

**STUDIES ON INTERCROPPING
IN
RUBBER PLANTATION
WITH
GINGER, PLANTAIN & GINGELLY
IN
TALIPARAMBA TALUK**

By
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DEPARTMENT OF PLANTATION CROPS & SPICES
KERALA AGRICULTURAL UNIVERSITY
VELLANIKKARA
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**DISSERTATION SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE
POST GRADUATE DIPLOMA IN NATURAL RUBBER PRODUCTION**

**FACULTY OF AGRICULTURE
KERALA AGRICULTURAL UNIVERSITY**

**DEPARTMENT OF PLANTATION CROPS & SPICES
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DECLARATION

I hereby declare that this dissertation entitled "**Studies on intercropping in rubber plantation with ginger, plantain and gingelly in Taliparamba Taluk**" and submitted in partial fulfilment of the course Post Graduate Diploma in Natural Rubber Production of Kerala Agricultural University is a bonafide record of research work done by me and that the dissertation has not previously formed the basis of the award to me of any degree, diploma, associateship, fellowship or other similar title of any University or Society.

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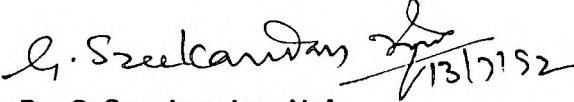
CERTIFICATE


Certified that this dissertation entitled "Studies on inter-cropping in rubber plantation with ginger, plantain and gingelly in Taliparamba Taluk" is a record of research work done by **Sri.P.C. SIMON** under our guidance and supervision and that it has not previously formed the basis for the award of any degree or diploma to him.

We, the undersigned members of the committee of Sri.P.C. Simon, a candidate for the Post Graduate Diploma in Natural Rubber Production, agree that the dissertation entitled "Studies on inter-cropping in rubber plantation with ginger, plantain and gingelly in Taliparamba Taluk" may be submitted by Sri.P.C. Simon, in partial fulfilment of the requirement of the Diploma.


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Introduction

1. INTRODUCTION

Rubber is a perennial crop extensively cultivated mainly in Kerala, Karnataka (South Canara), Tamil Nadu (Kanyakumari District), Goa and the North Eastern States. It occupies about 15 percentage of the net cultivated area in Kerala. In India an area of about 14,500 ha is either newly planted or replanted each year since 1980 and the prospects for future new planting of rubber is likely to be high, especially in the North Eastern States and the northern parts of Kerala.

This crop however, has a long gestation period of 6-7 years which acts as a disincentive to small rubber growers. In order to give some income to the grower during the immaturity period, intercropping is recommended by Rubber Board during the first three years.

Our present food production is 170 million tonnes. By 2000 A.D. the estimated production is 225 million tonnes. Hence we have to utilise all the possible ways to boost up our food production. Land being one of the limiting factors for agricultural development in Kerala, we need to popularise intercropping and multiple cropping so as to augment the supply of food in the country.

The rubber trees require about four years to fully develop the canopy. During the first three years enough sunlight and space

are available in the inter space, for intercropping. By utilising this area, the growers can get an additional income during the first three years of planting of rubber at the micro level and at the macro level it adds to the total agricultural production and productivity.

Though monocropping is most desirable in scientific rubber cultivation, intercropping with annuals is permitted for small rubber holdings in the first three years of planting. Only sporadic attempts were made to study the economic aspects of intercropping in rubber plantations. So far no study has been conducted to estimate the economic feasibility of intercropping in rubber plantations of Taliparamba taluk.

The present study is an attempt to investigate the economic aspect of intercropping in rubber plantations in Taliparamba taluk in the small holding sector. A brief note on Taliparamba taluk is given in Appendix-I.

Review of Literature

2. REVIEW OF LITERATURE

Intercropping is permitted for small rubber holdings in the first three years of planting. It should be planted at least one metre away from the rubber plants to avoid direct competition between the main crop and the intercrops (Rubber Board, 1980). Any annual crop including tapioca can be grown in the first year of planting. In the second year and third year all annuals except tapioca and paddy can be inter-cropped. Literature on economics of intercropping in rubber plantations are very few and the available ones are reviewed hereunder.

Sreenivasan et al. (1987) have reported the benefit cost ratio for intercrops in rubber plantation as 0.83 for ginger, 1.52 for turmeric and 1.60 for banana, indicating that banana cultivation is more profitable. The total returns from ginger did not cover the total cost due to the very low market price. The analysis showed that the relative profitability depends primarily on the market price during the harvesting season.

Chandrasekhara (1984) has reported the feasibility of pineapple cultivation in rubber plantations of Sri Lanka and revealed that the growth of rubber in the inter-cropped plots were better than those of the control plots.

Rajasekharan (1989) has reported the benefit-cost ratio for pineapple in rubber plantations in Kottayam district as 1.81

showing the great potential of the crop in the first three years of cultivation. The average pineapple plant population in the first year of planting was 4565 per ha and the total yield for the first three years amounted to 31 tonnes. The cost of production was worked to Rs.0.57 per kg of pineapple fruit on cost-C basis. Though pineapple is a perennial crop replanted in 7-8 years, economic yield could be expected only for three years since the rubber canopy gets covered by the fourth year.

Materials and Methods

3. MATERIALS AND METHODS

Details of intercropping in Taliparamba taluk were collected from the Rubber Board Regional Office, Taliparamba. Area with the highest degree of intercropping were selected and further details were collected from various Field Offices at Pulikurumba, Chemperi, Sreekandapuram, Payyavoor and Ulikkal region. A list of rubber growers who had inter-cropped with ginger, gingelly and plantain was prepared. A sample of 69 growers was randomly selected from this list for detailed investigation. The list of growers selected for the study is furnished in (Appendix-II). The data was collected by interview method using a questionnaire prepared for the study (Appendix-III). The cost and returns were worked out at cost-C basis similar to the procedure followed in the Farm Management Survey of the Government of India (as cited by Sreenivasan et al. (1989). A detailed description of the cost concept is given below.

