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ESTIMATION OF COST OF PRODUCTION OF COCONUT UNDER OPTIMUM MANAGEMENT CONDITIONS IN NORTH KERALA

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ABSTRACT

The estimated cost of cultivation of coconut based on 1995-96 prices, under optimum management conditions of North Kerala, ranges from Rs. 28,600/ha during the first year of planting to Rs. 23,450/ha during the stabilized bearing period. The same for irrigated condition ranges between Rs. 52,650 and Rs. 27,750/ha and the cost of production was estimated as Rs. 3.30/nut and Rs. 2.60/nut under rainfed and irrigated condition respectively

INTRODUCTION

India is the second largest producer of coconut in the world, with an annual production of about 13,967 million nuts from an area of 1.79 million hectares. Small and marginal farmers dominate the coconut production in the country with more than five million farm families depending on this crop for their livelihood. The palm plays a vital role in the generation of employment opportunities in the rural sector, especially in harvest and post harvest operations including processing, coir industry, toddy tapping and handicraft's manufacture. Kerala State is the largest producer of coconut in the country, with an annual production of 5905 million nuts from an area of 0.98 million hectare. But, coconut cultivation in the state is beset with several problems like prevalence of root (wilt) disease, small holding size, presence of large number of senile palms, over crowding, low productivity, labour scarcity and high cost of labour, lack of irrigation facilities etc. resulting in hight cost of production. This paper attempts to study the economics of coconut cultivation in North Kerala under optimum management conditions.

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MATERIALS AND METHODS

The methodology and norms used by Das (1984) for estimating the production cost and return for coconut under monocrop condition in Kerala have been adopted in this study with necessary modifications. For estimating the cost of production per nut, the establishment cost was amortized into an annuity value @ 14% and an interest @ 13% was added to the annual maintenance cost as the opportunity cost for investment in coconut. For working out the cost and return, the following norms based on the recommended package of practices were followed:

1) The estimate is for the West Coast Tall (WCT) variety planted with a spacing of 7.5 X 7.5 m (175 palms per hectare)
2) A period of seven years has been considered as the pre-bearing period for rainfed gardens and five years in case of irrigated gardens
3) One-tenth, one-third and two-third of recommended doses of chemical fertilizers were applied during the first three years of planting, respectively followed by the recommended dose of

500 g N, 320 g P_2O_5 and 1200 g of K_2O from the fourth year.

4) Economic life span under good management has been assumed as 60 years
5) The technical coefficients used in the study are given in Tables 1 and 2
6) An interest rate of 13% which is considered by the commercial banks for long term deposits has been taken into account as the opportunity cost for annual maintenance cost
7) The establishment cost was amortized into an annuity @ 14% discount rate.
8) The input output data considered for this study were based on the experimental field data and the prevailing market rates during 1995-96.
9) The productivity of WCT variety of coconut during stabilized yield phase, with good management under rainfed condition based on experimental data is assumed as 70 nuts/palm. The same under irrigated condition is assumed as 100 nuts/palm during the stabilized yielding phase. The productivity during early bearing phase is assumed as 49 and 80 nuts/palm for rainfed and irrigated conditions, respectively.
10) A drip irrigation system is installed during the first year of planting at a cost of Rs. 20,000/ha after availing the subsidy.

RESULTS AND DISCUSSIONS

Labour requirement: Labour is a very important factor in coconut cultivation which

Table 1. ***Labour requirement (in mandays) for one hectare of coconut cultivation over the years.***

Operations	Years					
	1	2	3	4-7	8-14	15 & above
Land development	50	0	0	0	0	0
Fencing & its maintenance	30	5	5	5	5	5
Levelling, peg-marking & bunding	40	5	5	5	5	5
Digging pits	35	0	0	0	0	
Planting	5	1	0	0	0	0
Shading & mulching	6	7	5	5	5	5
Basin opening & manuring	2	10	15	25	30	30
Application of organics	0	5	5	8	8	8
Digging & weeding	5	10	10	10	12	12
Pot irrigation	40	60	80	0	0	0
Harvesting	0	0	0	0	24	32
Total (rainfed condition)	213	103	126	58	89	97
For irrigated condition	173	43	46	58	89	97
Operating & maintenance of drip irrigation system	30	30	30	30	30	30
Total (irrigated (condition)	203	73	76	88	119	127

is scarce and costly in Kerala. Before estimating the cost, the operation-wise and year-wise labour input use were assessed. Operations included were fencing and its maintenance, levelling, bunding and peg marking, digging pits, planting, shading, mulching, basin opening and manuring, green leaf application, digging and weeding, irrigation, plant protection, crown cleaning and harvesting. Considering eight hours of work as one manday, the labour under rainfed conditions for one hectare of coconut garden worked out to 213, 103 and 126 mandays for the first, second and third year, respectively. Between fourth and seventh year it was 58 mandays and the same between 8th and 14th year was 89 mandays. From 15th year onwards it was 97 mandays per hectare (Table 1). Additional man power is required for pot irrigation in rainfed gardens during first three years of planting as compared to coconut gardens with drip irrigation system. Under irrigated condition, the total labour requirement (including an

