuts in 2013 to 69836.36 million nuts in 2014. India, Indonesia and Philippines are the leading coconut growing countries having 75.87 per cent of the total coconut area & contribute 75.48 per cent of the coconut production in the world. Among the major coconut growing countries, Brazil hold the highest productivity of 11630 nuts per ha followed by India with 10345 nuts per ha.

In Maharashtra state, area under coconut cultivation is 28.10 thousand ha with production of 187.44 Million nuts and Productivity is 6670 nuts per hectare. Konkan region is the coastal plain of Maharashtra State in the Western India with Asian Sea on the West and Western Ghats on the East and it is the major coconut growing belt as about 92.34 per cent of the total area and production of coconut

is concentrated in this region. The region composes of Ratnagiri, Raigad, Sindhudurg, Thane, Palghar districts and greater Mumbai and has hilly terrain and extensive sea coast of 720 Kilometers. It is reported that Ratnagiri district covers area of 4882 ha with production of 444 lakh nuts and Productivity is 9093 nuts per hectare. The coastal farmers in the Ratnagiri district having mango cashew, sapota and other fruit and field crops. They are starving for the resources in the cultivation of different crops. The coconut is also resource intensive plantation crop therefore to understand the input efficiency with respect to coconut production the study was undertaken.

Methodology:

Since the study is aimed at economics analysis of coconut production, the sample for the study necessarily involved the selection of cultivators for gathering the relevant data on the aspects of the study.

Three stage sampling technique was used in this study for the selection of coconut growers. Out of these nine tahsils from Ratnagiri district, viz. Ratnagiri, Chiplun, Guhagar and Dapoli were selected on area proportionate basis and from each tahsil two villages

were selected randomly. Then ten coconut growers were selected randomly from each selected village, thus final sample consisted of four tahsils, eight villages and eighty coconut growers. The data collected from the selected farmers were analyzed separately for the conclusions, by using simple statistical tools such as arithmetic mean, averages, frequency distribution, percentages and ratios etc.

Cobb-Douglas production function was used to assess marginal value productivity of resources in production. The Cob- Douglas production function was only calculated in the production of matured nuts on per hectare.

$$Y = a x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} e^u$$

Y= Per hectare yield of coconut in number

a= Intercept term

X₁=No. of bearing trees/ha

X₂= Human labour /ha

X₃= Manures (quintals/ha)

X₄= Nitrogen (kg/ ha)

X₅= Phosphorus (kg / ha)

X₆= Potassium (kg / ha)

X₇ = Irrigation cost(Rs/ha)

e^u= error term

b₁ to b₇ are the production elasticities of respective resources

Estimation of MPP and MVP

The MPP of different input was estimated by taking 1st order partial derivative of output (Y) with respect to concerned input appearing in production function.

$$Y = b_0 x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} e^u$$

MPP of x₁ is

$$dy/dx_1 = b_0 b_1 x_1^{b_1-1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} e^u$$

i) Marginal physical product (MPP)

$$dy/dx_i = MPx_i = b_i \frac{Y}{\bar{X}_i}$$

Where,

dy/ dx_i= MPP of X_i input

b_i= Production elasticity's of ith input

Ȳ = Geometric mean of output

X̄_i = Geometric mean of ith input

ii) Marginal value product (MVP)

$$MVP_{x_i} = \text{Price per unit of output X MPP}$$

iii) Marginal factor cost (MFC)

$$MFC = \text{Price per unit of the input.}$$

iv) Resource use efficiency

The efficiency of resources was judged by computing ratio of MVP of resource to its factor cost

$$MVP / P_{x_i} = 1 \text{ Optimum use of resource}$$

$$MVP / P_{x_i} < 1 \text{ Excess use of resource}$$

$$MVP / P_{x_i} > 1 \text{ Under use of resource}$$

Result and Discussion:

General occupation of sample farmers

The main and subsidiary occupations identified in the study area of coconut farmer were farming, business and service. The distribution of heads of sample families according to their occupation is given in Table 1

Regarding the main occupation 70.00 per cent coconut farmers had farming as their main occupation, 20.00 per cent farmers had business and 10.00 per cent farmers had service as their main occupation. However, regarding the subsidiary occupation higher percentage of farmers had service occupation i.e. 46.25 per cent.

Table 1: Occupation of sample family

Sr. No.	Occupation	Overall	Percent
a)	Main		
i)	Farming	56	70.00
ii)	Business	16	20.00
iii)	Service	08	10.00
	Total	80	100
b)	Subsidiary		
i)	Farming	20	25.00
ii)	Business	23	28.75
iii)	Service	37	46.25
	Total	80	100

Details coconut orchard

It is observed from Table 2 that, average size of matured coconut orchard was 0.52 ha. the per hectare average total number of matured coconut palms grown by sample growers was 176.25, out of which 150.67 coconut trees were bearing palms and only 25.58 non-bearing palms. However per farm average 91.65 coconut palm were grown by the

sample farmer, out of which 78.35 palms were in bearing condition. The average age of the coconut garden was found to be 41 year old having mostly Banawali and T X D coconut varieties were used to plant by the farmer in the study area.