Cost concept: Cost concepts include four main costs

1. Cost A_1 :

- (a) Costs of hired human labour
- (b) Costs of owned machinery
- (c) Charges towards hired machinery
- (d) Costs of fertilizers
- (e) Costs of manures

- (f) Costs of seeds/planting materials
- (g) Costs of insecticides and pesticides
- (h) Irrigation charges
- (i) Depreciation on farm implements
- (j) Interest on working capital
- (k) Miscellaneous expenses

2. Cost A_2 :

Cost A_1 + rent paid for leased in land

3. Cost B :

Cost A_2 + imputed rental value of the owned land and
imputed interest on owned fixed capital

4. Cost C :

Cost B + imputed family labour

The average returns were calculated at the 1991-92 price (December, 1991 to March, 1992). The relative profitability of the different intercrops were compared by working out the net returns and the benefit-cost ratio. The interest on working capital was worked out at 11.5 per cent level. Fair rent was taken as 10 per cent of the gross value. The benefit-cost ratio for ginger, plantain and gingelly were worked out. In the case of plantain benefit-cost ratio for four varieties, viz., 'Nendran', 'Poovan', 'Njalipoovan' and 'Palayankodan' were also computed. Relative profitability for ginger, plantain and gingelly were also worked out.

Results and Discussion

4. RESULTS AND DISCUSSION

The survey revealed that plantain, ginger and gingelly were the main intercrops grown by small holders in the area. In addition to these, tapioca, elephant foot yam, pineapple, tuemeric, etc., were also inter-cropped to some extent. The results of the detailed study in rubber holdings inter-cropped with plantain, ginger and gingelly are presented in this chapter.

4.1 Cropping pattern adopted by the rubber growers

The cropping pattern of the 69 units surveyed is presented in Table 1. Polybag plants were used as the planting material in 65 units and the rest four units occupied budded stumps of RR II 105. The management of rubber plants was as per the recommendations of the Rubber Board (Rubber Board, 1985). The rubber plants in the surveyed units were within three years of growth. Cover crops were found established only in three units. Plantain was the main intercrop in the units surveyed (29 units) followed by gingelly (23 units) and ginger (17 units). Plantain was preferred by growers because of high profitability as revealed elsewhere in the study.

4.2 Area-wise distribution of intercrops

The majority of rubber planters were small holders in the area surveyed. Area-wise distribution of intercrops among the units surveyed is given in Table 2. It was seen that intercropping was

Table 1. Cropping pattern adopted by the rubber growers of Taliparamba taluk

| Pattern of crop | Number of units | Percentage |
|--------------------------------|-----------------|------------|
| 1. Number of units surveyed | 69 | 100 |
| 2. Planting materials | | |
| (a) Budded stumps planting | 4 | 5.8 |
| (b) Polybagged plants planting | 65 | 94.2 |
| 3. Units with cover crop | 3 | 4.35 |
| 4. Units without cover crop | 66 | 95.65 |
| 5. Intercrop | | |
| Plantain | 29 | 42.03 |
| Ginger | 17 | 24.64 |
| Gingelly | 23 | 33.33 |

Table 2. Area-wise distribution of intercroops in the units surveyed

| Sl. No. | Area in hectares (slab) | Plantain | | Ginger | | Gingelly | |
|---------|-------------------------|-------------|-----------|-------------|-----------|-------------|-----------|
| | | No.of units | Area (ha) | No.of units | Area (ha) | No.of units | Area (ha) |
| 1. | 0.01 - 0.25 | 18 | 3.07 | 6 | 1.17 | 8 | 1.20 |
| 2. | 0.26 - 0.50 | 8 | 2.71 | 6 | 1.93 | 9 | 3.32 |
| 3. | 0.51 - 1.00 | 1 | 0.80 | 3 | 1.83 | 3 | 2.00 |
| 4. | 1.01 - 1.50 | - | - | 2 | 2.53 | 2 | 2.44 |
| 5 | 1.51 - 2.00 | 2 | 3.97 | - | - | 1 | 1.56 |
| Total | | 29 | 10.55 | 17 | 7.46 | 23 | 10.52 |

mainly done by those having an area, less than 0.50 ha. The trend was the same for all the three intercrops studied. Forty six per cent of the surveyed units were within 0.50 ha.

Most of the small holders were under low income group and to a great extent depend on the returns from the intercrop during the pre-bearing period of the main crop. Intercropping was rare in large holdings where growers had other sources of income.

Among the seven villages surveyed, Payyavoor village had the maximum inter-cropped units (82.61%) covering an area of 18.02 ha. The data are presented in Table 3. Intercropping was more popular in that area and the farmers were adopting intensive cultivation with the maximum utilisation of land.

4.3 Educational status of growers

The educational status of growers is given in Tale 4. The results indicate that the farmers in the surveyed units had preliminary education. Fifty seven per cent of the 69 growers contacted had only primary education. The level of education was found to have no influence on the intercropping pattern. The educational status of most of the rubber growers in the area surveyed was only upto the secondary education.

4.4 Influence of intercrops on growth of rubber

Intercropping was found to have a favourable influence on

Table 3. Village-wise distribution of inter-cropped units

| Sl. No. | Village | Plantain | | Ginger | | Gingelly | |
|---------|----------------|--------------|-----------|--------------|-----------|--------------|-----------|
| | | No. of units | Area (ha) | No. of units | Area (ha) | No. of units | Area (ha) |
| 1 | Payyavoor | 21 | 6.17 | 16 | 2.39 | 20 | 9.46 |
| 2 | Padiyoor | 2 | 2.34 | - | - | - | - |
| 3 | Eruvessy | 3 | 0.82 | 1 | 0.07 | - | - |
| 4 | Sreekandapuram | 1 | 0.18 | - | - | 2 | 0.70 |
| 5 | Naduvil | 1 | 0.80 | - | - | - | - |
| 6 | Kooveri | 1 | 0.24 | - | - | - | - |
| 7 | Nediyanga | - | - | - | - | 1 | 0.36 |
| Total | | 29 | 10.55 | 17 | 2.46 | 23 | 10.52 |

