ECONOMIC ANALYSIS OF CASHEW PLANTATIONS UNDER AGROFORESTRY CONDITIONS OF CENTRAL TAMIL NADU

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SEKAR, C. & KARUNAKARAN, K.R. 1994. Economic analysis of cashew plantations under agroforestry conditions of central Tamil Nadu. This study was taken up in Udayarpalayam Taluk of Tiruchirapalli district which is a dry tract of central Tamil Nadu. Out of one hundred selected farmers, only thirty-six were found to cultivate agricultural crops along with cashew and they were considered in this study. The study revealed that the farmer benefitted more from cashew cultivated under rainfed conditions than from the agricultural crops.

Keywords: Agroforestry - intercropping with trees - net present value - benefit cost ratio - annuity - internal rate of return

SEKAR, C. & KARUNAKARAN, K.R. 1994. Analisis ekonomi ladang gajus di bawah keadaan perhutanantani di bahagian Tamil Nadu tengah. Kajian ini dijalankan di Udayarpalam Taluk di daerah Tiruchirapalli, yang merupakan kawasan kering di bahagian Tamil Nadu tengah. Daripada 100 petani yang dipilih, hanya 36 petani yang didapati menanam tanaman pertanian di samping pokok gajus dan mereka dipertimbangkan untuk kajian ini. Kajian ini menunjukkan bahawa petani mendapat keuntungan yang lebih dengan menanam pokok gajus yang bergantung pada air hujan daripada menanam tanaman pertanian.

Introduction

Cashew (*Anacardium occidentale*) is a native of southeastern Brazil from where it was introduced to India during the 16th century mainly for checking soil erosion on the coast. Realising the export value of the nuts, the country entered into cashew export trade during the early part of the 19th century. India produces about 0.28 million tonnes of raw cashew nut annually from an area of 0.53 million *ha* (Mandal 1992). Out of the total coverage, about 75 % of the areas are on the west coast. Major cashew producing states in India are Kerala, Andhra Pradesh, Orissa, Maharashtra, Karnataka and Tamil Nadu. In Tamil Nadu, cashew growing districts are North Arcot, South Arcot, Tiruchirapalli, Pudukottai, Pasumpon Muthuramalinganar, Chingleput, Thanjavur, Kanyakumari and Dharmapuri. During the late seventies and eighties most of the farmers of Tiruchirapalli District decided to raise cashew as their tree crop (because 70 % of net areas sown were under drylands). The prime aim of raising any tree crop under field conditions is generally to make profit on capital investment (Rawat 1989). The overall goal of raising tree crops along with agricultural crops in farm lands is to increase

production, to generate a sustained agricultural product base, to reduce environ-
mental damage and to raise the standard of living of the farmer (Betters 1988).
Since economic analysis helps a farmer to make decisions about allocation of scarce
resources in a rational way in order to meet the targeted objectives (Hoekstra
1990), an economic analysis was done in the case of cashew plantations to highlight
the economic incentives under rainfed conditions where appreciable return from
the agricultural crops cannot be obtained.

Materials and methods

Design of the study

Udayarpalayam Taluk of Tiruchirapalli district was purposely selected as it has
about 90 % of the total area of cashew and casuarina in the district which are under
dry land conditions. In the second stage 10 villages were randomly selected and in
the third stage 10 farmers were randomly selected from each village, thus making
a sample size of 100. Since cashew and casuarina are different in characteristics,
economic analysis was done in the case of cashew plantation where the farmers
had the habit of growing intercrops like groundnut and bajra in the interspaces
of cashew trees.

Although the plantations had spacings varying from 6.50 $\times$ 6.50 *m* to 7.50
$\times$ 7.50*m*, the study focused on the cost and return for the 7.50 $\times$ 7.50 *m* spacing
only. Out of the total of 100 farmers, only 36 were found to cultivate cashew with
spacing of 7.50 $\times$ 7.50*m* and, intercropped with agricultural crops like groundnut
and bajra, are alone considered in this study for analysis.

The data on costs incurred over the years and the return realised from the
agricultural crops and cashew were obtained through a survey. Although the
plantations varied in age, the data were carefully gathered up to the 15th year of
the plantation. Accordingly, the data were subjected for discounting using 16%
discount rate to find the value of future income for comparative analysis.

Methods

Conventional analysis like percentage analysis was carried out in this study.
Financial evaluation measures like net present value (NPV), benefit cost ratio
(BCR) annuity and internal rate of return (IRR) were worked out to study the
worthiness of plantation as follows:

1. Net present value (NPV)

$$NPV = \sum_{i=1}^{t} \frac{B_t}{(1+r)^t} - \sum_{i=0}^{t} \frac{C_t}{(1+r)^t}$$

2. Benefit cost ratio (BCR)

$$BCR = \sum_{i=1}^{t} \frac{Bt}{(1+r)^t} / \sum_{i=0}^{t} \frac{Ct}{(1+r)^t}$$

Similar methodology by Sekar *et.al.* (1990)was used for the economic analysis .

3. Internal rate of return (IRR)

$$IRR = \sum_{i=1}^{t} \frac{Bt - Ct}{(1+r)t} = 0$$

4. Annuity value (AV)

$$AV = NPV / \sum_{i=1}^{t} \frac{1}{(1+r)t}$$

Where,   Bt is the benefit obtained in the year 't',
        Ct is the cost incurred during the year 't'
        r = discount rate
        t = age of the plantation.

Annuity values of perennial crops indicate the average annual discounted net return from them which is directly compared with the per year net return of annual crops. The methodology was similar to that used by Sharma and Diwakar (1989).

