# ADOPTION OF COCONUT-BASED INTERCROPPING SYSTEMS IN SRI LANKA: THE FALLACY OF CONVENTIONAL WISDOM ON ECONOMIC PROFITABILITY

By

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# ABSTRACT

Despite the concerted efforts of successive governments in Sri Lanka to popularize coconutbased intercropping (CBI) systems, an intensive land use alternative to traditional less intensive coconut monocropping, its adoption by farmers is as low as 25% of the agronomically potential area of 100,000 ha. Although the adoption of an innovation is influenced by a range of determinants which can be broadly categorized as technical, economic, institutional and personal/social, economic profitability of the technology itself is one of the key determinants influencing its adoption. This study assesses the economics of widely practiced five different CBI systems vis-a-vis coconut monocropping, employing five economic indicators, namely Total Gross Margin (TGM), Net Present Value (NPV), Benefit-Cost Ratio (BCR), returns to labor and returns to capital. Data were collected by a field survey of 113 intercroppers and 37 monocroppers conducted from March to May 1995 in three main coconut growing districts in Sri Lanka, namely: Gampaha; Kurunegala; and, Puttalam. Results revealed that all the CBI systems give higher returns per hectare than coconut monocrops, though some of the indicators, namely BCR and returns to variable costs, are reasonably attractive for monocrop coconuts, albeit they are less than for some CBI systems. The study concluded that the low rate of adoption of CBI systems is not a problem of low profitability. Hence, it is worthwhile to explore the other factors typically influencing the adoption of production technologies to find out the reasons for low adoption of CBI

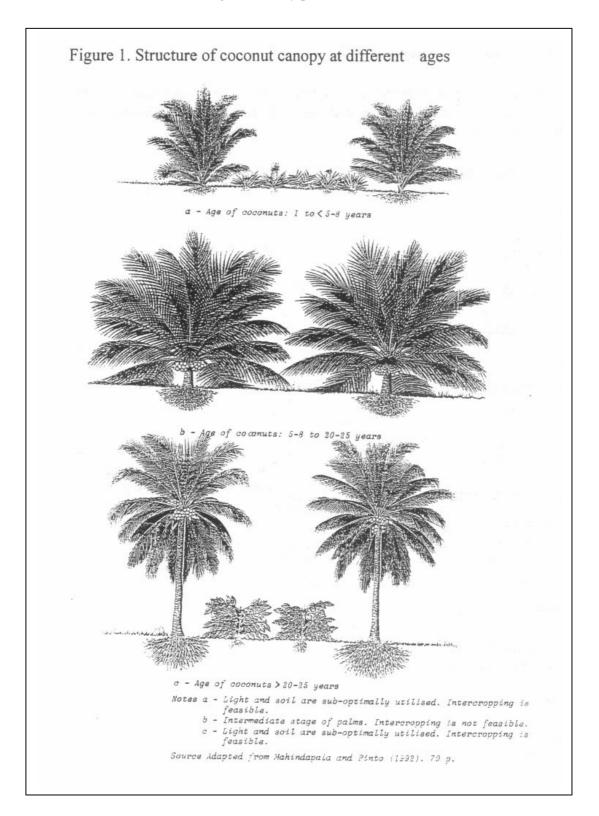
## **INTRODUCTION**

Coconut is indispensable to Sri Lanka mainly because of its intimate integration into the daily diet of Sri Lankans. The coconut industry contributes about 2.7 and 3.3%, to the Gross Domestic Product (GDP) and to export earnings, respectively, while providing livelihood for some 400,000 rural families (Liyanage, 1997). As is well known, coconuts are cultivated predominantly as a monocrop in almost all coconut growing countries in the world including Sri Lanka. Since coconuts have to be planted at wider spacing to permit the canopy growth at maturity (Figure 1), monocrop coconuts utilize bio-physical resources sub-optimally. A mature coconut palm in a pure coconut stand utilizes only about 25% of the soil mass, leaving some 75% of the soil unutilized or under utilized (Fernando, 1997). A mature coconut palm during the 6-hour peak brightest period of the day (i.e. 10:00 to 16:00 hours) intercepts effectively only about 44% of the total solar radiation, the remaining 56% of solar radiation being unutilized (Nair and Balakrishnan, 1976). In terms of land use, coconut is the largest plantation crop occupying 416,000 ha which is about 20% of nation's cultivable lands, and is approximately equal to the collective area occupied by tea and rubber, the other two major plantation crops. Inefficient land use by monocrop coconuts involves a foregone opportunity cost of an intensive land use alternative. Intercropping monoculture coconut lands with annuals, semi-perennials and perennials, raising livestock or intercropping-livestock integration under coconuts intensify the less efficient land use of coconut monocropping, thereby raising farmer's income. Despite state efforts in terms of providing subsidies, low-interest loans, extension

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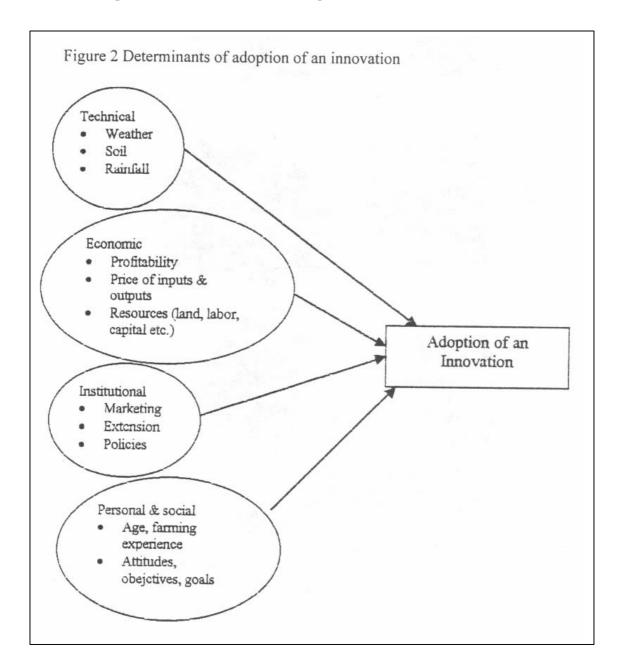
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support, etc. to popularize coconut-based intercropping (CBI) over two decades, its adoption by farmers is still as low as 25% of the agronomically potential area of 100,000 ha.