Table 4. Educational status of the growers

| Sl. No. | Category | Plantain | | Ginger | | Gingelly | |
|---------|---------------------------|----------------|-------|----------------|-------|----------------|-------|
| | | No. of growers | % | No. of growers | % | No. of growers | % |
| 1 | Minimum Literacy | 1 | 3.45 | - | - | 5 | 21.74 |
| 2 | Primary Education | 17 | 58.62 | 15 | 88.24 | 7 | 30.43 |
| 3 | Secondary Education | 8 | 27.59 | 2 | 11.76 | 10 | 43.48 |
| 4 | Above Secondary Education | 3 | 10.34 | - | - | 1 | 4.35 |
| Total | | 29 | 100 | 17 | 100 | 23 | 100 |

the growth of rubber. The results indicate that in the first year, the growth of plants in the inter-cropped units was better by one whorl of leaves as compared to the plants in the plantations without any intercrops (Table 5). For the second year also the plants in the inter-cropped units noted better performance than the other. It is clearly noticed that rubber plants in the ginger inter-cropped units showed better girth increment than the other two. None of the growers planted ginger and gingelly in the third year. The rubber plants in the plantain inter-cropped units showed an increase in girth by 3 cm over the control plots in the third year (Table 5).

The better growth of rubber plants in the inter-cropped area can be attributed to the effect of better cultural operations and manuring given to the intercrops. This is in conformity with the findings of Chandrasekhara (1984). The added benefit of ginger over the other intercrops in the 2nd year may be due to the additional organic manure incorporated to the soil during ginger cultivation.

4.5 Effects of intercropping in soil erosion and weed growth

The effect of intercropping in soil erosion and weed growth are presented in Table 6. Soil erosion was found to be low in gingelly inter-cropped units. This may be due to the bunds constructed against contour for gingelly cultivation. After harvesting the crop, the bunds were not destroyed. This would have helped in reducing soil erosion.

Table 5. Influence of intercrops on growth of rubber

| Sl. No. | Intercrop | Growth of plants | | |
|------------|-------------------|--------------------------------|------------------------------|------------------------------|
| | | Ist year (No. of whorls) | 2nd year (Girth in cm) | 3rd year (Girth in cm) |
| 1 | Plantain | 6 | 8 | 18 |
| 2 | Ginger | 6 | 9 | - |
| 3 | Gingelly | 6 | 8 | - |
| 4 | Without intercrop | 5 | 7 | 15 |

Ginger intercropping was found to enhance soil erosion. The ginger beds in the surveyed area were found to be comparatively smaller (1.5 - 2 metre) in length. The disturbance to the soil surface during earthing up and harvest, and drainage channel provided in between the beds would have promoted soil erosion.

Soil erosion was medium in plantain inter-cropped units. The earthing up given to the intercrop and the suckers of intercrop prevent the free flow of water and thus prevent the soil erosion.

Weed count was found to be low in ginger and gingelly inter-cropped plantations (Table 6). This may be due to the cultural practices adopted for the intercrops. Before planting all the weeds in the area were buried and thus reducing the emergence of weed in the later stages. In plantain inter-cropped units the weed count was found to be medium but less than in the units without any intercrops.

4.6 Effects of irrigating the intercrop on the growth of main crop

The influence of irrigating the intercrop on the growth of rubber is presented in Table 7. Irrigation was done only in plantain inter-cropped area. In the case of 'Poovan', 'Njalipoovan' and 'Palayankodan' irrigation was not done by any of the farmers. Five growers out of nine having 'Nendran' variety had irrigated their intercrops. The large expenditure required for the installation prevented the remaining five growers from irrigating their intercrops.

Table 6. Effects of intercropping in soil erosion and weed count

| Sl. No. | Factors | Without intercrop | With intercrop | | |
|---------|--------------|-------------------|----------------|--------|----------|
| | | | Plantain | Ginger | Gingelly |
| 1 | Soil erosion | Medium | Medium | High | Low |
| 2 | Weed count* | High | Medium | Low | Low |

Weeds/sq.m.

| | | |
|--------|---|--------------|
| *Low | - | 10 |
| Medium | - | 11-50 |
| High | - | 51 and above |

Table 7(a). Effect of irrigation of the intercrop on the growth of main crop

| Sl. No. | Intercrop | Irrigated | | | Non-irrigated | | |
|---------|-------------------|--------------------------------|------------------------------|------------------------------|--------------------------------|------------------------------|------------------------------|
| | | 1st year (No. of whorls) | 2nd year (Girth in cm) | 3rd year (Girth in cm) | 1st year (No. of whorls) | 2nd year (Girth in cm) | 3rd year (Girth in cm) |
| 1 | Plantain | 8 | 9 | - | 7 | 8 | 18 |
| 2 | Ginger | - | - | - | 6 | 9 | - |
| 3 | Gingelly | - | - | - | 6 | 8 | - |
| 4 | Without Intercrop | 7 | 8 | - | 5 | 7 | 15 |

Table 7(b). Effect of irrigation of 'Nendran' on the growth of main crop

| Intercrop | Irrigated | | Non-irrigated | |
|-----------|---------------------------------------|------------------------------|---------------------------------------|------------------------------|
| | No. of units (no. of whorls) | 2nd year (girth in cm) | No. of units (no. of whorls) | 2nd year (girth in cm) |
| Nendran | 5 | 9 | 4 | 7 |

The rubber plants in the irrigated units showed an advanced growth of one whorl of leaf in the first year and one cm girth in the second year. Units where irrigation was provided in the 3rd year were lacking in the surveyed area.

4.7 Economic aspects of intercrop

4.7.1 Plantain

The details of costs and returns from cultivating plantain as an intercrop with rubber are presented in Table 8.

