

FEASIBILITY OF PINEAPPLE AS AN INTERCROP IN SMALL HOLDINGS
OF RUBBER IN MUVATTUPUZHA TALUK

(By Jose, V.C.)

(Dissertation submitted in partial fulfilment of the
requirements for post-graduate Diploma in Natural Rubber
Production)

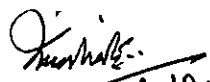
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DECLARATION

I hereby declare that this dissertation entitled Feasibility of Pineapple as an intercrop in small holdings of Rubber in Muvattupuzha Taluk is a bonafide record of original work done by me during the course of placement/training and that this dissertation has not formed the basis for award of any degree, diploma, associateship or other similar titles of any other University or society.

Vellanikkara,
8.4.96.


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CERTIFICATE

Certified that this dissertation entitled Feasibility of Pineapple as an intercrop in small holdings of Rubber in Muvattupuzha Taluk is a record of research work done by Sri. Jose, V.C. under our guidance and supervision and that it has not previously formed the basis for the award of any degree or diploma to him.

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CONTENTS

	Page No.
INTRODUCTION	1
REVIEW OF LITERATURE	4
MATERIALS AND METHODS	6
RESULTS AND DISCUSSION	9
SUMMARY AND CONCLUSION	24
REFERENCES	
APPENDICES	

LIST OF PLATES

Plate No.	Title
1.	Rubber intercropped with pineapple - first year
2.	Rubber intercropped with pineapple - second year
3.	Rubber intercropped with pineapple - third year
4.	Rubber intercropped with Kew variety of pineapple

Introduction

1. INTRODUCTION

Rubber (NR) is a perennial crop and its cultivation on a commercial scale in India can be traced back to the first quarter of the present century. From the very beginning the State of Kerala had a dominant position in terms of area under cultivation and production. Even now, the state's share is as much as 90 per cent of the total natural rubber production in the country. The crop covers about 15 per cent of the cultivated area with an extent of 4.9 lakh hectares. The two important factors which stimulated the expansion of natural rubber cultivation in the country were institutional support at various levels and a captive domestic market absorbing the production. An important outcome of the policies pursued by the government since independence was a steady increase in area under rubber in the small holdings sector characterised by a shift from other cash crops in areas where agro-climatic conditions were suitable for natural rubber cultivation.

The gestation period of rubber is about seven years and the sustained efforts of the growers to identify crops which can be grown as intercrops during the immature phase resulted in the development of intercropping as a standard

cultural practice in the rubber plantations. Banana, ginger, turmeric and elephant foot Yam are the common inter crops recommended in rubber during the first two or three years of planting (Sreenivasan et al., 1987). Reports from Sri Lanka revealed that pineapple is a good intercrop in rubber. Rajasekharan (1989) studied the benefit of growing pineapple as intercrop in some parts of Kottayam District and found that the benefit cost ratio (BCR) as 2.27.

As in any other rubber growing areas in the state farmers of Muvattupuzha taluk also used to grow annual crops such as ginger, banana, elephant foot Yam etc. in young rubber holdings. In recent years, pineapple is becoming popular in this taluk. Earlier this crop was confined to the villages like Manjallor, Arakuzha, Kalloorkad etc. But now it is a wide practice in all parts of the taluk to grow pineapple as intercrop in young rubber, probably because of the relatively higher profit coupled with good marketing facilities at Vazhakulam and other parts of the taluk.

The main objective of the present study is to find out the benefits of growing pineapple as an intercrop in young rubber holdings in Muvattupuzha taluk, and to work out

the B.C.R. It is also intended to asses the comparative performance of rubber plants under intercrop, cover crop and intercrop + cover crop and the influence of these cropping systems on the later performance of rubber.

Review of Literature

2. REVIEW OF LITERATURE

The literature on the feasibility of intercropping in rubber plantation is comparatively recent in origin and region specific. Chandrasekhara (1984) found that the growth of rubber intercropped with pineapple was better, under Srilankan conditions.

