

# ECONOMICS OF INTERCROPPING IN THE FIRST THREE YEARS AMONG NEW/REPLANTED RUBBER

SREENIVASAN K. G., VIJU IPE C., HARIDASAN V., and MATHEW M.  
Rubber Research Institute of India, Kottayam-686 009.

## Introduction

Intensification of cultivation is a major route to increased agricultural production and productivity. Land being the major limiting factor for agriculture in developing countries intercropping and multiple cropping have special importance. Rubber is a perennial crop with a long gestation period of 6-7 years and an economic life span of about 30 years. The trees take about four years to fully develop the canopy and planting of annual or semi-annual crops can be done during the first three years after planting. During the gestation period, the grower does not realise any returns from rubber. The practise of intercropping provides additional income to the cultivator at the micro level, and at the macro level it adds to the total agricultural production and productivity.

Though rubber should ideally be grown in association with a legume cover, rubber growers are found raising different crops like banana, ginger, turmeric and elephant-foot yam (*Amorphophallus*) as intercrops, during the first three years after planting rubber. The present analysis is an attempt to probe into the economics of these intercrops and their relative profitability.

## Method of Study

The study was based on the data collected from a sample of 80 rubber growers, randomly selected, having new/replanted rubber in Kottayam district. The data were collected by interview method using a pre-tested ques-

tionnaire and the cost and returns were worked out at cost-c, similar to the procedure followed in the Farm Management Survey of the Government of India. A detailed description of the cost concepts is given below.

## Cost concepts

Cost concepts include four main costs:

### 1 Cost A-1:

- 1 Costs of hired human labour (permanent and casual)
- 2 Costs of owned machinery
- 3 Charges towards hired machinery
- 4 Costs of fertilizers
- 5 Costs of manures (owned and purchased)
- 6 Costs of seeds/planting material (owned and purchased)
- 7 Costs of insecticides and pesticides
- 8 Irrigation charges (owned and hired)
- 9 Land revenue, cess and other taxes
- 10 Depreciation on farm implements
- 11 Depreciation on farm buildings, machinery and irrigation installations
- 12 Interest on working capital
- 13 Miscellaneous expenses

(wages, artisans, repairing and other servicing charges)

### 2 Cost A-2

Is cost A-1 plus

- 14 Rent paid for land leased in

### 3 Cost B:

Is cost A-2 plus

- 15 Imputed rental value of owned land (less land revenue paid there upon) and
- 16 Imputed interest on owned fixed capital (excluding land)

### 4 Cost C:

- 17 Imputed family labour costs.

Although according to the Ricardian Theory, rent is surplus and price determined for the individual producer, it is a cost. The costs towards owned inputs and indirect costs were imputed at the opportunity costs. The interest on working capital was worked out at a 9%.

The average returns were calculated at the 1985-86 prices during the harvesting period. The relative profitability of the different intercrops were compared by working out the net returns and the benefit cost ratios.

Agricultural income to a large extent is influenced by what the classical economists called "the invisible hand"; (the market prices). Therefore, the sensitivity analysis was conducted at the 1984-'85 and 1983-'84 prices

### 1. Economics of Intercrops

The study revealed that banana, ginger and turmeric are the main intercrops grown by the rubber growers. Although vegetable crops, elephant-foot yam and pineapple are also grown by a few, due to insufficient degrees of freedom, they could not be considered in the present analysis.

#### Ginger

Economics of ginger grown as an intercrop with rubber is presented in table-1.

The total costs at cost-C worked out to Rs. 15794.36 per hectare and the average yield was 19.7325 quintals of dry ginger per hectare. Thus the costs of production at cost-C was Rs. 800.45 per quintal. To work out the returns, the average of wholesale prices of ginger at Cochin market during the quarter March to June 1986, which coincides with the harvesting season, was used. The farmers were assumed to get only 80 per cent of the wholesale price in the terminal market and so appropriate adjustments were made.

The total returns thus worked out at the 1986 (March to June) price amount to Rs. 13212.88 per hectare. It did not cover the total costs and gave only a negative net return of Rs. 2581.48 per hectare over cost-C. India is an exporter of ginger and it may be noted that the prices of ginger during 1985-86 harvesting season plummeted to a very low level due to poor demands in the international market thus explaining the losses during the year. The benefit cost ratio worked out to 0.8365 implying that a rupee invested earned only 0.8365 rupee as returns.