Twenty nine sample units were surveyed for the purpose of the study. The total costs at cost-C worked out to Rs.10,980.41 per ha and the average yield was 3.48 tonnes. Thus the cost of production at cost-C was Rs.3,157.10 per tonne. All the growers sold the entire produce to the local dealers or hotels for village level consumption.

The total returns thus worked out at the 1991-92 price at the village level market amounted to Rs.19,499.75. It covered the total costs and gave a return of Rs.8,519.34 per ha over cost-C.

A place called Chamathachal in Payyavoor village is identified as an area highly suitable for 'Poovan' where the disease incidence was almost nil and the weight per bunch was 10 to 15 kg. In other areas 'Nendran' was found suitable.

Plantain cultivation in rubber plantation was not found to have any negative influence on rubber (Plate 1).

Table 8. Costs and returns per hectare of plantain grown as an intercrop with rubber

| Sl. No. | Operations | Costs (Rs./ha) |
|---------|------------------------------------|-----------------|
| 1 | Cost of suckers | 1763.56 (16.07) |
| 2 | Labour wages | 2040.92 (18.59) |
| 3 | Cost of fertilisers | 1027.30 (9.36) |
| 4 | Cost of organic manures | 110.13 (1.00) |
| 5 | Cost of pesticide/insecticide | 119.32 (1.09) |
| 6 | Irrigation expenses | 1451.47 (13.22) |
| 7 | Repairing of tools | 25.90 (0.23) |
| 8 | Depreciation allowances | 998.08 (0.09) |
| 9 | Miscellaneous expenses | 337.70 (3.44) |
| 10 | Interest on working capital | 425.37 (3.87) |
| 11 | Sub total: Cost-A | <u>8339.73</u> |
| 12 | Imputed rental value of owned land | 1803.47 (16.42) |
| 13 | Sub total: Cost-B | <u>10143.20</u> |
| 14 | Imputed family labour | 837.21 (7.62) |
| 15 | Total costs: Cost-C | <u>10980.41</u> |
| 16 | Total returns | 19499.75 |
| 17 | Benefit-cost ratio (B/C) | 1.7759 |
| 18 | Net returns over - Cost A | 11160.02 |
| | Cost B | 9356.55 |
| | Cost C | 8519.34 |

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

Plate 1. Rubber inter-cropped with plantain (2nd year)

4.7.2 Ginger

Seventeen units were surveyed for the purpose of the study. Economics of ginger grown as an intercrop with rubber is presented in Table 9.

The total costs at cost-C worked out to Rs.16,499.09 per ha and average yield was 0.54 tonnes dry ginger per ha. Thus the cost of production at cost-C was Rs.30,383.90 per tonne. It was observed that all the growers sold the entire produce directly to the local dealers realising the then price which was always less than the wholesale price at taluk level.

The total returns thus worked out at the 1991-92 price amounted to Rs.10,478.81. It did not cover the total costs and gave only a negative net return of Rs.5,970.28 per ha over cost-C. India is an exporter of ginger and it may be noted that the prices of ginger fluctuated to a large extent in every year, thus explaining the losses during the year. The benefit-cost ratio worked out to 0.64 implying that a rupee invested in ginger cultivation earned only 0.64 rupee as return.

More than 50 per cent of cost for ginger cultivation was accounted for procuring the seed material. Ginger cultivation also warrants large quantity of organic manure which was scarce in the surveyed area. The high cost of seed material, cattle manure and green leaf boosted up the cost of production for ginger.

Table 9. Costs and returns per hectare of ginger grown as an intercrop with rubber

| Sl. No. | Operations | Costs (Rs./ha) |
|---------|------------------------------------|-----------------|
| 1 | Cost of planting materials | 9509.76 (57.81) |
| 2 | Labour wages | 1630.19 (9.91) |
| 3 | Cost of fertiliser | 761.42 (4.69) |
| 4 | Cost of organic manure | 1597.82 (9.72) |
| 5 | Cost of pesticide/insecticide | 96.94 (0.59) |
| 6 | Interest on working capital | 515.27 (3.13) |
| 7 | Repairing of tools | 25.32 (0.15) |
| 8 | Depreciation allowances | 95.72 (0.58) |
| 9 | Sub total: Cost-A | <u>14232.44</u> |
| 10 | Imputed rental value of owned land | 1047.87 (6.37) |
| 11 | Sub total: Cost-B | <u>15280.31</u> |
| 12 | Imputed family labour cost | 1168.78 (7.11) |
| 13 | Total costs: Cost-C | <u>16449.09</u> |
| 14 | Total returns | 10478.81 |
| 15 | Benefit-cost ratio (B/C) | 0.6370 |
| 16 | Net returns over - Cost A | -9753.63 |
| | Cost B | -4801.50 |
| | Cost C | -5970.28 |

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



Plate 2. Rubber inter-cropped with ginger (2nd year)

However, it has many advantages. It is having no shade effect on rubber (Plate 2). The high dose of cowdung and chemical fertilisers added for ginger cultivation encourage better growth of rubber. In all plantations where ginger was grown as an intercrop, the growth of rubber was found to be better than the others. Moreover, in such area the weed count was also found to be very low.

The profitability of ginger as an intercrop depend on the market price for the produce and availability of organic manure. The procurement of seed material and organic manure at low cost again determine the net profit. Yield in ginger depend greatly on the organic matter supplied. Application of organic matter was limited in the surveyed area, and was badly reflected on yield.

4.7.3 Gingelly

The cost and returns for the cultivation of gingelly grown as an intercrop with rubber plantation are shown in Table 10.

Twenty three sample units were surveyed for the purpose of the study.

The total costs at cost-C worked out to Rs.2,718.95 per ha and the average yield was 0.23 tonnes per ha of gingelly. Thus the cost of production at cost-C was Rs.11,735.29 per tonne. It was noticed that all the growers sold the entire produce directly to the local dealers who in turn sold the materials to the taluk level dealers.