Sreenivasan et al. (1987) has studied the benefits of growing banana, ginger and turmeric in young rubber plantations in Kottayam District. They have reported that the benefit cost ratio was 1.61 for banana, 0.84 for ginger and 1.52 for turmeric. The analysis showed that the profitability depends much on market price during harvest season.

Rajasekharan (1989) conducted a detailed study on pineapple intercropping in rubber covering Vijayapuram, Ayarkunnam and Kooropada villages of Kottayam District. He has reported that the crop is highly beneficial, considering the high returns, giving a BCR of 2.27. The average population of pineapple was 4565 per ha and the total yield during first three years was 31 tonnes. The cost of production was worked out to be Rs. 0.57 per kg of pineapple. The study revealed a very high potential of the crop for intercropping in young rubber.

According to Webster and Baulkil (1989) it is ideal to go for monoculture because best results are obtained in such conditions. It is difficult to provide ideal condition for both main crop and intercrop in intercropped situation. It is also pointed out that annual crops are preferable for intercropping compared to perennial tree crops.

Madhavankutty (1991) has studied the benefits of growing betelvine as intercrop in Mavelikkara taluk. He reported that it is a beneficial crop.

Simon (1992) has studied the feasibility of growing banana, gingely and ginger in young rubber in Taliparamba taluk of Kannoor District. The studies revealed that intercropping banana and gingely are feasible compared to ginger. Among the varieties of banana, 'Poovan' was most beneficial giving the highest return (BCR 2.32). The BCR worked out for banana, ginger and gingely were 1.78, 0.64 and 1.46 respectively.

Samson (1980) reported that pineapple is a crop best suited to be grown in tropical countries. It is having fibrous root system and is a soil exhausting crop.

Materials and Methods

3. MATERIALS AND METHODS

3.1. General information

The study was based on data collected from small growers of Muvattupuzha taluk. The taluk lies about 30 km towards the east of Kochi. People are mostly farmers. There are no major industries. The river Muvattupuzha and NH 49 (Kochi-Madurai) passes through this taluk. Major crops grown are rubber, coconut, arecanut, paddy, tapioca, ginger, nutmeg etc.

A sample of 110 growers whose rubber areas cover such patterns as rubber+pineapple, rubber+pineapple+covercrop and rubber+covercrop in the first, second and third year of planting were selected randomly based on the available information in Rubber Board Regional Office, Muvattupuzha and the Field Office Vazhakulam. In all the cases intercropping was done in the same year of planting of rubber.

For comparing the effect of pineapple as an intercrop on the biometric characters of the rubber trees, 10 sample holdings in the 7th year of planting under the categories mentioned above were also covered.

- b. Value of fertilizers
- c. Value of manual labour (own and purchased)
- d. Value of planting material (farm produced and purchased)
- e. Land revenue and other taxes
- f. Depreciation of farm buildings
- g. Depreciation of farm implements
- h. Interest on working capital
- i. Miscellaneous expenses (repair of implements, value of rodenticides, insecticides etc.)

2. Cost B

Cost A + imputed rental value of own land (less land revenue paid thereupon)

3. Cost C

Cost B + imputed value of family labour.

The interest on working capital was worked out at 10 per cent. The returns were calculated at the average price in open market during 1991, 1992 and 1993 during harvesting period. Rental value of own land was calculated @ Rs 7500 per ha which is the prevailing rate in Muvattupuzha taluk. Profitability and B.C.R. for both the cultivated varieties viz., Mauritius and Kew were worked out.

3.3. Biometric characters of rubber plants

3.3.1. Girth of plants were measured at 125 cm height from bud union using a tape and expressed in cm. Girth was recorded for three year old plants.