#### Turmeric

The costs and returns from the cultivation of turmeric as an intercrop with rubber are presented in table-2.

The total costs at cost-C worked out to Rs. 12429.62 per hectare and the average yield was 20.1634 quintals of dry turmeric per hectare. Thus the cost of

Table-1. Costs and returns per hectare of ginger grown as an intercrop with rubber.

Operation	Costs Rs/ha.
1. Land preparation, planting and mulching	2155.15 (13.64)
2. Costs of planting material and its treatment	6214.23 (39.34)
3. Costs of basal organic manure including bonemeal and application charges	915.54 (5.80)
4. First weeding, intercultivation, top dressing and mulching.	921.54 (5.83)
5. Second weeding, top dressing and mulching	912.49 (5.82)
6. Plant protection	146.12 (0.93)
7. Harvesting, processing and drying	1614.04 (10.22)
8. Depreciation allowances	64.84 (0.41)
9. Interests on working capital	1165.17 (7.38)
10. Miscellaneous expenses	60.13 (0.38)
11. Sub total. Cost-A <sub>1</sub>	14176.44
12. Rent paid for land leased in	495.4 (3.14)
13. Sub total: Cost-A <sub>2</sub>	14671.84
14. Imputed rental value of owned land and interest on owned fixed capital	136.23 (0.86)
15. Sub total: Cost B	14808.07
16. Imputed family labour	986.29 (6.24)
17. Total costs: Cost C	15794.36 (100.00)
18. Total returns (yield 19.7325 quintals/ha)	13212.88
19. Benefit: Cost ratio	0.8365
20. Net returns over	
a) Cost A <sub>1</sub>	-963.56
b) Cost A <sub>2</sub>	-1458.96
c) Cost B	-1595.19
d) Cost C	-2581.48

(Figures in parentheses are percentages to total cost-C)

production at cost-C was Rs. 616.45 per quintal. The total returns at 1986 (March-June quarter) prices, assuming that farmers realise only 80 percent of the prices in terminal markets, was Rs. 18953.57 per hectare. The Benefit: Cost ratio, implying the rate of returns on a rupee invested worked out to 1.5248. The net return over cost-C was Rs. 6523.95 per hectare.

### Banana

Table-3 gives the costs and returns from cultivation of banana as an intercrop with rubber. The total costs at cost-C worked out to Rs. 17211.78 per hectare. The plant population per hectare of banana grown as an intercrop was 933 and the cost per plant (at cost-C) was Rs. 18.45. The total returns at 1985-86 price was Rs. 27676.36 including the returns from the byproduct (suckers). The net returns over cost-C was Rs. 10464.58 per hectare and the benefit: cost ratio worked out to 1.6079.

### 2. Relative Profitability of Different Intercrops

Of the three intercrops considered, banana was the most profitable intercrop followed by turmeric at the 1985-86 price levels. The net returns from one hectare of banana and turmeric were Rs. 10,464.58 and Rs. 6523.95 respectively. The total returns from ginger did not cover the total costs due to the very low market prices. The analysis of benefit: cost ratio also confirms the above conclusions. Thus the analysis showed that the relative profitability depends primarily on the market prices during the harvesting season.

### 3. Sensitivity Analysis

Sensitivity analysis may be defined as reworking an analysis as to elucidate what happens to the net-worth position (project viability) under alternative conditions, (Gittinger).... It is relevant under conditions of fluctuating prices. Among the three

Table-2. Costs and returns per hectare of turmeric grown as an intercrop with rubber.

Operation	Costs Rs/ha
1. Land preparation, planting and mulching	2267.01 (18.24)
2. Cost of planting material	3921.90 (31.55)
3. Costs of basal organic manure and bonemeal/ fertilizer and application charges	636.05 (5.12)
4. First weeding, intercultivation, top dressing and mulching	910.62 (7.32)
5. Second weeding, intercultivation, top dressing and mulching	494.90 (3.98)
6. Plant protection charges	103.43 (0.83)
7. Harvesting, processing and drying	1618.28 (13.02)
8. Depreciation allowances	59.31 (0.48)
9. Interests on working capital	901.29 (7.25)
10. Miscellaneous expense	62.18 (0.5)
11. Sub-total: Cost A-1	10974.97
12. Rent paid for land leased in	413.21 (3.32)
13. Sub total: Cost A-2	11388.18
14. Imputed rental value of owned land and interest on owned fixed capital	138.76 (1.12)
15. Sub-total: Cost B	11526.94
16. Imputed family labour costs	902.68 (7.26)
17. Total cost Cost-C	12429.62 (100.00)
18. Total returns (yield 20.1634 quintals/ha.)	18953.57
19. Benefit: cost ratio	1.5248
20. Net returns over	
a) Cost A-1	7978.60
b) Cost A-2	7565.39
c) Cost B-2	7426.63
d) Cost C	6523.95