Results and discussion

The average life span of cashew was found to be 25 to 30 years. It gives economic returns from the third year of planting, becomes stabilised at the seventh year, produces economic yield up to the 20th year and then starts declining. In the study area, cashew plantations are felled after 25 years of age. Since the data were available only up to the 15th year, the cash flow was analysed up to the 15th year. On an average a population of 175 trees were maintained per hectare, generating about 200-250 *kg* of cashew nuts per year.

Economics of cashew cultivation

The costs incurred and the returns realised from cashew plantations under rainfed farm conditions are presented in Table 1. The total cost incurred included establishment, maintenance and harvesting costs of cashew. Under establishment cost, pot watering was also included because it is a customary

Table 1. Cost and return for cashew plantation intercropped with groundnut and bajra
(Rs ha^{-1})

Year	Establishment cost	Maintenance cost	Harvesting cost	Int. @ 16%	Total cost	Quantity $kg\ ha^{-1}$	Price $Rs\ kg^{-1}$	Gross income	Net income
1	6333.02	1007.50[a]	656.30	1279.49	9276.31	450.00	12.49	5620.00[a1]	-3656.31
2	-	685.50[b]	348.60	165.46	1199.56	520.00	1.72	894.00[b1]	- 305.56
3	-	713.40	148.20	137.86	999.46	580.00	1.63	945.00	- 54.46
4	-	614.80	164.30	124.66	903.76	305.00	10.33	3151.00	2247.24
5	-	738.80	220.60	153.50	1112.90	316.00	11.96	3779.00	2666.10
6	-	906.10	267.80	187.82	1361.72	325.00	16.48	5356.00	3994.28
7	-	1152.90	284.80	230.03	1667.73	298.00	18.19	5421.00	3753.27
8	-	1208.50	343.90	248.38	1800.78	316.00	17.36	5486.00	3685.22
9	-	1274.30	389.30	266.18	1929.78	268.00	20.69	5545.00	3615.22
10	-	1711.30	427.60	342.22	2481.12	306.00	18.24	5581.00	3099.88
11	-	1433.40	447.90	301.01	2182.31	276.00	20.46	5647.00	3464.69
12	-	1559.40	497.40	329.09	2385.89	330.00	17.34	5722.00	3336.11
13	-	1772.30	547.70	371.20	2691.20	346.00	16.72	5785.00	3093.80
14	-	1908.80	612.80	403.46	2925.06	265.00	21.92	5809.00	2883.94
15	-	2037.80	738.30	444.18	3220.28	254.00	21.08	30834.00[c]	27613.72
Total	6333.02	18724.80	6095.50	4984.54	36137.86	5155.00		95575.00	59437.14
Mean	6333.02	1248.32	406.37	332.30	2409.19	300.42[d]		6371.67	3962.48

a & a[1] are additional cost incurred and gross return realised from groundnut as intercrop;
b & b[1] are additional cost of cultivation and gross return realised from bajra as intercrop;
  c include wood value of the cashew plantation Rs 25,480 at 15th year;
  d mean quantity of the cashew nut yield $kg\ ha^{-1}$

approach among the farmers of Tiruchirapalli to save the life of the crop during dry summer periods. In the total establishment cost, 40 % was consumed by the cost of seeds/seedlings and preparation. The average maintenance and harvesting costs were worked out to be Rs 1248.32 and Rs 406.37 respectively. To support their families the farmers were intercropping with agricultural crops like groundnut and bajra during the first and second year of establishment of cashew. The gross benefits received were Rs 5620/- and Rs 894/- from groundnut and bajra per hectare per year respectively. Since considerable yield commences from the third year onwards, it acts as a sustainable income generator to the poor farmers. Average net return from the enterprise was Rs3962/- per hectare per year revealing that the farmers can plant cashew in the barren and less productive rainfed lands for higher returns. The gross income in absolute terms increases progressively from the third year onwards until the replacement of the plantation. However, the discounted benefits (Table 2), taking into consideration the time value of money, increases continuously up to the sixth year only, and then starts to decline. But the trend in discounted costs shows continuous decline over the years giving positive net income in each year.

Table 2. Discounted cash flow of the cashew plantation
(Rs *ha* $^{-1}$)

Year	Disc. factor @ 16%	Discounted	
		cost	benefit
1	0.862	7996.82	4844.83
2	0.743	891.47	665.87
3	0.641	640.31	605.42
4	0.552	499.14	1739.72
5	0.476	529.87	1799.71
6	0.410	558.91	2197.92
7	0.354	590.09	1917.76
8	0.305	549.64	1673.06
9	0.263	507.44	1458.07
10	0.227	562.43	1264.89
11	0.195	426.46	1103.32
12	0.168	401.93	964.11
13	0.145	390.83	840.28
14	0.125	366.20	727.38
15	0.108	347.55	3327.82
Total	5.58	15259.55	25130.18

The benefit cost analysis indicates that the net present value (NPV) from this agroforestry enterprise was Rs.9871/- with a benefit cost ratio (BCR) of 1.65 and an internal rate of return (IRR) of 40.83% (Table 3). Since this enterprise was capable of generating Rs.9871/- as NPV, it is more profitable than other rainfed crops.

Table 3. Economic appraisal of cashew plantation

Sl No.	Particulars	Unit	
1.	Net present value (NPV)	Rs ha^{-1}	9871.08
2.	Annuity value (AV)	Rs ha^{-1}	1769.01
3.	Benefit cost ratio (BCR)	-	1.65
4.	Internal rate of return (IRR)	%	40.83

The benefit cost ratio (1.65) shows that for a rupee of investment, a farmer can generate Rs1.65 as return revealing the better profit. Since BCR was more than one, cashew cultivation in the study area could be considered as a profitable enterprise.

The discounted annual net income (annuity) realised by the plantation was Rs 1769/- revealing that the discounted net income was quite high even under rainfed conditions compared to the costs incurred.

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