Table 10. Costs and returns per hectare of gingelly grown as an intercrop with rubber

| Sl. No. | Operations | Costs (Rs./ha) |
|---------|------------------------------------|-----------------|
| 1 | Cost of seeds | 74.77 (2.74) |
| 2 | Labour wages | 1176.84 (43.29) |
| 3 | Fertiliser cost | - |
| 4 | Cost of insecticides/pesticide | 144.85 (5.33) |
| 5 | Repairing of tools | 12.49 (0.46) |
| 6 | Other expenses | - |
| 7 | Depreciation allowances | 57.46 (2.11) |
| 8 | Interest on working capital | 13.23 (0.49) |
| 9 | Sub total: Cost-A | <u>1479.64</u> |
| 10 | Imputed rental value of owned land | 409.67 (15.07) |
| 11 | Sub total: Cost-B | <u>1889.31</u> |
| 12 | Imputed family labour | 829.64 (30.51) |
| 13 | Total costs: Cost-C | <u>2718.95</u> |
| 14 | Total returns | 3979.54 |
| 15 | Benefit-cost ratio | 1.4636 |
| 16 | Net returns over: | |
| | Cost A | 2499.90 |
| | Cost B | 2090.23 |
| | Cost C | 1260.59 |

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

A small quantity of the produce was used for the extraction of oil at the local mills by the individual growers.

The total returns thus worked out at the 1991-92 price at the village level market amounted to Rs.3,979.54. It covered the total costs and gave a return of Rs.1,260.59 per ha over cost-C.

The benefit-cost ratio worked out to 1.46 implying that the rate of return on a rupee invested as 1.46.

Gingelly cultivation is extensively done in Taliparamba taluk especially in Payyavoor and also in Eruvessy villages. The intercropping is done in the first year of planting of rubber (Plate 3). Generally the cultivation of gingelly in the same area is not done. It is due to the difficulty to construct the bunds again in the same area. In all the gingelly cultivated area, the bunds are constructed across the contour, thus reducing soil erosion. Gingelly is of 4 to 5 months duration and hence it will not adversely affect the growth of the main crop. The crop entirely depends on rainfall. It requires only moderate rainfall. If rainfall is high specially in the initial stages it is detrimental to the crop. Normally the rainfall in this area is suitable for gingelly cultivation. Rainfall pattern & temperature in the area surveyed is given in Appendix IVa and Appendix IVb respectively. The growers were found generally reluctant to thinning out operations and application of chemical fertilisers and organic manures. Spraying against leaf eating caterpillar was done by all



Plate 3. Rubber inter-cropped with gingelly (1st year)

the growers. The damage caused by the caterpillar (Acherantia styx) is too high in this taluk. The loss due to birds attack was also high in the surveyed units (3 Nos.) near paddy fields.

4.8 Relative profitability of different intercrops

Of the three intercrops studied, plantain was found to be the most profitable intercrop followed by gingelly (Table 11a). The returns from one ha of plantain and gingelly were Rs.19,499.75 and Rs.3,979.54 respectively. The total returns from ginger did not cover the total costs due to very low yield and market price. The whole plantain and gingelly were consumed indigenously while ginger was mainly exported. So the price of ginger in the market affected the return from ginger cultivation while the price of gingelly and banana had almost a fixed internal market. Thus the analysis showed that the relative profitability depends primarily on the market price.

The benefit-cost ratio of plantain, ginger and gingelly were 1.78, 0.64 and 1.46 respectively and is depicted in Fig.1.

The benefit-cost ratio of different plantain varieties as intercrops in rubber plantation were also studied.

Different varieties of plantain were cultivated in this area. They were 'Nendran', 'Poovan', 'Njalipoovan' and 'Palayankodan' (Table 11b). Of these, the 'Nendran' and 'Poovan' varieties were

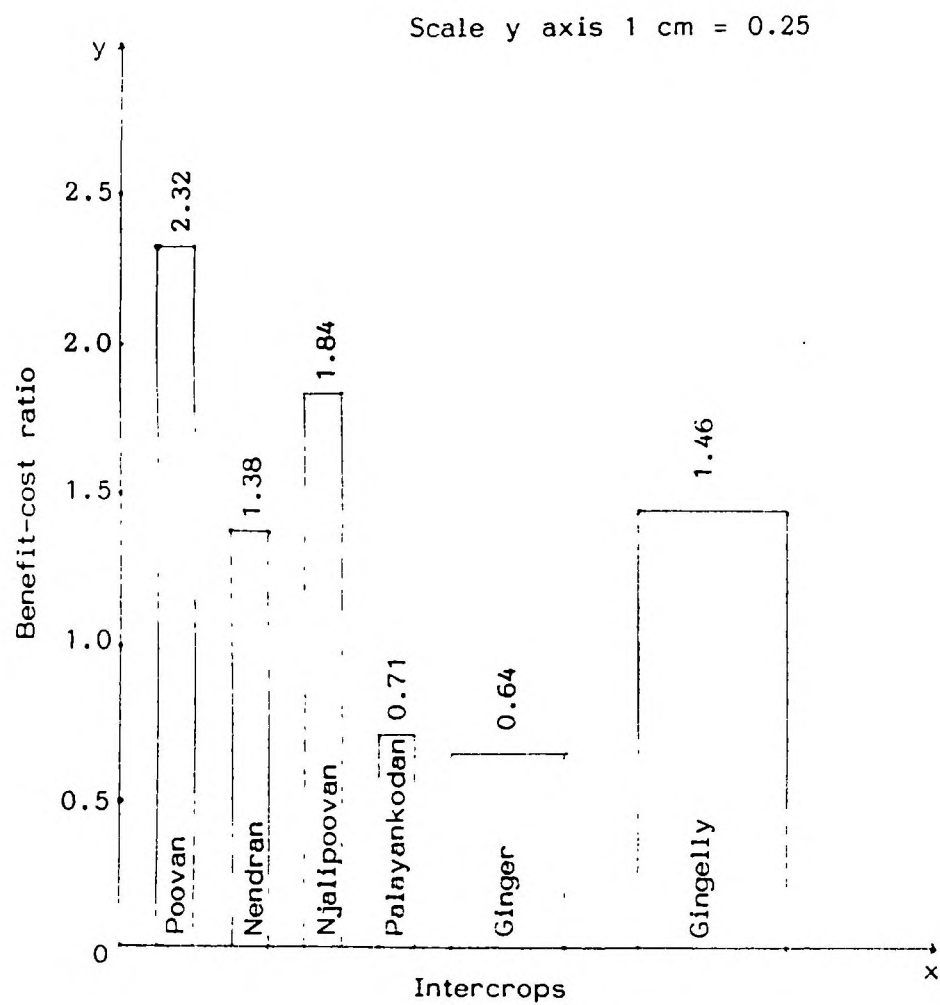
Table 11(a). Benefit-cost ratio of plantain, ginger and gingelly as intercrops in rubber plantations