# Theory of Adoption of an Innovation

As show in Figure 2, a range of factors, which could be broadly categorized as technical, economical institutional, and personal/social, influences the adoption of an innovation.



Among the factors shown in Figure 2, the economic profitability of a technology is one of the key determinants influencing its adoption by farmers. The objective of this paper is to assess the economics of existing CBI systems. More specifically, this study determines the economics of widely practiced five different CBI systems in relation to coconut monocropping.

## **Hypothesis:**

Maintenance of existing mature coconut lands as monocrop is economically worthwhile in relation to intensifying them as CBI systems.

## **METHODS**

Data: A farmer survey was carried out from March to May 1995 to collect the data.

Sample size: The sample comprises 113 coconut-based intercroppers and 37 coconut monocroppers

*Survey area:* Three main coconut-growing districts in Sri Lanka, namely: Gampaha; Kurunegala; and, Puttalam constitute the survey area.

Sampling Procedure: Although these districts comprise five agro-ecological regions, namely  $IL^1$ ,  $WL^2$ ,  $WL^4$  and  $WM^3$ , a greater percentage (86%) of Coconut Development Officer (CDO) ranges<sup>1</sup> fall in the  $IL_1$  and  $WL_3$ , and hence only the CDO ranges falling in  $IL_1$  and  $WL_3$  were purposively selected for the survey. The land area of the above three districts falling under IL1 agro-ecological region is greater than that of  $WL_3$ . Hence, about 60% of sampling units (22 monocroppers and 68 intercroppers) were allocated into  $WL_3$  (Table 1).

	Agro-ecological regions*						
	IL <sub>1</sub>	IL <sub>1</sub> WL <sub>3</sub> Total					
Monocroppers	22	15	37				
Intercroppers	68	45	113				
Total	90	60	150				

Table 1. Allocation of sampling units

Sampling units were allocated in each CDO range as follows.

• Agro-ecological regions are categorized based mainly on 75% expectancy value of annual rainfall. Major soil groups and terrain characteristics are also considered for the categorization.

 $IL_1$  - : Low-country Intermediate zone 1

 $WL_2$  : Low-country Wet Zone 2

*Wl*<sub>3</sub> : Low-country Wet Zone 3

*WL*<sub>4</sub> : Low-country Wet Zone 4

*WM*<sub>3</sub> : *Mid-country Wet Zone 3* 

# Table 2 Distribution of monocroppers and intercroppers in CDO ranges

		Agro-ecologi	cal region			
	$WL_2$		WL <sub>3</sub>			
CDO range	Monocroppers	Intercroppers	CDO range	Monocroppers	Intercroppers	
Dummalasuriya	2	8	Nittambuwa	2	7	
Kuliyapitiya	2	7	Mirigama	2	7	
Welpalla 2 7		Pallewela	3	8		
Yackwila	3	8	Minuwangoda	3	8	
Dambadeniya	2	7	Urapola	3	8	
Weerambugedara	2	7	Weke	2	7	
Udubaddawa	3	8				
Dankotuwa	3	8				
Hamangalla	3	8				
Total	22	8		15	45	

# Analysis

A range of economic indicators is available to measure the relative advantage/disadvantage of a new technology. The importance of each economic indicator for this study and the calculation procedure are outlined below.

#### Total Gross Margin (TGM)

Annual TGM analysis provides an estimate of the sum of annual net cash flows in the intercrop and monocrop systems. The annual gross output quantities of each product were priced to derive the annual gross income, and deducting the variable costs (see Appendix Tables A1 to A5) derived annual gross margins.

#### *Net Present Value (NPV)*

Coconut is a perennial crop and most of the other intercrops observed in the field are semiperennial crops. The costs and benefits of such crops occur at different times and, therefore, a measure is required to compare the net worth of the monocrop and integrated system over the entire production period. NPVs are employed to meet this objective. The credit scheme of the Perennial Crops Development Project (PECRODEP) which is widely operating through its Participatory Credit Institutes provides loans at 15% interest rate, so a 15% interest rate was used for NPV calculations. A sensitivity analysis is also carried out at 20 and 25%.

## Benefit-Cost Ratio (BCR)

This measures the returns in relation to the invested sums. The sum of the discounted benefits was divided by the sum of the discounted costs to derive the BCR.

#### Returns to Variable Costs

This economic indicator measures the efficiency of the production system with respect to the variable costs involved. Returns to variable cost were computed by dividing the annual gross farm income by the annual farm variable costs.

## Returns to Labor

Labor productivity is an important consideration in smallholder agriculture. Returns to labor measured in Rupees per man-day was employed to investigate the relative returns provided by the monocrop and intercropping systems. Non-labor inputs were deducted from the gross farm income in each year, and the result was divided by the total labor use in man-days over the whole season to drive the returns to labor.

The above indicators are separately computed for monocrops as well as intercropping systems.

#### **RESULTS AND DISCUSSION**

## (A) Economic analysis of existing coconut monoculture systems

The economic analysis of existing coconut monoculture system will be carried out in this section using the above indicators for coconut monoculture system. The testable hypothesis of this analysis is whether the maintenance of existing mature coconut lands, as monocrops is economically worthwhile than introducing coconut-based intercropping (CBI). The inclusion of the establishment

costs of monocrop coconuts would not be helpful in testing this hypothesis, as they are historical (sunk) costs (Famiyeh, 1971). Therefore, only the annual maintenance costs of monocrop coconuts wee included in the calculation.

## a) TGM (Total Gross Margin)

Annual input and output data with respect to existing mature coconut monoculture system of the sample farmers were used to derive the total gross margin of coconut monocrop system. Liyanage *et al.* (1988) found that the nut yield of Sri Lanka Tall (SLT) palms increases progressively every year after initial bearing until a maximum<sup>2</sup> is attained at about 16-18 years, and is maintained thereafter depending on the environmental conditions. The average age of the coconut palm in the sample was 41 years and the annual average nut yield was 2946 nuts/acre/year (7277 nuts/ha/year). It could be argued that the representative monocrop stand of the survey sample has already achieved the maximum yield. Therefore, the average yield of 2946 nuts per acre per year would be expected to continue during each year of the entire five years<sup>3</sup> of planning horizon considered for the comparison with the intercropping systems. Table 3 shows the sample average gross margin (Rs/ac/year) of the matured coconut monoculture system.

