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PINEAPPLE INTERCROPPING IN THE FIRST THREE YEARS OF RUBBER PLANTING IN SMALLHOLDINGS : AN ECONOMIC ANALYSIS

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A study on pineapple intercropping in rubber holdings was conducted during July-August 1989 in Kottayam district of Kerala. Fifty one rubber smallholders, having pineapple intercropping, were interviewed and an analysis was done using ABC cost concept. Sensitivity analysis was done at 10 per cent variation of output prices and input prices. The discounted net income for the first three years was worked out at Rs. 22443.48 per hectare. The average pineapple plant population in the first year of planting was 4565 per hectare and the total yield for the first three years amounted to 31 tonnes. The cost of production worked out to Rs. 0.57 per kilogramme of pineapple on cost C basis. The BCR of the discounted cash flow was 2.27. Even though the BCR indicates the economic feasibility of investment, this crop lacks definite policy content. More and more pineapple processing industries need to be set up in Kerala so as to have much greater value addition within the state itself, resulting in price stability and a fair share of consumer's rupee to the growers.

Key words – Pineapple intercropping, ABC cost concept, Gross income, Farm business income, Family labour income, Net income, Land rent, Capital productivity, Sensitivity analysis.

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INTRODUCTION

Rubber, a perennial crop, occupies around 15 per cent of the net cultivated area in Kerala. This crop however, has a long gestation period of about seven years which could act as a disincentive to rubber cultivation particularly in the case of smallholders. In order to give the rubber grower some income during the pre-maturity period, researchers have identified certain annual intercrops which can be grown during the first three years without adversely affecting the rubber trees. Banana, ginger, turmeric, elephant-foot yam etc. are the common intercrops recommended and cultivated in young rubber plantations (Sreenivasan *et al.*, 1987). Pineapple is reported to be grown as an intercrop in Sri Lanka and the superior effect of growing pineapple as an intercrop in rubber holdings was demonstrated in an experiment conducted by the Rubber Research Institute of Sri Lanka. The growth of rubber in the intercropped plots has been found better than that of the control plots (Chandrasekhara, 1984). In certain areas namely Amayannoor, Areepparambu and Kooroppada of Kottayam district of Kerala pineapple is also cultivated as an intercrop in rubber holdings from very early times. Studies conducted by the Agronomy Division of the Rubber Research Institute of India also indicate the possibility of growing

pinapple as an intercrop along with rubber during the initial years without adversely affecting the rubber trees (unpublished). So far no study was conducted to estimate the economic feasibility of this enterprise. The present study is an attempt to fill this gap.

METHODOLOGY

On the basis of information available in the Regional Office of the Rubber Board, three panchayats, viz., Vijayapuram, Ayarkunnam and Kooroppada having the highest area under pineapple in Kottayam district were selected for the study. A list of rubber cultivators intercropping pineapple was prepared for these panchayats. A sample of fifty one growers was randomly selected from this list for detailed investigation on the economics of intercropping pineapple in rubber holdings. Relevant data for the study were collected by personal interview, using a well structured interview schedule.

The cost and income concepts followed in the Farm Management studies of the Government of India (Kahlon & Singh, 1980) were adopted for this study.

I. *Cost concepts*

(1) *Cost A* 1:

(a) Value of hired human labour
(b) Value of fertilisers
(c) Value of manure (own and purchased)
(d) Value of planting materials (both farm produced and purchased).
(e) Land revenue and other taxes.
(f) Depreciation on farm buildings
(g) Depreciation on farm implements
(h) Interest on working capital
(i) Miscellaneous expenses (repairs of implements, value of rodenticides,etc.).

(2) *Cost A* 2:

Cost A1 + Rent paid for leased in land.

(3) *Cost B*:

Cost A2 +

(a) Imputed rental value of own land (less land revenue paid thereupon).
(b) Imputed interest on fixed capital (excluding land).

(4) *Cost C*:

Cost B + Imputed value of family labour.

II. Income concepts

(a) *Gross Income:* This is derived by adding together the gross value of pineapple sold, imputed value of pineapple consumed in the grower's household, income from sale of suckers and imputed value of pineapple leaves used as fodder.

(b) *Farm business income*: This is derived by deducting Cost A from gross income.

(c) *Family labour income*: Obtained by deducting Cost B from gross income.

(d) *Net income*: Computed by deducting Cost C from gross income.

The total costs and gross income were worked out based on the average input–output prices that prevailed during the season ending June 1989. Interest on working capital was computed at 10 per cent, being the opportunity cost of capital. Since the costs and returns were spread over a period of three years, cost streams and income streams were discounted at the rate of 10 per cent for comparison.

Land rent is a cost to the individual grower. It is generally accepted that where owner and user of land are the same whatever part of income he might obtain by letting the land to another should be treated as rent. But in Kerala this concept cannot be adopted since land leasing is illegal. We have taken one-fifth of the gross value of the produce as fair rent as suggested by the Planning Commission in the First Five Year Plan document.