| Sl. No. | Intercrop | No. of units | Benefit | Cost | BCR |
|---------|-----------|--------------|----------|----------|--------|
| 1 | Plantain | 29 | 19499.75 | 10980.41 | 1.7759 |
| 2 | Ginger | 17 | 10478.81 | 16449.09 | 0.6370 |
| 3 | Gingelly | 23 | 3979.54 | 2718.95 | 1.4636 |

Table 11(b). Benefit-cost ratio of different plantain types as intercrops in rubber plantation

| Sl. No. | Variety | Benefit (Rs.) | Costs (Rs.) | BCR |
|---------|--------------|---------------|-------------|------|
| 1 | Poovan | 49218.31 | 8273.74 | 2.32 |
| 2 | Nendran | 23011.30 | 16555.01 | 1.38 |
| 3 | Njalipoovan | 14485.29 | 7836.29 | 1.84 |
| 4 | Palayankodan | 1302.00 | 1817.00 | 0.71 |

Fig. 1. Benefit-cost ratio of different types of plantain, ginger and gingelly



predominantly seen. Plantain gave high remuneration compared to the other two crops studied. Diseases and pest attack apart from 'bunchy top' was found to be low.

The 'Poovan' is of 12 months duration while 'Nendran' requires 10 months. The 'Nendran' requires irrigation while the others are rainfed. 'Nendran' requires replanting every year while the 'Poovan' can yield better in the 2nd and 3rd year (ratoon crop). The long leaves of 'Poovan' may be harmful due to its shade effect and the extensive roots may compete for nutrients with the intercrop.

In plantations where 'Nendran' was inter-cropped with irrigation, the growth of rubber plants were found to be better (Table 7b). Moreover growers were in the habit of manuring the plantain regularly which also encouraged the growth of rubber. However, it is confirmed that intercropping three years after rubber planting is highly detrimental to rubber growth. Among the four numbers 'Poovan' gave a better benefit-cost ratio followed by 'Njalipoovan' and 'Nendran' (Table 11b). Out of the nine units inter-cropped with 'Nendran' only five were irrigated. The rainfed culture of 'Nendran' would have reduced the benefit-cost ratio for this variety. 'Nendran' could be recommended only in irrigated areas.

Summary and Conclusions

5. SUMMARY AND CONCLUSIONS

The average area of a rubber grower in Kerala is less than two hectares. He will have to wait for at least six years to get income from rubber. For the full canopy development, rubber takes four years and the interspace could be utilised for intercropping with remunerative crops during the initial three years.

From ^{this} the study (it was) ^srevealed that among the three inter-crops, plantain was the best followed by gingelly and ginger.)

It also discusses —
 ~~Each intercrop had its own advantage and disadvantage.~~ of each intercrop

Ginger was found to promote soil erosion. But it had the advantage of not having any shade effect unlike plantain. In all the plantations where ginger intercropping was done, the growth of rubber plants were found to be better than the control plots. In those plots the weed count was also less.

In the case of gingelly, it was found profitable. It offered less chances for soil erosion. Weed count was also found to be less. The agro-climatic condition in this area was found suitable for gingelly cultivation.

Plantain was found to be the best intercrop in terms of monetary benefits. It prevented soil erosion in sloppy area to some extent. In the 29 units surveyed, 4 varieties of plantain were found. Of these 'Poovan' gave better performance especially in rainfed areas.

But it may be mentioned that the long leaves and extensive root system of 'Poovan' may be harmful to the normal growth of rubber plants.

From the survey it could be concluded that:

- (1) Plantain gave the maximum profit as an intercrop, with a benefit-cost ratio of 1.78. 'Poovan' was found suitable in rainfed area and 'Nendran' in irrigated area.
- (2) Gingelly cultivation was suited as an intercrop and gave a benefit-cost ratio of 1.46 in the area. It prevented soil erosion considerably and along with gingelly intercropping cover crop also could be established as demonstrated by three growers contacted. Another important factor was that it had the least cost of production among the three intercrops studied.
- (3) Ginger intercropping gave no profit and the benefit-cost ratio was only 0.64. The growth of rubber plants was found to be encouraged by ginger intercropping.
- (4) Intercropping could be advised in small holdings so as to give an additional income during the long gestation period of the main crop.

Intercrops are to be suitably selected according to the prevailing climate, facilities available in the locality and market trends. However, the rubber plantations are to be kept free of intercrops by the fourth year of planting. Attempts for establishing the cover crop could be made earlier at least by the third year.

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APPENDIX-I

Taliparamba Taluk - A brief note

The Taliparamba Taluk situates in the Kannur District. The total area is 1330.6 Sq. K.M. and the population is 5,66,341. There are 47 villages in 3 firkas.

Two private colleges are there and a large number of L.P., U.P. and High Schools function in the taluk.

Large scale irrigation projects are lacking, but 40 numbers small scale irrigation projects are functioning in the taluk.

Only twenty nine small scale industrial projects have come up in the taluk.

A Light House and Naval Academy are located in Ramanthaly village and the Snake Park is in Andoor village of the taluk.

N.H. 47 passes through the taluk.