## NPV (Net Present Value) and BCR (Benefit-Cost Ratio)

Constant annual variable costs and gross returns for the entire period of five years were considered to calculate the NPV and BCR of monoculture system (see Appendix Table A6). The calculated NPVs of GMs are Rs. 20,364; Rs. 18,168, and Rs. 16,337 at 15; 20; and 25% discount rates, respectively. The BCR is 2.87.

## b) Returns to Labor

This was calculated to be Rs 656 per man day (Appendix Table A6)

#### *c) Returns to Variable Costs*

In coconut monoculture systems, this is the same as the BCR (2.87), as it assumes constant annual: a) variable costs and b) gross returns, for the entire five-year period. These results are compared with the corresponding results of CBI systems in the next section to test the relevant hypothesis.

<sup>2</sup> The maximum yield is about 3,000 to 4,000 nuts per acre depending on soil, environment and management conditions (Liyanage *et al.* 1988)

<sup>3</sup> The reason for considering a five-year period for this comparison is as follows: Monoculture coconuts in the present sample have already achieved the maximum yield and therefore the sample average yield of 2,946 nuts/ac/year will be consistent throughout the rest of the palm life. On the other hand, the input requirements' including labor does not vary much over the years once monocrop coconuts attain the maximum yield. This implies that the TGM of coconut monocrops does not vary over the rest of the palm life given the constant prices used for calculations throughout. Hence, the number of years required for the comparison of monocrop with intercropping systems is dictated by the number of years required by intercrops for an effective comparison. Five years would be sufficient for the comparison because the economic life of semi-perennial intercrops considered is five years.

OUTPUT	
No. of nuts (per acre/year	2946
Average price (Rs/nut)	3.16
Gross Return (Rs)	9309.36
INPUTS	
Labor use (man days)	
Weeding	5.5
Fertilizer application	3
Nut collection	2.5
Total man days	11
Average wage rate (Rs/man day)	104
Contract labor cost for harvesting (Rs/ac)	582
Sub-total 1 – labor cost (Rs)	1726
Material Cost	
Fertilizer (kg/ac)	12.5
Price (Rs/kg)	8.5
Fertilizer cost (Rs)	1062.5
Sub total 2 materials cost (Rs)	1062.5
Transport Cost	
Fertilizer transport (Rs)	208
Cost for internal field transportation of coconut (Rs)	238
Sub total 3 transport cost (Rs)	446
Variable costs (Rs/ac)	3234.5
Gross Margin (Rs/acre/year	6074.86

Table 3 Calculation of annual gross margin (Rs/acre) of coconut monoculture system

Note: Ave. age of coconut palms - 41 years Source: Farmer Survey, 1985

# (B) Economic Analysis of Existing Coconut-Based Intercropping Systems

The survey has identified an array of different intercropping systems involving various combinations of intercrops, and the relative abundance of each system is shown in Table 4.

Only the first five intercropping systems of the Table 4 namely: coconut + pineapple + banana; coconut + banana; coconut + pineapple; coconut+ betel; and, coconut + betel + banana were used for the economic analysis in view of their widespread practice. Other intercropping systems are relatively less significant. All the five economic indicators, as in the case of monoculture systems, have been calculated for the five different intercropping systems considered. While full details of the calculation procedure are found in Appendix Tables A7, A8, A9, A10 and A11 for the five different intercropping systems, respectively, their summary results are compared here with the results of the monoculture system.

No.	Cropping system	Number of farmer practisin	Percentage
1	Coconut + pineapple + banana	30	2.50
2	Coconut + banana	15	13.27
3	Coconut + pineapple	14	12.39
4	Coconut + betel	7	6.19
5	Coconut + betel + banana	6	5.31

 Table 4. Relative abundance of different intercropping systems

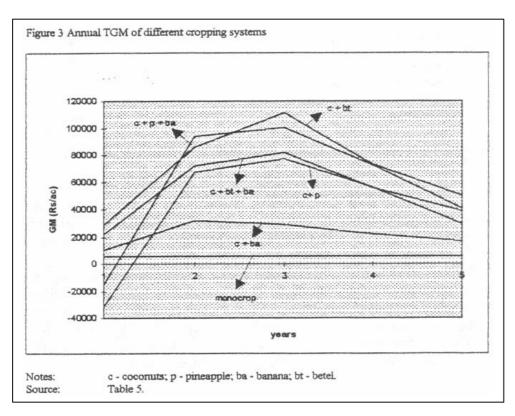
6	Coconut + pepper	4	3.54
7	Coconut + pineapple + pepper	4	3.54
8	Coconut + pineapple + banana + ginger	4	3.54
9	Coconut + ginger + banana	3	2.65
10	Coconut + ginger + banana + betel	3	2.65
11	Coconut + banana + pepper + coffee	3	2.65
12	Coconut + pepper + banana	2	1.77
13	Coconut + banana + rambutan	2	1.77
14	Other systems	16	14.15
	Total	113	100.00

# a) TGM

Table 5 and Figure 3 show the annual gross margins of different intercropping systems in comparison with monocrop system.

Cropping system	Year 1	Year 2	Year 3	Year 4	Year 5				
TGM (Rs/ac)									
Monocrop	075	075	6,075	6,075	6,075				
Coconut + pineapple + banana	-15,263	94,077	100,420	72,621	40,398				
Coconut + banana	10,451	32,040	28,938	2,213	16,933				
Coconut + pine apple	-31,061	7,455	76,874	56,241	29,351				
Coconut + betel	28,869	85,693	111,045	73,193	49,625				
Coconut + betel + banana	22,057	72,058	81,632	55,904	38,969				

Table 5. Annual TGM of different cropping systems



It is clear that the cropping systems comprising pineapple has negative gross margins in the first year, as pineapple does not generate returns in the first year but incurs high costs of establishment. However, it commences to produce much higher gross margins that the monocrop system from the second year onwards.

Cropping systems consisting of betel and banana generate higher positive gross margins compared to monocrop system in the first year of establishment, as these crops commence to yield in the first year. In summary, the annual gross margin analysis suggests that all the intercropping systems considered are superior to monocrop systems in terms of margins per unit of land. Among them, banana and betel systems are more attractive in terms of providing positive annual gross returns during the entire planning period of five years while pineapple systems have a little longer waiting period. The poorly endowed/resource-poor farmers may be much concerned with sustaining a positive annual cash flow, no matter how low rather than waiting longer to obtain higher cash flows. The better endowed/resourceful farmers may be better able to await for higher returns occurring at later stages. NPV, rather than the TGM analysis, would be a better criterion to investigate the appropriateness of cropping systems for the latter group of farmers.