Income from a crop to a large extent is influenced by the fluctuation in output prices, input prices and yield of the crop. Hence, in order to assess the sensitivity of the enterprise to various economic factors, sensitivity analysis was done at 10 per cent variation of output, output prices and input prices.

The study pertains to the pineapple production and marketing season July 1988 to June 1989 and the field data were collected during July–August 1989.

RESULTS AND DISCUSSION

Cost of Cultivation

Pineapple (*Ananas comosus*) is a ratooned "semi perennial crop" and when planted as a pure crop, replanting is done only after 7–8 years. But in rubber holdings intercropping is recommended for the first three years of planting of rubber. In the area selected for the study, pineapple is the major intercrop in rubber holdings. After the third year, pineapple is generally removed, though in a few holdings it is retained for another 1–2 years. But usually after the third year when canopy covers the entire area, the growth and yield from pineapple will be very much reduced. In this study costs and returns were worked out only for the first three years. Operation-wise and input-wise costs have been estimated separately.

Operation-wise cost of cultivation is presented in Table 1. Total cost for the

Table 1. **Operation-wise cost of cultivation of pineapple grown as an intercrop in the first three years of rubber planting (Rs/ha)**

	Undiscounted costs				Discounted total costs
	I year	II year	III year	Total	
Land preparation, cost of planting materials and planting	2230.26	..	..	2230.26	2027.53
Cost of fertiliser, fertiliser application and earthing up	813.38	1238.00	1511.07	3562.45	2897.81
Weeding and pruning	721.86	1070.25	1260.44	3052.55	2487.66
Cost of organic manure and organic manure application	335.18	31.87	31.87	398.92	354.99
Clearing	..	..	1098.79	1098.79	825.52
Harvesting	21.61	51.01	89.06	161.68	128.71
Miscellaneous expenditure	18.53	25.94	30.13	74.60	60.93
Interest on working capital	379.15	213.78	355.93	948.86	788.77
Depreciation on buildings and implements	23.88	23.88	23.88	71.64	59.38
Land revenue and other taxes	4.77	4.77	4.77	14.31	11.86
Imputed interest on fixed capital	21.38	21.38	21.38	64.14	53.17
Imputed rental value of owned land	1021.27	3790.71	5269.59	10081.57	8020.12
TOTAL COST	5591.27	6471.59	9696.91	21759.77	17716.45

three year period came to Rs. 17,716. Cost of fertiliser and fertiliser application ranked first with a share of 16.36 per cent of total cost, followed by cost of weeding and pruning (14.04 per cent). The cost of harvesting for the producer was found to be negligible since out of 51 samples, only three growers harvested the produce themselves and the other growers sold the produce either on a per unit basis or sold the entire produce for a fixed amount. In other words, in both cases, the traders met the cost of harvesting.

Input-wise estimation of costs was done by using ABC cost concepts and is shown in Table 2. Among the paid out costs, hired human labour accounted for 27.17 per cent of cost C, followed by cost of fertiliser with a share of 10.68 per cent. The share of family labour was on the lower side. Cost A2 was not worked out since leasing was not practised in the area studied. The percentage share of imputed rental value was found to be high for this enterprise owing to relatively lesser per hectare costs of other inputs.

Table 2. **Input-wise cost of cultivation of pineapple grown as an intercrop in the first three years of rubber planting (Rs/ha).**

	Undiscounted costs				Discounted costs
	I year	II year	III year	Total	
Cost A1 :					
Hired human labour	2084.31	1292.43	2462.96	5839.70	4813.33
Cost of fertilisers	490.69	799.71	1046.00	2336.40	1892.83
Cost of manures	281.58	16.30	16.30	314.18	281.70
Cost of planting materials	912.99	..	..	912.99	830.00
Miscellaneous expenses	18.53	25.94	30.13	74.60	60.93
Land revenue and other taxes	4.77	4.77	4.77	14.31	11.86
Depreciation on buildings and implements	23.88	23.88	23.88	71.64	59.38
Interest on working capital	379.15	213.78	355.93	948.86	788.77
TOTAL COST	4195.90	2376.81	3939.97	10512.68	8738.80
Cost B:					
Imputed rental value of own land	1021.27	3790.71	5269.59	10081.57	8020.12
Imputed interest on fixed capital	21.38	21.38	21.38	64.14	53.17
TOTAL COST	5238.55	6188.90	9230.94	20658.39	16812.09
Cost C:					
Imputed value of family labour	352.72	282.69	465.97	1101.38	904.36
TOTAL COST	5591.27	6471.59	9696.91	21759.77	17716.45

Income From Pineapple Intercropping

The gross income, farm business income, family labour income and net income were worked out and are shown in Table 3. The discounted net income for the first three years was worked out at Rs. 22,443.48 per hectare. In the benefit stream, imputed value of pineapple leaves used as cattle feed was also accounted. The leaves are utilised as green feed for cattle and as a result a significant quantum of green feed as well as paddy straw required for cattle can be saved.