3.3.2. Height - Total height of the plant was measured using a pole and expressed in centimetres.

3.3.3. Nature of canopy - Canopy was categorised as light, medium and dense based on visual observation.

3.4. Soil erosion - Soil erosion was categorised as low, medium and high based on visual observation.

3.5. Weed count - Using wooden frame a field of 1 sq.metre was measured and the number of weeds in this area was counted and this was expressed as low, medium and high depending on the weed intensity.

3.6. Standard of literacy

Literacy was classified as minimum literacy, primary education, secondary education and above secondary education.

Results and Discussion

4. RESULTS AND DISCUSSION

This chapter elaborates the major findings of the study on the standard of literacy of growers, size of holding, pattern of intercropping, influence of intercrop on growth of rubber in the early stages and its later performance in the tappable stage and economic aspects of intercropping.

4.1. Educational status of growers

The percentage of literacy of growers to different standards are presented in Table 1. Out of 100 growers, only three percentage had minimum level of literacy. Seventeen percentage of the growers was having primary education, 57 percentage was having secondary education and 23 percentage of growers had acquired educational status above secondary. The survey revealed that irrespective of educational status, maximum preference was for the mauritius variety of pineapple.

4.2. Size of holdings and cropping pattern

Details on size of holding, number of units in each size group and the total area covered by them with respect to different cropping patterns are shown in Table 2. From the data it was concluded that there is no correlation between cropping pattern adopted and size of holding.

Table 1. Educational status of growers.

Educational status	No. of growers	Variety of intercrop	
		Kew	Mauritius
Minimum literacy	3	1	2
Primary education	17	1	16
Secondary education	57	-	57
Above secondary education	23	1	22
<i>TOTAL</i>	<i>100</i>	<i>3</i>	<i>97</i>

Table 2. Size of holdings and cropping pattern

Size of holdings (ha)	Cropping pattern					
	Rubber+cover crop		Rubber+pine-apple		Rubber+pine-apple+cover crop	
	No.	Total area (ha)	No.	Total area (ha)	No.	Total area (ha)
< 0.25	1	0.23	40	8.64	2	0.41
0.25 to 0.50	4	1.25	22	9.52	3	1.08
0.51 to 0.75	3	1.56	21	12.48	1	0.64
0.76 to 1.00	2	1.60	6	5.12	2	1.84
1.01 to 1.50	-	--	3	3.94	-	--
<i>TOTAL</i>	<i>10</i>		<i>92</i>		<i>8</i>	

4.3. Varietal preference

The pattern of intercropping in 100 units surveyed, having intercrop pineapple is summarised in Table 3. All the units were planted with budded variety of clone RR11-105. Buddings were preferred to clonal or unselected seedlings considering the high and uniform yield of budded varieties. RR11-105 was preferred because of higher yield. Regarding intercropping with pineapple, it was observed that out of 100 units, 96 units were interplanted with Mauritius variety. Kew variety was not popular as an intercrop.

4.4. Influence of different cropping system on growth of rubber

For finding out the effect of intercropping on growth of rubber, two different pattern of intercropping viz. Rubber + pineapple and rubber + pineapple + cover crop were studied. It was compared with a situation of pure planting with cover crop. The details are presented in Table 4. Growth of rubber plants was measured in terms of height and girth and the nature of canopy was also noted.

During the first year, pure planting with cover crop recorded maximum height (300 cm) whereas rubber with pineapple intercrop brought out a drastic reduction in the height of the plants and it was minimum (255 cm). In the

Table 3. Varietal preference

	No. of units			Area (ha)		
	1st year	2nd year	3rd year	1st year	2nd year	3rd year
1. Main crop						
a. Budgrafts						
RRII-105	25	31	44	11.48	14.44	25.50
Others	-	-	-	-	-	-
b. Polyclonal/ unselected						
	-	-	-	-	-	-
2. Intercrop						
a. Kew	2	1	1	0.45	0.20	0.12
b. Mauritius	23	30	43	11.03	14.24	25.38