## b) NPV

NPVs generated by all the intercropping systems are markedly higher compared to the coconut monocrop system at all the interest rates addressed (Table 6). The coconut + betel system yielded the highest NPV. The descending order of NPV of other cropping systems is: coconut + pineapple + banana; coconut + betel + banana; coconut + pineapple and coconut + banana.

Cronning system	NPV (Rs)				
Cropping system	15%	20%	25%		
Monocrop	20,364	18,168	16,337		
Coconut + pineapple + banana	185,498	161,982	142,397		
Coconut + banana	73,417	65,186	58,298		
Coconut + pineapple	121,291	104,365	90,336		
Coconut + betel	229,434	20,309	18,103		
Coconut + betel + banana	178,678	158,282	14,122		

## Table 6. NPV of different cropping systems over five years (Rs/ac)

Notes: a, b, c are discount rates.

Source: Farmer survey, 1995.

As shown by Table 5, the cropping systems involving pineapple has negative gross margins in the first year whereas the gross margins of monocrop system are positive in all the five years considered<sup>4</sup>. It may therefore be argued that the NPVs of intercropping systems involving pineapple would be lower than those for the coconut monocrops at discount rates beyond the ones addressed in Table 6. Hence, a much higher discount rate (100%) was used to test the sensitivity of NPVs of intercropping systems having pineapple as a component crop. The resultant NPVs were: Rs 5,885; Rs34,241; and, Rs 5,375, respectively for monocrop coconuts, coconut + pineapple + banana system, and coconut + pineapple system. In addition, the NPV of the monocrop system was also compared with the NPVs of the remaining three other intercropping systems at 100% discount rate. Coconut + banana; coconut + betel; and, coconut + betel + banana systems, respectively generated Rs 18,765; Rs55,864; and, Rs43,959 as against the monocrop NVP of Rs5,885.

<sup>4</sup> Coconuts also produced negative gross margins in the first few years of establishment. However, this concern requires no consideration here, because the establishment costs can be considered as historical costs as has been discussed.

These results prove beyond reasonable doubt that no matter how high the discount rates, the monocrop coconuts are not competitive with any of the other five intercropping systems in terms of providing higher NPVs. The relatively low returns generated by monocrop coconuts are one of the main problems of maintaining coconuts as a monocrop today. This already held view by researchers and farmers were confirmed by the present finding.

# c) BCR

BCRs were calculated for the five different cropping systems as shown in Table 7.

Cropping systems	BCR
Monocrop	2.87
Coconut + pineapple + banana	3.24
Coconut + banana	3.07
Coconut + pineapple	2.74
Coconut + betel	1.88
Coconut + betel + banana	2.12

Table 7 BCRs of Different Cropping Systems

Source: Farmer survey, 1995

The procedure to accept or to reject any project based on BCR criterion, is to accept all those having BCRs greater than unity while rejecting all projects having BCRs lower than unity. Based on this criterion, it is clear that all the cropping systems are financially worthwhile to individual farmers. Perhaps, the most noticeable point is that the coconut monocrop systems exhibit higher BCRs than 3 of the 5 intercropping systems. Coconut monocrop systems utilize less inputs, for instance, less labor and other paid costs for fertilizers etc., but generate benefits more than double in financial terms, indicating that it is a profitable crop. Clearly, the problem of monoculture coconut is not that the return to investment is low, but rather that it generates lower returns per unit of land to growers as evidenced by the previous NPV calculations. Although the coconut + betel system generates the highest NPV/acre compared to other cropping systems (see the results of the NPV calculations in the previous section), the return to investment of this system is the lowest (1.88) compared to the other systems. The reason for this is higher labor inputs required for betel cultivation (labor was valued at market wage rate to compute BCRs). However, betel is an attractive crop for families having high levels of family labor supply. In summary, the BCR analysis reveals that all the cropping systems are financially worthwhile in terms of returns to investment. Of them, the highest BCR was observed in coconut + pineapple + banana system (3.24) while coconut monocrop system also exhibits an attractive BCR (2.87).

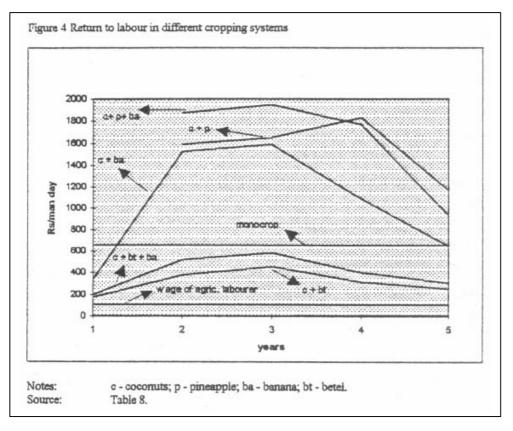
# *d) Returns to family labor*

The returns to family labor generated by different cropping systems were compared with the wage rate of an agricultural laborer, and the returns to family labor of monocrop coconuts were compared with that of the other intercropping systems (Table 8).

The monocrop as well as all the intercropping systems generate markedly higher returns to family labor compared to the average wage rate of an agricultural laborer. From the second year onwards, coconut + pineapple + banana, coconut + pineapple and coconut + banana systems generate substantially higher returns to labor than coconut monocrop system. However, intercropping systems involving betel produces lower returns to labor compared to monocrop systems because betel is a highly labor-intensive crop requiring almost daily labor involvement. Figure 4 shows the return to labor of different cropping systems, and compares these with the wage rate of an agricultural laborer.

Cropping system	Year 1	Year 2	Year 3	Year 4	Year 5		
Rs/man day							
Monocrop	656	656	65	65	56		
Coconut + pineapple + banana	(-) ve	1,870	1,955	1,773	941		
Coconut + banana	39	1,528	1,588	1,088	650		
Coconut + pine apple	(-) ve	158	1,549	1,834	1,171		
Coconut + betel	177	378	461	320	254		
Coconut + betel + banana	198	519	58	404	309		
Wage rate of an agricultural labour	104	104	104	104	104		

Table 8. Returns to family labour in different cropping systems



In summary, these results reveal that the return to labor of all the cropping systems analyzed is higher than the wage rate of agricultural laborer. This indicator is particularly high in pineapple and banana systems, although the labor requirements of these crops are also higher. The higher returns to labor of these systems, while utilizing high levels of labor, are mainly due to their higher gross margins. Higher returns to labor of monocrop systems are mainly due to the inherent low labor utilization. The low returns to labor in cropping systems involving betel is not due to higher returns per acre (NPV calculations indicated that betel systems are the highest NPV earners), but due to their much higher labor requirement.