The average pineapple plant population in the first year of planting was 4565 per hectare and the total yield for the first three years amounted to 31 tonnes. The cost of production was worked out to Rs. 0.57 per kilogramme of pineapple fruit on cost C basis.

Capital Productivity

The capital productivity was measured by using benefit cost ratio (BCR). The BCR of the discounted cash flow was 2.27 which indicates the economic feasibility of investment in the pineapple enterprise for a period of three years.

Sensitivity Analysis

The income, to a large extent, depends on the market price of the commodity. Other factors influencing income of the growers are the yield of the commodity and the input costs. Before investing in a project, sensitivity of the project to these economic factors is to be tested. Gittinger (1976) defined sensitivity analysis as "re-working an analysis so as to elucidate what happens to the net worth position (project viability) under alternative conditions". In this study sensitivity was examined on three alternative assumptions viz., a 10 per cent increase in input costs, 10 per cent decrease in output price and a 10 per cent decrease in yield and the corresponding incomes and BCR were worked out (Table 4). In spite of the assumed overall 10 per cent variability the BCR was 1.81 which shows the viability of the project.

Table 3. **Income from pineapple grown as an intercrop in the first three years of rubber planting (Rs/ha).**

	Undiscounted income				Discounted total income
	I year	II year	III year	Total	
A. Gross income					
Sale of fruits	5130.19	17618.91	22186.38	44935.48	35892.76
Sale of suckers	..	..	2455.18	2455.18	1844.58
Imputed value for leaves used as fodder	..	1358.50	1730.24	3088.74	2422.59
TOTAL INCOME	5130.19	18977.41	26371.80	50479.40	40159.93

B. Farm business income : Rs. 31421.13

C. Family labour income : Rs. 23347.84

D. Net income : Rs. 22443.48

BCR : 2.27

Table 4. **Sensitivity analysis for pineapple grown as an intercrop in the first three years of rubber planting.**

	Discounted costs and income (Rs/ha)
Cost C	18671.78
Gross income	33750.02
Farm business income	24146.32
Family labour income	16073.03
Net income	15078.24

BCR = 1.81

MARKETING

In the area studied, a system of contract sales predominated. Usually the traders announce the price for the next year immediately after completing the previous harvest. Depending on the price, the growers can resort to short term measures such as weeding, fertiliser application, etc. The traders advance about 50 per cent of the estimated gross value of the produce to the growers who in turn get the amount from the Bombay merchants. The payment of advance amount in the peak crop management season may be a blessing for the poor growers but ultimately reflects adversely in their share in the consumers rupee.

SUITABILITY OF PINEAPPLE AS AN INTERCROP

The majority of Kerala farmers, to whom agriculture is mostly a part-time business, will try to allocate land resource to crops where the requirement of management and labour inputs is relatively less. Pineapple satisfies the above two requirements. Other advantages noticed were the suitability of pineapple leaves as a cattle feed in the declining era of paddy straw availability and the absence of competition for sunlight with rubber as against banana in the earlier years of planting.

Out of the 51 growers interviewed 3 growers viz., 5.9 per cent, who had planted one row of pineapple in between two rows of rubber were found to be growing cover crops successfully. But the chance of cover crop establishment was reduced when the growers resorted to planting 3–4 rows of pineapple in between two rows of rubber. More 'rational' growers planted four rows of pineapple between two rows of rubber and obtained the subsidy amount for the first three years. After the third year pineapple was removed and shade tolerant cover crops like *Mucuna* was planted in the fourth year.

Hence, owing to this flexibility, optimum plant population needs to be recommended taking the agronomic aspects into consideration in order to avoid the tendency of indiscriminate planting of pineapple in rubber holdings causing deleterious effect to the main crop.

In an observation trial conducted by the Agronomy Division of the Rubber Research Institute of India, the possibility of growing cover crops and pineapple together, was shown. The planting of pineapple was done in one interspace in between two rows of rubber followed by cover crops in the adjacent interspace. However none of the sample growers in the study followed this practice.

POLICY IMPLICATIONS

The processing and marketing aspect of this crop lack definite policy content. At present the price depends on the whims and fancies of the wholesalers and commission agents in the Bombay market where bulk of the produce is sold. More and more pineapple processing industries need to be set up in Kerala so as to have much greater value addition within the state itself, creating

additional employment opportunities resulting in price stability and a fair share of consumer's rupee to the growers. Year round employment can be assured since storage of the fruit in the pulp form is possible upto 1–1½ years with the addition of suitable preservatives like Potassium metabisulphite, thanks to the development of modern technologies in the agro-processing sector.

The fibre in the pineapple leaves is another potential raw material which needs better exploitation. This aspect needs to be investigated further so as to utilise the bulk volume of leaves in line with the technology of fibre extraction of *Agave* sp.

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