Table 4. Influence of different cropping systems on growth of rubber

	Rubber + cover crop			Rubber + Pineapple			Rubber + Pineapple+ covercrop		
	Avera- ge girth (cm)	Hei- ght (cm)	Canopy	Avera- ge girth (cm)	Hei- ght (cm)	Canopy	Avera- ge girth (cm)	Hei- ght (cm)	Canopy
Ist year	-	300	Dense	-	255	Medium	-	270	Medium
2nd year	-	420	Dense	-	330	Medium	-	360	Medium
3rd year	17.5	-	Dense	15	-	Dense	15	-	Dense

case of rubber plants with cover crop and pineapple intercropped the reduction in height was not much pronounced (270 cm). In pure planting with cover crop the canopy was dense where as in intercropped situations the canopy was medium.

During the second year also the trend was similar to first year and rubber plants with cover crop recorded maximum height (420 cm) and the canopy was dense. The girth measurements made during the third year indicated that there is a reduction in girth by 2.5 cm due to intercropping. The retardation in growth due to intercropping can be attributed to the following facts. Usually two rows of pineapple are planted in the interspace between two rows of rubber. Pineapple is having fibrous roots and rubber is also a surface feeder. So towards the end of first year or from second year onwards there will be root competition for nutrients and soil moisture. In addition, the plant density of pineapple increases from second year onwards. More over pineapple is a soil exhausting crop (Samson, 1980). No improvement in girth was observed by cover cropping in intercropped situation.

4.5. Girth of rubber at 7th year as influenced by intercropping

To compare the effect of different cropping system on the later performance of rubber five units each coming under the cropping patterns viz. rubber + cover crop, rubber + covercrop + pineapple and rubber + pineapple were surveyed. All the units were at tappable stage and intercropping was over. Data presented in Table 5 showed that there is slightly higher standard of growth for pure planting in the 7th year (49 cm). Girth was least in rubber + pineapple situation (46.5 cm) and also the range in girth was wide (40 to 53 cm), which means that there was more weeklings in that case (50%) compared to 30% in the case of rubber with covercrop.

4.6. Effect of pineapple intercrop on soil erosion and weed growth

Among the units surveyed, none was seen with high soil erosion (Table 6). Majority of holdings recorded medium soil erosion. In rubber with cover crop soil erosion was only low. Rubber in Muvattupuzha taluk is cultivated mostly on hill sides. Yet soil erosion was not high even in intercropped units. This can be attributed to the fibrous root system of pineapple. It is for this reason that pine apple is used as a hedge plant in integrated soil conservation system.

Table 5. Girth of rubber at seventh year as influenced by intercropping

Cropping patterns	Girth (cm)		
	Range	Mean	Weaklings (%)
Rubber+Pineapple	40-53	46.5	50
Rubber+Pineapple+ Covercrop	43-53	48.0	40
Rubber+ covercrop	44-54	49.0	30

Table 6. Effect of pineapple intercrop on soil erosion & weed growth

	Soil erosion				Weed count			
	Pure planting		Intercropped area		Pure planting		Intercropped area	
	No. of units	Per-centage	No. of units	Per-centage	No. of units	Per-centage	No. of units	Per-centage
Low	10	100	16	16	10	100	47	47
Medium	-	-	84	84	-	-	36	36
High	-	-	-	-	-	-	17	17
<i>TOTAL</i>	<i>10</i>		<i>100</i>		<i>10</i>		<i>100</i>	

Weeds/sq.meter

Low - 10 and below 10

Medium - Between 10 and 50

High - 50 and above

Regarding weed growth it was low in all cases of pure planting and in 47 intercropped plots. In 36 plots it was found medium and in 17 plots high. Weed growth was comparatively low in intercropped area due to smothering of weeds by pineapple.

4.7. Details of cropping intensity and mode of marketing

The details presented in Table 7 showed that maximum preference was for Mauritius variety. Flower induction using ethrel was followed in all the units. The plant density for Kew was found to be low (9625/ha) when compared to Mauritius (10,000/ha). Maximum number of growers sold the fruits in open market irrespective of varietal difference. The yield for Kew was only 30,000 kg/ha whereas for Mauritius it was 42,000 kg/ha.