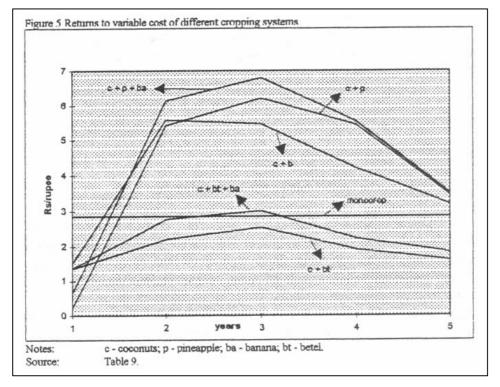
#### e) Returns to variable costs

Table 9 and Figure 5 show the returns to variable costs for different cropping systems in different years.

Cropping system	Year 1	Year 2	Year 3	Year 4	Year 5			
Returns to variable costs (Rs/rupee invested)								
Monocrop	2.87	2.87	2.87	2.87	2.87			
Coconut + pineapple + banana	0.67	6.13	6.80	5.54	3.50			
Coconut + banana	1.50	5.59	5.47	4.20	3.21			
Coconut + pine apple	0.23	5.42	6.21	5.45	3.46			
Coconut + betel	1.35	2.19	2.54	1.89	1.61			
Coconut + betel + banana	1.37	2.76	3.01	2.21	1.83			

Table 9. Returns to variable costs in different cropping systems

Source: Farmer survey, 1985



In the first year, all the intercropping systems show a relatively low return to variable costs compared to the monocrop system, which is obviously due to the high cash outlays associated with the intercrop establishment. But from the second year onwards, the coconut + pineapple + banana; coconut + pineapple and coconut + banana systems begin to generate markedly higher returns to variable costs compared to the monocrop system. The interesting feature is that the intercropping systems involving betel always exhibit a tendency to yield low returns to variable costs compared to the monocrop system, except that the coconut + betel + banana system generate a marginally higher returns to variable costs only in the third year. These results suggest that the generation of gross return relative to the utilization of variable costs is higher in pineapple and banana intercropping systems. The results also indicate that coconut monoculture has an ability to generate higher gross returns relative to the variable costs.

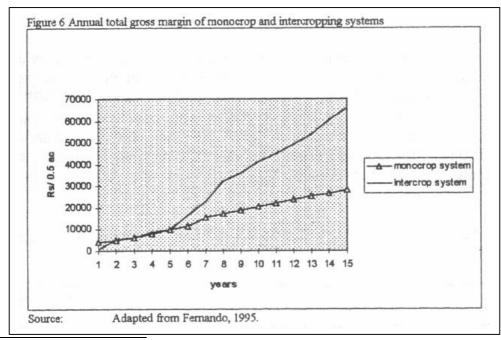
Thus far, the analysis has been confined only to the most prevalent intercropping system found in the survey, and involving semi-perennial intercrops such as pineapple, banana and betel. However, there exists a range of other perennial intercropping systems including crops such as pepper, coffee, cocoa, etc. Although they were not found widely practiced during the survey, they deserve comparing with monocrops because their lower abundance was mainly due to the persistence of low market prices for them in recent years <sup>5</sup>. However, farmers expect an increased price for them in years to come.

The main difficulty in comparing perennial intercropping systems with monocrop coconuts arises with regard to the excessive data requirements as perennial intercrops take over ten years to attain the full potential production. For instance, coffee and pepper respectively take 11 and 10 years to reach full production. However, the farmers were unable to provide sufficient accurately remembered data with regard to these intercrops, and this precluded a rigorous comparison with monocrops coconuts. The author has, however, compared a monocrop system with a perennial intercropping system <sup>6</sup> using six years of actual data, collected from a crop model established in a farmer's field, supplemented with nine years of budgeted data (full details are reported elsewhere, Fernando (1995)). The findings of that comparison may be useful to infer how monocrop coconuts compare with a perennial intercropping system in the first year is less than that of the monocrop system because of the higher costs involved in planting intercrops. It is almost the same as the monocrop system from year 2 to 5, after which it increases progressively due to the benefits accrued by pepper and coffee as well as the incremental nut yield resulting from the complementary effect of intercropping.

 Table 10. Comparison of annual total gross margins (Rs/0.5 ac) of a monocrop system with a perennial intercropping system

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Monocrop system	4,019	4,747	5,949	7,910	9,660	11,350
Intercropping system	976	5,448	6,013	8,702	9,782	1,096

Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
15,326	17,002	18,652	20,272	21,860	23,496	25,091	26,640	23,137
22,983	32,072	35,960	40,945	44,616	49,049	53,530	60,422	65,741



<sup>5</sup> A sudden drop in price of these perennial intercrops took place about a decade ago, resulting in a reduction of their widespread growing.

<sup>6</sup> This consists of pepper and coffee (ginger was grown only in one year).

Fernando (1995) has also examined the NPV of the monocrop and intercropping systems, at different discount rates, for two different periods, namely a six-year period of actual data, and a fifteen-year period of actual plus budgeted data (Tables 11 and 12, respectively).

Intercropping system Monoculture system Interest rate (%) 5 37,609 39,795 10 32,839 34,112 25 23,350 22,919 30 21,230 20,446 40 17,952 16,646

Table 11 Comparison of NPV (Rs/0.5 ac) of monocrop and intercropping systems over six years

It is clear that the NPV of the perennial intercropping system in the short run (6 years) is higher compared to the monocrop system at low interest rates of 5% and 10%, but the opposite is the case at higher interest rates.

The NPVs of both monocrop and intercropping systems break even at the 20% discount rate, above which the NPV of monocrops is higher compared to intercropping system, and below which the NPV of intercropping system is higher compared to monocrop system (Fernando, 1995). However, the comparison over the long run (15 years), as demonstrated by Fernando (1995), reveals that the intercropping system generates higher NPVs even at higher discount rates compared to the monocrop system.