The main crops cultivated are cashew, rubber, coconut, arecanut, pepper etc.

APPENDIX-II

List of growers selected for the study

| Sl. No. | Name and address of the growers | Ref.No./Reg.No. |
|---------|--|------------------|
| 1 | 2 | 3 |
| 1 | Sri.Kurian, Keeraingamackal, Payyavoor | Applied for |
| 2 | Sri.Jose Mangalasseril, Payyavoor | PDA/TP/68 /90 |
| 3 | Sri.Ulahannan, Pulivelil, Chamathachal | PDA/TP/1679/90 |
| 4 | Smt.Gracy Puthukulathil, Chamathachal | PDA/TP/1673/90 |
| 5 | Sri.Abraham Chettiatt, Chamathachal | Applied for |
| 6 | Sri.Thomas Mukulel, Chamathachal | Applied for |
| 7 | Sri.Chacko Thenanmackal, Chamathachal | PDA/TP/1533/90 |
| 8 | Sri.C.K.Joseph Chazhisseril, Chamathachal | PDA/TP/2262/90 |
| 9 | Smt.Fathima, Pallipath, Irikkur | PD/TP/575/90(A) |
| 10 | Smt.Aleyamma Pulianmanayil, Chamathachal | PD/TP/4612/89(A) |
| 11 | Sri.R.P.Hussain, Pallipath, Irikkur | PD/TP/1073/90(A) |
| 12 | Sri.Mani, Olikkara, Chamathachal | PDA/TP/2209/90 |
| 13 | Sri.Mathai, Karimbil, Kootumukam | PD/TP/609/90(A) |
| 14 | Sri.P.C.Joseph, Parackal, Chamathachal | PDA/TP/2205/90 |
| 15 | Sri.A.D.Mathew Edat, Chamathachal | PDA/TP/4990 |
| 16 | Sri.Sebastian Maniangot, Chemperi | PDA/TP/998/90 |
| 17 | Sri.K.P.Pathros, Karumanappillil, Payyavoor | PDA/TP/2104/91 |
| 18 | Sri.Thomas Kiliankunnel, Chamathachal | PDA/TP/2173/90 |
| 19 | Smt.Brijitha Abraham, Pullolickal, Paisakari | PDA/TP/1142/90 |
| 20 | Sri.Thomas Thattaparambil, Payyavoor | PD/TP/1388/90(A) |

Contd.

Appendix-II. Continued

| 1 | 2 | 3 |
|----|--|------------------|
| 21 | Sri.Philip Thattaparambil, Payyavoor | PD/TP/145/90(A) |
| 22 | Sri.Kora, M.C., Moorthiyil, Chandanackampara | PDA/TP/2319/90 |
| 23 | Sri.Andrews Karingachira, Chapparapadava | PDA/TP/1250/90 |
| 24 | Sri.P.V.Joseph, Paliurumbil, Chandakunnu | PD/TP/1544/90(A) |
| 25 | Sri.George Kunnakatt, Chamathachal | Applied for |
| 26 | Smt.Mariakutty Chalil, Chamathachal | PD/TP/1546/88(A) |
| 27 | Sri.Mathai Muzhupel, Chamathachal | Applied for |
| 28 | Smt.Mary Kanjirathingal, Chamathachal | PD/TP/509/89(A) |
| 29 | Sri.Thomas Kanhirathingal, Chamathachal | PD/TP/510/80(A) |
| 30 | Sri.Lucka Arackaparambil, Payyavoor | PDA/TP/1021/91 |
| 31 | Sri.James Keeringamackal, Payyavoor | PDA/TP/442/91 |
| 32 | Sri.Kurian Thonduparambil, Payyavoor | Applied for |
| 33 | Sri.T.A.Simon, Thevar mattathil, Payyavoor | PDA/TP/727/91 |
| 34 | Sri.C.U.Varghese Chundayil, Chandanackampara | PDA/TP/582/90 |
| 35 | Sri.Thomas Puliyarmattathil, Nellikutty | PDA/TP/568/91 |
| 36 | Sri.Joseph Alankathadathil, Paisakary | PDA/TP/845/90 |
| 37 | Sri.Narayanan Thalachira, Payyavoor | PDA/TP/1510/91 |
| 38 | Sri.George Kaitholickal, Chandanackampara | PDA/TP/1160/90 |
| 39 | Sri.Mathai Kureekattil, Payyavoor | PDA/TP/2011/91 |
| 40 | Sri.Kurian Keeringamackal, Payyavoor | Applied for |
| 41 | Sri.Joseph Keeringamackal, Payyavoor | Applied for |
| 42 | Sri.T.M.Mathew, Thodianlackal, Paisakari | PDA/TP/3168/91 |
| 43 | Sri.Kuriakose Naganadiyil, Chamathachal | PDA/TP/1280/90 |

Contd.