4.8. Comparison of performance of Kew and Mauritius

Management practices and performance of two varieties were compared (Table 8). It is evident that Mauritius is superior to Kew in many aspects and its suitability for ratooning makes it ideal to be planted in young rubber. The only draw back of Mauritius is that the weight of fruits is little less compared to Kew.

Table 7. Details of intercropping and mode of marketing

	Total units intercropped	Cropping intensity		Flower induc- tion (No.of units)	Yield/ ha (kg)	Mode of market- ing(No.of units)	
		Range	Mean			Open mar- ket	Co-op. soci- ety
Kew	4	9500- 10000	9625	4	30000	4	-
Mauri- tius	96	7500- 10250	10000	96	42000	88	8

Table 8. Comparison of performance of pineapple varieties, Kew and Mauritius

Particulars	Mauritius	Kew
1. Average cost of planting material	Rs 0.90 to 1.25/ sucker	Rs 0.40 to 0.65 per sucker
2. Manuring required	Normal	One additional dose required
3. Flower induction stage	20 leaves	35 leaves
4. Response to flower induction	100%	Upto 70%
5. Sucker formation	3 to 5 nos.	1 to 2 nos.
6. Average weight of fruit	1.5 kg	2.5 kg
7. Response to flower induction material in excess quantity	Not much affected	Breakage of outer skin of fruit and exposure of pulp
8. Average price realised/kg	Rs 3/-	Rs. 2/-
9. Damage of fruit on rough handling	Not easily damaged	Very easily damaged
10. Damage of fruit on long distance transporting	Not easily damaged	Very easily damaged
11. Suitability for ratoon cropping	Very suitable	Not much suitable