Table 12 Comparison of NPV (Rs/0.5 ac) of monoculture and intercropping systems over 15 years

Interest rate %	Monoculture system	Intercropping system
10	107298	183946
25	45575	66094
30	36881	50523
40	26213	32210

Source: Fernando, 1995

These findings confirm that intercropping systems involving perennial intercrops considered generate higher incomes compared to monocrops. However, the returns to labor and variable costs of perennial intercropping system analyzed are less compared to the monocrop system (Fernando, 1995).

Comparison of the results obtained for different economic indicators with respect to coconut monoculture and coconut-based intercropping systems do not provide sufficient evidence to accept the hypothesis that the coconut monoculture systems are economically advantageous than CBI systems. Rather, it provides strong evidence that the intercropping systems are economically advantageous in relation to monocrop system. However, some of the indicators, namely; BCR and returns to variable costs, are reasonably attractive for monocrop coconuts, though they are less than for some intercropping systems.

#### SUMMARY

Coconuts are cultivated predominantly as a monocrop in almost all coconut growing countries, including Sri Lanka. Monocrop coconut use bio-physical resources such as soil, sunlight, etc. sub-optimally. Coconut-based intercropping (CBI) is a strategy to intensify the use of above resources while raising farmers' income. Despite this agronomic promise, the adoption of CBI systems by farmers is as low as 25% of the agronomically potential area of 100,000 ha notwithstanding the government efforts over 20 years. Economic profitability, albeit not the sole criterion, greatly influences the adoption of new technologies by farmers.

A study was conducted to assess the economics of widely practised five different CBI systems vis-à-vis coconut monocropping. The CBI systems considered were: coconut + pineapple + banana; coconut + banana; coconut + pineapple; coconut + betel; and, coconut + betel + banana. Data were collected by a field survey of 113 coconut-based intercroppers and 37 coconut monocroppers, conducted during March to May 1995 in three main coconut growing districts, namely: Kurunegala; Gampaha; and, Puttalam. Five economic indicators, namely: Total Gross Margin (TGM); Net Present Value (NPV); Benefit-Cost Ratio (BCR); returns to labor; and, returns to capital were employed to test the hypothesis that the coconut monocrooping is economically worthwhile in relation to CBI. The results revealed the following.

- TGM and NPV were markedly higher in all the five intercropping systems analyzed compared to monocrops. However, the CBI systems involving pineapple showed a negative TGM in the first crop year because pineapple does not generate returns to cover the costs in the first year. However, the BCRs were less in three of the five intecropping systems than monocrops.
- Returns to labor of all intercropping systems were greater than the agricultural wage rate.
- Two of the five intercropping systems had lower returns to labor and to variable costs as compared with monocrops, while three of the five intercropping systems had lower BCRs than monocropping.

#### CONCLUSIONS

The results obtained for five different economic indicators with regard to coconut monocropping and coconut-based intercropping (CBI) provide strong evidence to prove that CBI systems are economically advantageous vis-à-vis coconut monocropping. Although not the sole criterion, the profitability of an agricultural innovation is a key consideration for its adoption by small farmers. This study has concluded that CBI systems generate higher incomes per unit of land than coconut monocrops. Hence, we argue that the low rate of adoption of CBI is not a problem of low profitability and thus refute the conventionally held view that the low adoption of CBI is tied to low economic profitability of CBI systems. The problem may rest on some other factors, which include: demand for the management of the crop and its inputs, and a skilled knowledge compared to monocropping. These management demands include procuring of: disease-free planting materials; fertilizer; flowering hormones; fiber dust from fiber mills, all with critical timing; hired labor management; etc. The skilled knowledge includes the practical skill of planting different intercrops at different spacing, timely application of flowering hormones for pineapple, harvesting at the right time, disease precaution measures etc. (e.g. soft rot disease in ginger, panama disease in banana, and wilt in pineapple, etc). The risk perception about the innovation being unsuccessful and the risk associated with yield and price outcomes of intercrops appear to be the other factors constraining the adoption of CBI by farmers. Equally, the study thus concludes with emphasizing the need for exploring the influence of above less-frequently addressed factors on adoption of coconut-based intercropping in Sri Lanka.

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OUTPUT	
Ginger (cwt/ac)	47
Average price (Rs/cwt)	1,325
Income from ginger (Rs/ac)	62,805
GROSS RETURN (Rs/ac)	62,805
INPUTS	
Labor use (md/ac)	
Land clearing	5
Land preparation	11
Dipping in chemicals	4
Planting	8
Fertilizer application	6
Mulching	8
Weeding	23
Harvesting	22
Application of insecticide	5
Processing	30
Total labor use (md/ac)	119
Wage rate (Rs/md)	104
Labor cost (Rs/ac)	*
Materials	
Seed singer (cwt.ac)	9
Price of seed ginger	1,450
Seed ginger cost (Rs/ac)	13,746
Fiber dust-number of 4WT/ac	45
Price per 4WT (Rs)	95
Cost of fiber dust (Rs/ac)	4,237
Inorganic fertilizer (kg/ac)	450
Average price (Rs/kg)	10
Cost of inorganic fertilizer (Rs/ac)	4,343
Cost of insecticide & fungicides (Rs/ac)	768
Total material cost (Rs/ac)	23,094
Transport	
Fiber dust – number of 4WT	45
Ave. cost for transport one 4WT (Rs)	139
Fiber dust transport cost (Rs/ac)	6,199
Planting materials transport	193
Fertilizer 1 –transport cost (Rs/ac)	256
Fertilizer 2 – transport cost (Rs/ac)	100
Fertilizer 2 – transport cost (Rs/ac) Total transport cost (Rs/ac)	
Total transport cost (Rs/ac)	100 6,748
Total transport cost (Rs/ac) Machinery	6,748
Total transport cost (Rs/ac)	

Table A1 Gross margin of ginger cultivation under coconuts (Rs/ac)

Notes: Errors in sums are due to rounding 1 Sterling pound is approximately Rs 95 in July 1997 1 cwt = 112 pounds (50 kg) md – man-days