Table 2: Details of coconut orchard

Sr. No.	Particular	Matured nuts
I)	Size of orchard (ha)	0.52
II)	Varieties	Banawali and T X D
III)	Age (years)	41.01
IV)	Per farm No. of palms	
a.	Bearing	78.35
b.	Non bearing	13.3
c.	Total	91.65
V)	Per hectare No. of palms	
a.	Bearing	150.67
b.	Non bearing	25.58
c.	Total	176.25

Yield, returns and profitability of mature and tender coconut orchard:

On the basis of per hectare production of coconut orchard, gross returns were worked out and presented in Table 3. It is seen from the table that, per hectare 10073 mature nuts were obtained from the orchard by realizing gross returns of Rs.148315 from nuts and by-product. The by produce was brooms, *zaps*, leaf mats etc.

Table 3: Per hectare yield and returns from matured & tender coconut cultivation

Sr. No.	Particulars	Matured nuts
A	Production	
1	Quantity in nuts (Nos.)	10073
2	Value (Rs)	14.59
3	By produce (Rs)	1350
B	Gross return (Rs)	148315

Profitability of matured and tender coconut

Per hectare production of matured coconuts gross returns were worked out and the profitability at various costs level *viz.* Cost-A, Cost-B and Cost-C were also worked out by deducting respective costs from gross returns. The per hectare profitability at these various costs are presented in Table 4.

Table 4: Per hectare profitability of matured and tender coconut

Sr. No.	Particulars	Matured nuts amount (Rs)
1	Gross return	148315
2	Costs	
	a) Cost A	74480
	b) Cost B	116795
	c) Cost C	132748
3	Profit at	
	a) Cost A	73836
	b) Cost B	31520
	c) Cost C	15567
4	Benefit cost ratio	1.12
5	Per nut cost of production	13.1

It is seen from Table 4 that, the per hectare gross returns for matured coconut orchard were accounted to Rs.148315, whereas Cost-A, Cost-B and Cost-C were worked out to be Rs.74480, Rs.116795 and Rs.132748 respectively. After deducting the various cost from gross returns, profit from coconut orchard at Cost-A (Farm business income) were accounted to Rs.73836, profit at Cost-B (Family labour income) were accounted to Rs.31520 and profit at Cost-C (Net income) were found to be Rs.15567. The benefit-cost ratio of coconut orchard was worked out to be 1.12. When the benefit-cost ratio is greater than one indicates the profitability of crop.

Functional analysis

Cobb-Douglas production function

The Cobb-Douglas type of production function was found to be “best fit” to the present data for coconuts orchard. The regression coefficients for identified resources for coconut orchard are presented in Table 5. It was observed that the value of coefficient of multiple determinations (R^2) was 0.89 indicated that 89 per cent variations in coconut production were explained by variables included in the function. The sum of production elasticity was 0.954, indicating decreasing returns to scale in coconut production. It is also revealed that the elasticity coefficient for bearing trees (X_1), manures (X_3), were positive and statistically significant at 5 per cent level, whereas nitrogen (X_4) variable was found to be negative and statistically

significant at 5 per cent indicating adverse effect on coconut production.

Table: 5 Result of estimated Cobb-Douglas production function for matured nuts

Sr. No.	Variables	Regression coefficients
1.	Constant (Intercept)	1.879
2	Bearing trees (X_1)	1.011** (0.123)
3.	Human labour days (X_2)	0.0260 (0.051)
4.	Manures in quintal (X_3)	0.0771** (0.037)
5.	Fertilizers	
	N(X_4)	-0.1788** (0.070)
	P(X_5)	-0.0560 (0.165)
	K(X_6)	-0.00796 (0.021)
6.	Irrigation cost (X_7)	0.0831* (0.027)
	Sum of elasticity	0.954
	R^2	0.89

* Significant at 1 per cent level of profitability.

**Significant at 5 per cent level of profitability

However irrigation variable was found positive and statistically significant at 1 per cent level of probability indicated significant effect on production of the coconut orchard. The elasticity of coefficients for human labour(X_2), phosphorus(X_5) and potash(X_6) were found statistically non-significant, indicating no significant effect of these variables on yield of coconut orchard.

Resource use efficiency in matured coconut production

The resource use efficiency for coconut orchard was studied and the ratio of marginal value product (MVP) to marginal factor cost (MFC) was computed to know the resource use efficiency and the result are presented in Table 6.