Appendix-II. Continued

| 1 | 2 | 3 |
|----|--|-----------------|
| 44 | Sri.Mathew Munnoor, Payyavoor | Applied for |
| 45 | Sri.Mathai Chellambel, Chamathachal | PDA/TP/342/90 |
| 46 | Sri.Joseph Perumattikunnel, Payyavoor | PDA/TP/1742/91 |
| 47 | Sri.Zacharia Thodianplackal, Paisakari | Applied for |
| 48 | Sri.Gopalan Edapath, Paisakari | Applied for |
| 49 | Sri.Kurian Kocharikudiyil, Payyavoor | PDA/TP/607/91 |
| 50 | Sri.M.M.Joseph, Mecheriyil, Payyavoor | PD/TP/720/82(A) |
| 51 | Sri.George Poovunnikunnel, Payyavoor | Applied for |
| 52 | Sri.Antony Pariyarath Kunnel, Payyavoor | Applied for |
| 53 | Sri.Kovil Bhaskaran, Paisakari | PD/TP/627/89(A) |
| 54 | Sri.S.C.Thomas, Sourianmthottiyil, Paisakari | PDA/TP/1492/91 |
| 55 | Sri.Mathew Kalappurackal, Payyavoor | PDA/TP/1139/91 |
| 56 | Sri.Thomas Karumanappillil, Payyavoor | PDA/TP/2058/91 |
| 57 | Sri.K.C.Abraham Kodakachira, Paisakari | Applied for |
| 58 | Sri.Kuttappan Ottaplackal, Payyavoor | Applied for |
| 59 | Sri.T.M.Mathew, Thidianplackal, Paisakari | PDA/TP/3168/91 |
| 60 | Sri.Chandran Edavankoyyoth, Kootumukam | PDA/TP/236/91 |
| 61 | Sri.Narayanan Chathanattu, Paisakari | Applied for |
| 62 | Sri.Mathew Thomas Chiramattel, Nedungom | Applied for |
| 63 | Sri.Ayyappan Thalachira, Paisakari | Applied for |
| 64 | Smt.Sarada Eettickal, Paisakari | Applied for |
| 65 | Sri.Bhaskaran Edapat, Paisakari | Applied for |
| 66 | Sri.Raghavan Nambiar, E.K., Edavankoroth, Kootumukam. | PDA/TP/374/91 |

Contd.

Appendix-II. Continued

| 1 | 2 | 3 |
|----|--|----------------|
| 67 | Smt.Lakshmi Amakallunkal, Payyavoor | PDA/TP/2039/91 |
| 68 | Smt.Brijith Karumanappillil, Payyavoor | Applied for |
| 69 | Sri.Devasia,C.J., Chiramattel, Chunda,paramba | PDA/TP/1723/91 |

APPENDIX-III

QUESTIONNAIRE FOR COLLECTING DATA ON INTERCROPS FROM SMALL RUBBER GROWERS

1.a) Name and address of the :
estate owner

b) Location :

c) Size of the family (No. of :
adults)

d) Level of education :

| | | | |
|------------------|---------|-----------|-----------------|
| Can read & write | Primary | Secondary | Above secondary |
|------------------|---------|-----------|-----------------|

2. Reg.No/Ref.No. of the estate :

3. Type of planting material - :
with clone

| | | | |
|--------------------------------------|-------------|--|-----|
| 4.a) Area under immature rubber (ha) | <u>YEAR</u> | | |
| 1st | 2nd | | 3rd |
| 4th | 5th | | 6th |
| 7th | | | |

b) Area under mature rubber (ha) :

5.a) Cover cropped or not : Yes/No

b) Establishment of cover crop : not established/established well/
established at patches/others
(specify)

c) Area under cover crop :

| | | | |
|----------------------|-------------|--|-----|
| 6. Name of intercrop | <u>YEAR</u> | | |
| 1st | | | 2nd |
| 3rd | | | 4th |

...2.

7. Area under each intercrop :

8. Cropping intensity (actual area intercropped in the rubber plantation)

| 9. Cost of cultivation | Ginger (Rs.) | Gingelly (Rs.) | Plantain (Rs.) | Rs./ha |
|----------------------------------|-----------------|-------------------|-------------------|--------|
| a) Cost of seeds/suckers | | | | |
| b) Labour wages | | | | |
| c) Fertilisers cost | | | | |
| d) Cost of cowdung, etc. | | | | |
| e) Cost of pesticide/insecticide | | | | |
| f) Expenditure for irrigation | | | | |
| g) Interest on capital | | | | |
| h) Repairing of tools | | | | |
| i) Land rent paid | | | | |
| j) Imputed family labour | | | | |
| k) Others, if any | | | | |
| Total | | | | |

10) Other cultural operations taken up :

11) Average price during the last three years (1988-89, 1989-90, 1990-91) :

12) Selling price in the locality :

13) Total return (Rs.) :

14) No. of vacancies supplied :

15) Height of branching :

3

- 16) Overall performance :
- 17) Effect on soil erosion :
- 18) Weed count :
- 19) Yield obtained :
- 20) Mode of disposal :

Place:

Date :

Signature

APPENDIX-IV(a)

Details of rainfall recorded at Pepper Research Station, Panniyoor in 1990-1992*

| Month | 1990 | | 1991 | | 1992 | |
|-----------|-------------------|----------------------------|-------------------|----------------------------|-------------------|----------------------------|
| | Rainfall in mm | No. of rainfall days | Rainfall in mm | No. of rainfall days | Rainfall in mm | No. of rainfall days |
| January | - | - | - | - | - | - |
| February | - | - | - | - | - | - |
| March | - | - | - | - | - | - |
| April | - | - | 8.2 | 1 | - | - |
| May | 603.6 | 16 | 85.2 | 9 | - | - |
| June | 7421.0 | 30 | 945.6 | 29 | - | - |
| July | 1058.0 | 28 | 1298.4 | 31 | - | - |
| August | 678.4 | 27 | 750.6 | 28 | - | - |
| September | 168.6 | 8 | 76.2 | 6 | - | - |
| October | 383.4 | 16 | 243.6 | 13 | - | - |
| November | 84.8 | 5 | 77.8 | 5 | - | - |
| December | - | - | - | - | - | - |

* Panniyoor station is 28 Km away from the surveyed area and is the nearest observatory from where reliable rainfall data could be collected

APPENDIX-IV(b)

The monthly mean temperature recorded at Pepper Research Station,
Panniyoor in 1990-1992

| Month | 1990 | 1991 | 1992 |
|-----------|-------|-------|-------|
| January | 35.7 | 35.29 | 36.0 |
| February | 36.28 | 36.23 | 34.91 |
| March | 37.11 | 37.20 | 36.3 |
| April | 36.74 | 38.05 | 37.28 |
| May | 33.51 | 37.74 | |
| June | 30.13 | 29.61 | |
| July | 27.21 | 29.07 | |
| August | 28.2 | 29.14 | |
| September | 31.0 | 32.8 | |
| October | 32.0 | 32.4 | |
| November | 32.88 | 33.5 | |
| December | 35.51 | 34.3 | |