\* labor was not valued, 4WT – four-wheel tractor Source: Farmer survey, 1995

	· · · ·		Years		_
OUTPUT	1	2	3	4	5
Bunches/ac	122	180	177	151	14
Average price (Rs/bunch	154	143	130	107	7
Income from bunches (Rs/ac)	18,788	25,740	23,010	16,157	10,65
Suckers	240	300	234	271	35
Average price (Rs/sucker)	13.22	13.22	13.22	13.22	13.2
Income from suckers (Rs/ac)	3,173	3,966	3,093	3,583	4,62
Gross return (Rs)	21,961	29,706	26,103	19,740	15,28
INPUTS					
Labour (md/ac)					
Land cleaning	6				
Land preparation	5				
Cutting pits	7				
Dipping in chemicals	1				
Planting	3				
Fertilizer application	4	4	4	4	
Fiber dust mulching	4				
Weeding	6	6	5	5	6
Removal of suckers	2	4	4	5.5	
Application of insecticide	1				
Removal of old banana logs		3	1	1	
Harvesting	2	2	2	3.5	
Total md/ac	41	19	16	19	27
Wage rate (Rs/md)	104	104	104	104	1(
Labour cost **					
Materials					
Number of suckers	158				
Average price (Rs/sucker)	13.22				
Cost of suckers (Rs/ac	2089				
Fiber dust (number of 4WTs)	35.5				
Price per 4WT (Rs)	69				
Cost of fiber dust (Rs/ac)	2,444				
Inorganic fertilizer (Rs/ac)	211	221	224	239	22
Average price (Rs.kg)	8.5	8.5	8.5	8.5	8
Cost inorganic fertilizer (Rs/ac)	1,793.5	1,878.5	1,904	2,031.5	1,895
Cost insecticides and fungicides (Rs/ac)	274	215			
Total material cost (Rs/ac)	6,600	2,093.5	1,904	2,031	1,895
Transports cost					
Number of 4WTs of fiber dust	35.5				
Average cost for transport/one load of 4WTs	152				
Fiber dust transport cost (Rs/ac)	5,396				
Planting materials transport cost (Rs/ac)	238				
Fertilizer transport cost (Rs/ac)	121.75	121.75	121.75	121.75	121.7
Total transport cost (Rs/ac)	5,755.75	121.75	121.75	121.75	121.7
Machinery					
Land preparation (Rs/ac)	1,415				
Total machinery cost (Rs/ac)	1,415				
Total variable cost (Rs/ac)	13,771	2,215	2,026	2,153	2,01
Gross Margin (Rs/ac)	8,190	27491	24078	17586	1326

# Table A2 Gross margin of banana cultivation under coconuts (Rs/ac)\*

\* - (158 plants per ac), \*\* - labour was not valued, md-man-days, 4WT- 4wheel tractors, 1 Sterling pound is approximately Rs 95, in July 1997.
 Source: Farming survey, 1995