Table 2. ***Input requirement for one hectare of coconut garden over the years.***

Particulars	Unit Price (Rs.)	Years 1	2	3	4-7	8-14	15 & above
Rainfed							
Labour (mandays)	100	213	103	126	58	89	97
Seedlings (No.)	15	175	13	7	0	0	0
Fencing & its maintenance (Rs.)	-	3200	320	320	320	320	320
FYM (t)	600	0.88	1.75	3.5	4.4	4.4	4.4
Urea (kgs)	3.7	19	61	126	190	190	190
Mussoriephos (kgs)	1.7	39	116	231	308	308	308
MOP (kgs)	4.7	40	119	237	351	351	351
Plant protection (Rs.) (including labour)	-	350	350	500	500	600	600
Crown cleaning (Rs.)	-	-	-	-	-	500	-
Harvesting (Rs.)	-	-	-	-	-	7500	10000
Miscellaneous (Rs.)	-	300	300	300	300	500	500
Irrigated							
Labour (mandays)	100	203	73	76	88	119	127
Seedlings (No.)	15	175	13	7	0	0	0
Fencing & its maintenance (Rs.)	-	3200	320	320	320	320	320
FYM (t)	600	0.88	1.75	3.5	4.4	4.4	4.4
Urea (kgs)	3.7	19	61	126	190	190	190
Mussoriephos (kgs)	1.7	39	116	231	308	308	308
MOP (kgs)	4.7	40	119	237	351	351	351
Plant protection (Rs.) (including labour)	-	350	350	500	500	600	600
Crown cleaning (Rs.)	-	-	-	-	-	500	-
Harvesting (Rs.)	-	-	-	-	-	7500	10000
Irrigation (Rs.)	-	25000	1300	1300	1300	1300	1300
Miscellaneous (Rs.)	-	300	300	300	300	500	500

additional 30 mandays per year for operating and maintaining the drip irrigation system) is 203, 73 and 76 mandays for the first, second and third year, respectively. Between the fourth and seventh year, it was 88 mandays and between 8th and 14th year it was 119 mandays. From 15th year onwards it was 127 mandays per hectare. The labour wages considered was Rs.100/ manday for all the operations except for harvesting, plant protection and crown cleaning for which it ranged between Rs. 2.50 to 3.00/palm/time.

Capital requirements: The detailed assessment of capital inputs like seedlings, fence maintenance, organic and inorganic manures, plant protection measures and other contingencies are given in Table 2 for rainfed and irrigated conditions. The input requirement for both rainfed and irrigated conditions were similar except for that of cost of labour and energy for irrigation. A total of 195 seedlings were considered for the establishment against a palm density of 175 palms/ha assuming a gap filling of about seven and three per cent, respectively during the second and third year after planting.

The amount of organic manures applied in the form of compost/farm yard manure was about 0.88 tonne during the first year. Its requirement steadily increase thereafter

Table 3. ***Cost of cultivation of one hectare of coconut garden over the years.***

Particulars	Years					
	1	2	3	4-7	8-14	15 &above
Rainfed						
Labour	21500	10500	13000	6500	6500	6500
Seedlings	2625	195	105	-	-	-
Fencing & its maintenance	3200	320	320	320	320	320
FYM	528	1050	2100	2640	2640	2640
Chemical fertilizers						
Plant protection including labour	350	350	500	500	600	600
Grown cleaning	-	-	-	-	500	-
Harvesting	-	-	-	-	7500	10000
Miscellaneous	300	300	300	300	500	500
Total (Rs./ha) (Rounded)	**28600**	**13500**	**17900**	**12450**	**21400**	**23450**
Irrigated						
Labour	20500	7500	8000	9500	9500	9500
Seedlings	2625	195	105	-	-	-
Fencing & its maintenance	3200	320	320	320	320	320
FYM	528	1050	2100	2640	2640	2640
Chemical fertilizers	325	982	1973	2876	2876	2876
Plant protection including labour	350	350	500	500	600	600
Crown cleaning	-	-	-	-	500	-
Harvesting	-	-	-	-	7500	10000
Irrigation	25000	1300	1300	1300	1300	1300
Miscellaneous	300	300	300	300	500	500
Total (Rs./ha)	**52650**	**11800**	**14200**	**16750**	**25700**	**27750**

Table 4. ***Cost of production of coconut under rainfed and irrigated conditions.***