(Figures in parentheses are percentages to the total cost at C)



intercrop considered, ginger and turmeric are commodities traded in the international market and hence the demand and supply conditions in the international market affect considerably the domestic prices, which in turn affect the farmers' income.

Sensitivity analysis was done with the market prices prevalent in 1983-84, 1984-85 and 1985-86 and the results are briefly discussed. The net returns and benefit; cost ratios at the 1983-84, 1984-85 and 1985-86 prices are presented in table-4.

The analysis brings out clearly the effects of changing market prices on the relative profitability of the three intercrops. Banana which is traded mostly in the domestic market showed less variations in net income. At 1984-85 prices, turmeric turned out to be more profitable than banana and ginger. Notably, at 1984-85 prices ginger earned a profit of Rs. 5714 per hectare the benefit; cost ratio was 1.3617. At 1983-84 prices, ginger turned out to be highly profitable than the other two crops, followed by turmeric.

The above analysis shows that prices affect considerably the profitability of both ginger and turmeric. Thus the risk associated with price changes is more pronounced in the case of ginger. It also reveals that the price risk is less with the cultivation of banana which is consumed domestically.

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#### References

1. Gittinger, P. J., Economic analysis of Agricultural projects, World Bank.
2. Rubber Board. Handbook of natural rubber production in India (ed. Radhakrishna Pillai et)

Table-3. Costs and returns per hectare of banana, grown as an intercrop with rubber.

Operation	Costs Rs/ha
1. Land preparation, planting and mulching	3528.85 (20.51)
2. Costs of suckers and treatment	2965.20 (17.22)
3. Costs of basal organic manure/ fertilizer and application charges	2064.04 (11.99)
4. First inter cultivation, top dressing and mulching	1989.16 (11.56)
5. Second intercultivation, top dressing and mulching	1917.49 (11.14)
6. Third dose of fertilizers and earthing up	1284.92 (7.46)
7. Plant protection charges	457.13 (2.66)
8. Depreciation allowances	70.42 (0.41)
9. Interests on working capital	1286.28 (7.47)
10. Miscellaneous expenses	85.24 (0.49)
12. Sub-total: Cost-A	15648.73
13. Rent paid for land leased in	502.97 (2.92)
14. Sub-total Cost A-2	16151.70
15. Imputed rental value of owned land and interest on owned fixed capital	145.84 (0.85)
16. Sub-total: Cost B	16297.54
17. Imputed family labour costs	914.24 (5.31)
18. Total costs: Cost C	17211.78 (100)
19. Total returns:	
a) Main product	24018.12
b) Suckers	3658.24
c) Total	27676.36
20. Benefit: Cost ratio (B/c)	1.6079
21. Net returns over	
a) Cost A-1	12027.63
b) Cost A-2	11524.66
c) Cost B-2	11378.82
d) Cost C	13464.58

(Figures in parantheses are percentages to total cost-C)

Table-4. Net returns and Benefit: Cost ratios at 1983-84, 1984-85 and 1985-86 prices.

Year	Crop	Total returns per ha.	Benefit cost ratio B/c	Net returns over cost B per hectare	Net returns over Cost-C per hectare
1985-86	Banana	27676.36	1.6079	11378.82	10464.58
	Ginger	13212.88	0.8365	-1595.19	-2581.48
	Turmeric	18953.57	1.5248	7426.63	6523.95
1984-85	Banana	16452.21	1.5368	10154.67	9240.43
	Ginger	21508.42	1.3617	6700.35	5714.66
	Turmeric	30648.36	2.4657	19121.42	18218.74
1983-84	Banana	26031.19	1.5124	9733.65	8819.41
	Ginger	47752.65	3.0233	32944.58	31958.29
	Turmeric	27018.95	2.1737	15492.01	14589.33

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