Plate 1. Rubber intercropped with pineapple - first year



Plate 2. Rubber intercropped with pineapple - second year

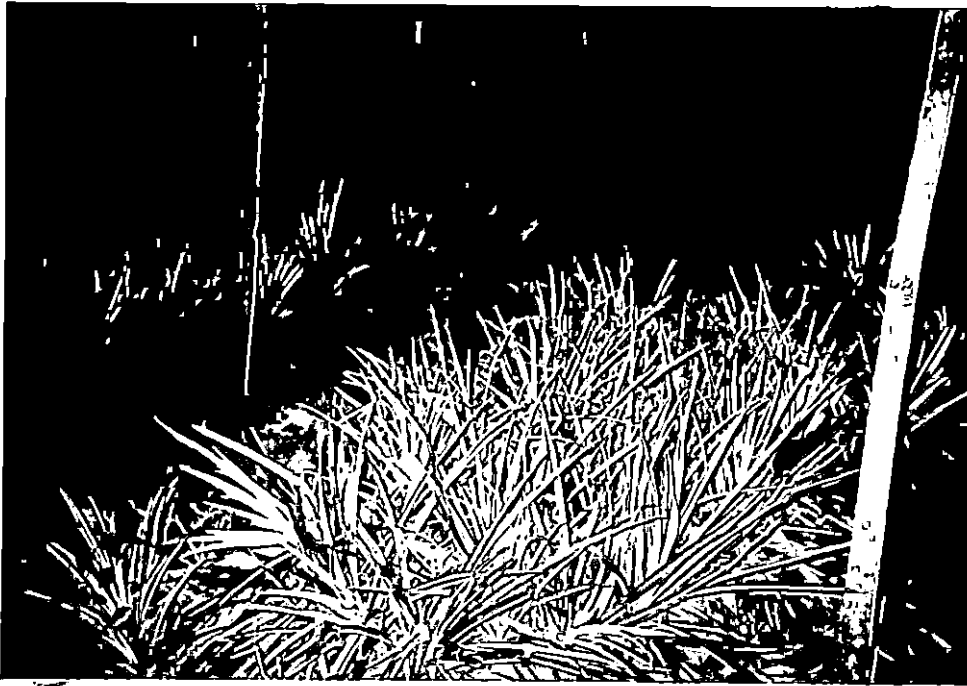


Plate 3. Rubber intercropped with pineapple - third year



Plate 4. Rubber intercropped with Kew variety of pineapple

4.9. Relationship between plant density, yield and net income of pineapple

The data furnished in Table 9 indicated the relationship between plant density, yield and net income of pineapple as intercrop. The optimum plant density for high yield (45225 kg/ha) and net income (Rs. 158288/ha) was found to be 10000, above and below which there is drastic reduction in yield and income in the villages surveyed. This can be explained by the reduction of size of fruits above the optimum plant density due to competition of plants. Below the optimum stand, fruit size increase, but this can not be compensated by the reduced number of fruits.

5.0. Economic aspects

The 100 units surveyed come under three groups viz. those with intercropping during first year, second year and third year. The cost and returns for each group were calculated accordingly.

5.1. Cost analysis of intercropping

Detailed cost analysis of intercropping after completion of first, second and third year is given in Table 10. The data indicated that there was no net profit during first year for Kew variety where as mauritius gave net profit in the first year itself.

Table 9. Relationship between plant density, yield and net income of pineapple variety Mauritius

Plant density/ ha	% of growers	Yield/ha (kg)	Net income/ha (Rs)
8750	5	38125	133438
10,000	62	45225	158288
10,125	16	38670	135345
10,250	17	25777	90220



Table 10. Details of cost benefit analysis of pineapple intercropping

Details	First year (25 units)		Second year (31 units)		Third year (44 units)	
	Mauritius	Kew	Mauritius	Kew	Mauritius	Kew
Cost A						
1. Cost of planting material	9963.58	4777.77	10630.55	3500.00	10432.43	4750.00
2. Cost of manure/fertilizer/ flower induction	5536.95	6222.00	10378.20	10750.00	14540.78	15833.00
3. Cost of hired human labour	4227.96	4000.00	8564.81	8600.00	11602.05	10000.00
4. Cost of irrigation	130.00	120.00	857.19	---	750.79	2000.00
5. Cost of tools/repairing charges	299.64	555.00	347.07	550.00	443.26	625.00
6. Transporting cost	858.41	688.00	1773.15	850.00	2369.39	1416.00
7. Interest on working capital	2101.65	1636.20	3255.00	2425.00	4013.85	3462.40
Total cost A	23118.19	17998.97	35805.97	26675.00	44152.35	38086.40
Cost B						
Rental value of own land	2500.00	2500.00	5000.00	5000.00	7500.00	7500.00
Total cost B	25618.19	20498.97	40805.97	31675.00	51652.35	45586.40
Cost C						
Imputed family labour cost	241.74	888.00	651.43	1000.00	464.18	1333.00
Total cost C	25859.93	21386.97	41457.40	32675.00	52116.53	46919.40
Total returns	32897.86	15555.00	100053.17	43500.00	129388.14	61150.00
Net returns	7037.93	-5831.97	58595.77	10825.00	77271.61	14230.60
Benefit cost ratio	1.27	0.73	2.41	1.33	2.48	1.30

The data also showed that Mauritius was relatively more profitable than Kew. The Mauritius variety yielded a net profit of Rs.7073.93/ha the first year itself compared to Kew variety which resulted in a net loss of Rs.5831.97/ha. Net returns on hectare basis from Mauritius on cost-C during second year was Rs. 58595.77 and during the third year it was Rs. 77271.61 whereas for Kew it was only Rs. 10825.00 and Rs. 14230.60 during second year and third year respectively. The highest net return was received during the third year in both the varieties. During the second and third year period both the varieties recorded increased net profits and relatively higher BCR compared to first year. In all the years studied, Mauritius recorded higher BCR than Kew and a progressive increase in the BCR was also noted as year advanced. The BCR worked out for Mauritius variety during the first, second and third year was 1.27, 2.41 and 2.48 respectively. For Kew the highest BCR was recorded during second year (1.33) since the major part of the yield was obtained during the second year only. This finding is in conformity with Rajasekharan (1989) who also observed a high BCR for pineapple as intercrop (2.27) in young rubber. The preference for pineapple as an intercrop in rubber holdings can be substantiated by these findings.