Table 6: Marginal value product and factor price in matured coconut orchard

Sr. No.	Resources	G.M.	M.P.P.	M.V.P.	Factor cost (PX)	MVP /PX	Remark
1	Bearing trees (X_1)	2.166	0.698	10.19	-	-	-
2	Human labour days (X_2)	2.457	0.616	8.98	249.3	0.036	Excess utilized
3	Manures in quintal (X_3)	1.103	1.371	20.01	156.4	0.128	Excess utilized
4	N(X_4)	4.171	0.363	5.29	5.8	0.912	Excess utilized
5	P(X_5)	1.742	0.868	12.67	8.24	1.537	Under utilized
6	K(X_6)	1.168	1.295	18.90	18.2	1.038	Under utilized
7	Irrigation cost (X_7)	3.355	0.451	6.58	1	6.580	Under utilized

It is seen that, the ratio of MVP/MFC is greater than unity in case of phosphorous, potash and irrigation cost indicated that these resources were underutilized, whereas resources' like nitrogen, manures and labours were excessively used. Therefore there is need to optimise the resources in order to maximized the yield of coconut plantation in the study area.

Agency wise sale of coconut

The information about quantity of nuts marketed by coconut growers through different agencies is presented in Table 7.

It is seen from Table 7 that, total quantity marketed by the farmer was 352092 matured nuts, out of this 90.31 per cent (317980 nuts) was marketed through commission agent; and 9.69 per cent (34112 nuts) was sold directly to the consumers as direct sale.

Table 7: Agency wise sale of coconut (No. of nuts)

Sr. No.	Name of Agency	No of growers	Total quantity sold (Nos.)
1	Commission agent/Wholesaler	71	317980
		(88.75)	(90.31)
2	Direct to consumer	9	34112
		(11.25)	(9.69)
Total	74	80	352092
	(100)	(100)	(100)

(Figures in the parentheses indicates percentage to total)

Problems faced by the farmers in coconut production:

The information regarding the constraints experienced by the coconut farmer in production of nuts is presented in Table 8.

It can be seen that, the various problems in production of coconut were reported by coconut farmer, out of which non availability of inputs in time was reported by 15 per cent farmers, irregular supply of electricity was another problem faced by the farmer in cultivation was 18.75 per cent.

Regarding losses due to insect/pest was reported by 50 to 56 per cent farmers, in that attack of rodents was prominent (56%) compared to attack of Eriophyid mites. (50%).

Regarding lack of technical knowledge in fertilizer and pesticide application, 77.5 per cent farmers were facing the problem. The other problems like high cost of labour, high cost of pesticides and non availability of skill labours were expressed by 81.25 per cent, 70 per cent and 65 per cent by the farmers respectively in the study area.

Table 8: Problems faced by the farmer in coconut production

Sr. No.	Particulars	No. of Farmers (N=80)	Percentage
I)	Problems in cultivation		
1	Non availability of input in time	12	15.00
2	Irregular supply of electricity	15	18.75
II	Losses due to insect /pest		
1	Attack of Eriophyid mites	40	50.00
2	Attack of rodents	45	56.25
III	Lack of technical knowledge in Fertilizer & Pesticide application	62	77.50
IV	Non availability of skilled labour in time	52	65.00
V	High cost of pesticides	56	70.00
VI	High cost of labour	65	81.25
VII)	Problems in marketing		
1	High cost of transportation	20	25.00
2	Price fluctuation in the market	35	43.75

Regarding the marketing, the problems like high cost of transportation, price fluctuation in the market was the major problem reported by 25 per cent and 43.75 per cent farmers respectively.

Suggestions for Improvement

The suggestions given by coconut grower are presented in Table 9.

It is seen that, majority of coconut growers (81.25%) suggested for coconut processing units at

village level. However proper training to the coconut grower for control of pest and diseases should be given were suggested by 72.5 per cent of coconut growers and 68.75 per cent of the coconut growers suggested to established the co-operative marketing societies at village level for avoid the price fluctuation.

Table 9: Suggestions for Improvement

Sr. No	Suggestions	Frequency (N=80)	Percentage
1	Establishment of Village level co-operative marketing Societies	55	68.75
2	Proper training for control of Insect/pests	58	72.5
3	Coconut processing units	65	81.25

Conclusions:

1. The per hectare average total number of matured coconut palms grown by sample growers was 176.25, out of which 150.67 coconut trees were bearing palms and only 25.58 non-bearing palms.
2. The average age of the coconut garden was found to be 41 year old having mostly Banavali and T X D coconut varieties were used to plant by the farmer in the study area.
3. The per hectare gross returns for matured coconut orchard were accounted to Rs.148315.
4. the elasticity coefficient for bearing trees (X_1), manures (X_3), were positive and statistically significant at 5 per cent level,
5. The resources like phosphorous, potash and irrigation were underutilized, whereas resources like nitrogen, manures and labours were excessively used in the coconut production process.
6. The non-availability of inputs in time, irregular supply of electricity, losses due to insect/pest, attack of rodents, attack of Eriophyid mites were the major problems face by the coconut grower in the study area.

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