S.No.	Particulars	Rainfed		Irrigated	
		Early	Stabilized	Early	Stabilized
		Bearing phase		Bearing phase	
01	Establishment cost (Rs./ha)	109800	109800	112150	112150
02	Amortized value or annuity value of the establishment cost (Rs./ha)	15372	15372	15601	15701
03	Annual maintenance cost (Rs./ha/year)	21400	23450	25700	27750
04	Interest on annual maintenance cost (Rs./ha)	2782	3042	3341	3601
05	Total cost (Rs./ha/year)	39554	41871	44742	47059
06	Income from byproducts (Rs./ha)	1500	1500	1500	1500
07	Net cost of production (Rs./ha/year)	38054	40371	43242	45559
08	Average production (nuts/ha)	8575	12250	14000	17500
09	Cost of production (Rs./nut)	4.44	3.30	3.09	2.60

and from fourth year onwards 4.4 tonnes of organic manure per year was needed for one hectare of coconut garden. The required quantity of chemical fertilizers was fixed as per the recommendation of the Central Plantation Crops Research Institute, Kasaragod. Accordingly, during the first year of planting one-tenth of the recommended dose of urea, mussoriephos and muriate of potash were considered, respectively. From fourth year onwards full dose of chemical fertilizers was taken into account. An expenditure of Rs. 350/year was incurred for the first and second year for prophylactic plant protection operations (including labout cost) against pests like rhinoceros beetle (*Oryctes rhinoceros*), red palm weevil (*Rhynocophorus ferrugineus*) and fungal diseases like bud rot. From third year upto seventh year and the same was increased to Rs. 500 per year. From eighth year onwards, the same was Rs. 600 per year. A contigent of Rs. 300 per year was given to meet the miscellaneous expenditure upto seventh year and the same was increased to Rs. 500 per year from eighth year onwards. In the case of irrigated gardens additional expenses on the labour and energy charges were also included considering the frequency of irrigation.

Cost of cultivation: The estimated cost of cultivation per hectare of coconut garden under rainfed conditions was Rs. 28,600 during the first year. It had decreased to Rs. 13,500 during the second year and increased to about Rs. 17,900 during the third year. Between fourth and seventh year it was only Rs. 12,450 per year and from the eighth year upto 14th year it was about Rs. 21,400 per year. The cost of cultivation from 15th year onwards was Rs. 23,450 per year (Table 3). It could be further inferred that the year to year fluctuations in the cost of cultivation especially in the establishment phase was mainly due to variations in labour requirement. In case of irrigated gardens, the estimated cost of cultivation per hectare for the first year was about Rs. 52,650 (including the cost of establishing a drip irrigation

system in the garden) while the same for the second and third year was Rs. 11,800 and 14,200, respectively and between fourth and seventh year it was Rs. 16,750 per year. The average cost of cultivation between 8th and 14th year was about Rs. 25,700 per year and the same from the 15th year onwards was about Rs. 27,750 per year.

Cost of production: For estimating cost of production per nut the annuity value approach was followed. In this method, the total investment, namely initial seven years expenditure was amortized into an annuity value bearing 14% interest rate (Gittinger, 1984). This value was estimated by the following formula

$$\text{Annuity (A)} = P \times \frac{i}{1-(1+i)^{-n}}$$

where P = total investment

i = rate of interest (14%)

n = life of the plantation (60 years)

The amortized value in the present study was Rs. 15, 372 and 15,701 under rainfed and irrigated conditions, respectively and these were added to the annual maintenance cost to arrive at the total annual per hectare. The total cost (including 13% interest rate for the annual maintenance cost as its opportunity cost) was Rs. 39,554 and 44,742 for rainfed and irrigated conditions, respectively during the early bearing period. The same was Rs. 41,871 and 47,059 per hectare during the stabilized bearing period respectively for the rainfed and irrigated conditions. After deducting the value of byproducts, the net cost of production was Rs. 38,054 and Rs. 43,242 for the early bearing period and Rs. 40,371 and Rs. 45,559 for the stabilized bearing period respectively for the rainfed and irrigated conditions. Considering an average production level of 8,575 and 14,000 under rainfed and irrigated conditions for the early bearing period, the cost of production per nut was Rs. 4.44 under rainfed and Rs. 3.09 per nut under irrigated conditions. The same during the stabilized bearing period with an average production of 12,250 and 17,500 nuts/year for rainfed and irrigated conditions, respectively was at Rs. 3.30 and Rs. 2.60 per nut (Table 4.).

In conclusion, as the farm gate prices of coconut and its products are highly variable, the profitability of coconut production also varies according to those fluctuations. However, with the average price of Rs. 4.00 per nut, the realized profitability of coconut production in the stabilized bearing period in this study is about Rs. 8,650 per hectare per year under rainfed condition. The same would increase to Rs. 24,450 under irrigated condition due to an additional yield of 30 nuts per palm. Hence, Government should intervene in an effective manner in the price policies of coconuts and its products. This study is limited to estimated cost of cultivation/ production of coconut under optimum management conditions. However, in an actual field situations, under different managerial practices of farmers, the estimate may show a different picture. Hence systematic field surveys in farmers' fields need to be conducted to have better estimates.

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