The relatively lower profitability from Kew is due to many reasons. The Major contributing factors appear to be lower price realisation, lower sucker production, more inputs required and more time required for attaining maturity of fruits. There is also lesser response to flower induction and fruits are more prone to damage. So Mauritius is preferred to Kew.

Summary and Conclusion

5. SUMMARY AND CONCLUSION

Muvattupuzha is a taluk where majority of people earn their living through agriculture. The literacy level of people is high. Among the crops raised, rubber is having great importance and it covers larger area. Almost all the rubber growers raise some intercrop during the first three years of immaturity of rubber to get some income. As an intercrop in rubber, pineapple has received much attention in recent years. The present study is an attempt to find out the benefits of growing pineapple as intercrop, to work out the B.C.R. and to study its feasibility when compared to other cropping systems.

Irrespective of the size of holding pineapple is used for intercropping in many units. Pineapple as intercrop was found to slightly retard the growth of rubber in the immaturity period and at tappable stage. Considering the long gestation period of 5 to 7 years and the profitability of intercropping during this period when there is no other income, it can be ignored. Cost analysis has proved that pineapple is a profitable intercrop in young rubber plantations. Among the varieties of pineapple, Mauritius is preferred due to higher profitability (B.C.R 2.4), easy management practices and marketability.

2 h.c

Cultural operations for pineapple is not difficult, requiring minimum digging compared with other crops. Though the profitability depends on market price during harvesting period, it is fetching comparatively higher returns on account of comparatively stable prices. In Muvattupuzha taluk there is good marketing facility for pineapple. Fruits are sold in open market and through co-operative societies.

The study revealed that soil erosion and weed growth are low or medium in pineapple intercropped plots. The study highlighted the potential of pineapple as an intercrop in rubber plantations in the taluk. The growing popularity of the crop is evident from the steady expansion of area under pineapple in all the villages of the taluk which was initially confined to selected regions.

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Appendix

APPENDIX I
Questionnaire

Main Crop (Rubber)

1. Name and address of owner :
2. Size of family (Adults :
/children)
3. Educational status :
4. Reg. No of Estate :
5. Type of planting material :
(U/S, C/S, Bgs.)
6. Year of planting :
7. Area under immature rubber:
8. Area intercropped :
9. Area having Cover crop :
10. Growth of plants (Girth/ :
Height), No. of whorls-
dense canopy, medium
canopy, light canopy
11. Uniformity of growth :
(uniform/slightly uneven,
uneven)
12. Weed Count (in 1 metre²) :
13. Soil erosion (High/Low/ :
Medium)

Intercrop (pineapple)

1. Variety - Kew (large :
Spineless) Mauritius(Long
Spiny) Queen(Short Spiny)
2. Cropping intensity (No. :
per acre
3. Cost of planting material :
4. Flower induction (Using :
Ethrel/ Natural)
5. Labour wages (Mandays + :
value)
6. Cost of manure/Fertilizer :
7. Cost of insecticides :
8. Cost of irrigation :
9. Input family Labour :
(Manddays + Value)
10. Land rent :
11. Interest on Capital :
12. Cost of tools/repairing :.
Charges.
13. Yield of fruit (No/Kgs.) :
14. Price per kg/No. - Total :
Sales price
15. Benefit cost ratio :
16. Mod of marketing (open :
market/Co-operative
Society/auction.
17. Transporting cost :
18. Difficulties in :
marketing if any
19. Income from Suckers (Rs.) :