amber of fruits         -         6302         9148         8929         5375           verage price (R#/ fruit)         -         11         7.9         5.9         4.55           amober of suckers         -         1770         4367         3000         3238           verage price (R#/sucker)         -         2.3         2.3         2.3         2.3         a.53           accome from suckers (R#/sc)         -         4071         10044         6900         7493           accome from suckers (R#/sc)         -         7393         82313         59381         31950           NPUTIS         adour (md)         -         -         7393         82313         59381         31950           NPUTIS         adour (md)         -         7         5         5         4.5           read isensing         6.5         -         -         7         5         5         4.5           read isensing         10         12.5         12         9         7           ibre dust mulching         17         10         12.5         13         1           optication of ibme dust         6.5         -         10         10         10         10 <th></th> <th></th> <th></th> <th>Year</th> <th></th> <th></th>				Year		
average price (Ruf Stuit)         -         11         7.9         5.9         4.455           accome form actives (Ruf sucker)         -         1770         4367         30000         3228           accome form actives (Ruf sucker)         -         2.3         2.3         2.3         2.3           accome form actives (Ruf sucker)         -         2.3         2.3         2.3         2.3           accome form actives (Ruf sucker)         -         73393         82313         59581         31950           Abover (mol)         and clearing         6.3         -         73393         82313         59581         31950           NPUTS         abover (mol)         -         7         5         5         4.5           and proparention         13         10         12.5         12         9         7           bire dust matching         17         -         -         3         4         4         4           att protection         8         10         12.5         6         5         5         5         5         5         5         5         5         5         5         5         5         5         5         5         5 <t< th=""><th>TUTTUC</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></t<>	TUTTUC	1	2	3	4	5
account form fruits (Ru/ac)         -         69322         72269         32681         22482           samber of suckers         -         1770         4367         3000         3258           samber of suckers         -         2.3         2.3         2.3         2.3         2.3           accous from suckers (Ru/suc)         -         4071         10044         6900         7493           incess return (Ru/suc)         -         7393         82313         59581         31950           NPUTTS         added (saming)         6.5         -         73973         82313         59581         31950           NPUTTS         added (saming)         12         -         7         5         5         4.5           Weeding         10         12.5         12         9         7         5         5         4.5           polication of insecticide         2         2         2.3         1.3         1         - <td>number of fruits</td> <td>-</td> <td>6302</td> <td>9148</td> <td>8929</td> <td>5375</td>	number of fruits	-	6302	9148	8929	5375
accouse form fixits (Ra/nackar)         -         6932.2         72.269         52.681         2.430           number of muckars         -         1.770         4.367         30000         32.58           accouse from suckars (Ra/nackar)         -         4.071         10044         6900         7433           income from suckars (Ra/nackar)         -         4.071         10044         6900         7433           income from suckars (Ra/nackar)         -         4.071         10044         6900         7433           income from suckars (Ra/nackar)         -         4.071         10044         6900         7433           about (mal)         -         -         73393         82313         59581         31950           NPUTTS         -         -         75         5         4.5         -           Veeding         10         12.5         12         9         7           ibre data tall from totat         6.5         -         -         -           veeding         10         12.5         12         9         7           ibre data tallocita         2         2.5         3         4         4           iprotection         8 <td< td=""><td>everage price (Ra/ fruit)</td><td>-</td><td>11</td><td>7.9</td><td>5.9</td><td>4.55</td></td<>	everage price (Ra/ fruit)	-	11	7.9	5.9	4.55
overage price (Ru/macker)       -       2.3       2.3       2.3       2.3         accome from macker (Ru/mac)       -       4071       10044       6900       7493         income return (Ru/mac)       -       73393       62313       59381       313930         NPUTIS       about (mol)       -       -       -       4071       10044       6900       7493         about (mol)       -       -       -       73393       62313       59381       313930         NPUTIS       -	ncome form fruits (Ra/ac)	-	69322	72269	52681	24456
accoss from suckers (Ra/sc)       -       4071       10044       6900       7493         Bross return (Ra/sc)       -       73393       82313       59581       31930         NPUTIS       abour (md)       and reserving       6.3       sead properties       12         Imping in chemicals       2       12       7       5       5       4.5         Veeding       10       12.5       12       9       7         withing up of fibre dust       6.5       9       9       7         Stress return (Ra/sc)       8       10       12.5       12       9       7         Weeding       10       12.5       12       9       7       7       3       4       2.5       3       4       2.5       3       4       2.5       5       5       9       7       7       7       3       4       2.5       5       5       5       5       5       5       10       104	number of success	-	1770	4367	3000	3258
invest return (Raviec)       -       73393       82313       59581       31950         NPUTIS       about (md)       about (md)       about (md)       about (md)         and clearing       6.3       2       imaing       12         imating       12       12       9       7         Wreding       10       12.5       12       9       7         intring up of Dire dust       6.5       -       -       -       7         pilication of hormones       2       2.5       3       4       2.5         pplication of insecticide       2       2.5       3       4       2.5         ipplication of hormones       2       2.5       3       4       2.5         ratig protection       8       10       -       -       -       -         istrovering       3       4       4       4       4       4       4       4       104<	sverage price (Ra/sucker)	-	2.3	2.3	2.3	2.3
NPUTS         abour (md)         and clearing       6.3         said preparation       13         lipping in chemicals       2         "maning       12         strilizer application       7       5       5       4.5         Weeding       10       12.5       12       9       7         arthing up of fibre dust       6.5       pplication of insecticide       2       2       2.3       1.33       1         pplication of fibre dust       6.5       pplication of hormones       2       2.5       3       4       2.5         fibre dust malching       17       3       4       2.5       5       5         fibre dust malching       17       3       4       <		-				
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Tillzer application       7       5       5       4.5         Weeding       10       12.5       12       9       7         arthing up of fibre dust       6.5       9       7       9       7         pplication of insecticide       2       2       2.3       1.33       1       1         pplication of fibre dust       6.5       9       3       4       2.5       3       4       2.5       6       5         more dust fibre dust       3       4       4.5.25       6       5       5       5       6       5         emoval of suckers       3       4       4       4       4       4       4       4       4         cotal labour use (nd)       78       42       47       29.33       24       5						
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Total labour use (md)       78       42       47       29.33       24         vage rate (Ra/md)       104       104       104       104       104       104       104         Total labour cost **       3343	emoval of suckers		3	4	4	4
vage rate (Rs/md)       104       104       104       104       104         Total labour cost ***       3545         daterials       3545         namber of suckers (Rs/sucker)       2.3         oet of suckers (Rs/sucker)       8153.5         bire dust - number of 4WTs       50         orice (Rs/4WT)       71         oet of fibre dust (Rs/sc)       3530         writizer (Rs/kc)       8.5         soat of fibre dust (Rs/sc)       3530         writizer (Rs/kc)       8.5         ost of fibre dust (Rs/sc)       6264.5         ost of fissecticide (Rs/sc)       399         ost of fissecticide (Rs/sc)       991         ost of fissecticide (Rs/sc)       10445         ost of fissecticide (Rs/sc)       19445         ost of transport cost (Rs/sc)       19445         insting material transport cost (Rs/sc)       7450         landing material transport cost (Rs/sc)       315         otal transport cost (Rs/sc)       315         intilizer transport cost (Rs/sc)       1881         otal machinery	emoval of leaves		5	5		
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amber of suckers       3545         werage price (Rs/sucker)       2.3         out of suckers (Rs/sucker)       8153.5         bire dust - number of 4WTs       50         rice (Rs/4WT)       71         oet of fibre dust (Rs/ac)       3550         ertilizer (Rs/sucker)       737         ost of fibre dust (Rs/ac)       3550         ertilizer (Rs/ac)       6264.5         ost of fibre filizer (Rs/ac)       6264.5         ost of finizecticide and fingicides (Rs/ac)       399         ost of filowering bormone (Rs)       177         177       220       203         ost of filowering bormone (Rs)       177         177       220       203         ost for thransport cost       umber of 4WTs of fibre dusts       50         ost for transport cost (Rs/ac)       7450         lanting material transport cost (Rs/ac)       7450         lanting material transport cost (Rs/ac)       315         and preparation (Rs/ac)       1881         'otal matchinery cost (Rs/ac)       1881         'otal variable cost (Rs/ac)       1881         'otal variable cost (Rs/ac)       29432       8095.75       7154       6850       6628.75         'sross Margin (Rs/ac)<	vage rate (Ra/md) Fotal labour cost **	104	104	104	104	104
amber of suckers       3545         werage price (Rs/sucker)       2.3         out of suckers (Rs/sucker)       8153.5         bire dust - number of 4WTs       50         rice (Rs/4WT)       71         oet of fibre dust (Rs/ac)       3550         ertilizer (Rs/sucker)       737         ost of fibre dust (Rs/ac)       3550         ertilizer (Rs/ac)       6264.5         ost of fibre filizer (Rs/ac)       6264.5         ost of finizecticide and fingicides (Rs/ac)       399         ost of filowering bormone (Rs)       177         177       220       203         ost of filowering bormone (Rs)       177         177       220       203         ost for thransport cost       umber of 4WTs of fibre dusts       50         ost for transport cost (Rs/ac)       7450         lanting material transport cost (Rs/ac)       7450         lanting material transport cost (Rs/ac)       315         and preparation (Rs/ac)       1881         'otal matchinery cost (Rs/ac)       1881         'otal variable cost (Rs/ac)       1881         'otal variable cost (Rs/ac)       29432       8095.75       7154       6850       6628.75         'sross Margin (Rs/ac)<	Jaterials					
verage price (Ra/aucker)       2.3         oet of suckers (Ra/ac)       \$153.5         ibre dust - number of 4WTs       50         rice (Ra/4WT)       71         oet of fire dust (Ra/ac)       3550         iertilizer (Ra/ac)       737       747       626       595       569         werage price of factilizer (Ra/ac)       8.5       8.5       8.5       8.5       8.5       350         ost of fire dust (Ra/ac)       001       717       809       809       809         ost of fire dust (Ra/ac)       901       717       809       809       809         ost of fire dust (Ra/ac)       901       717       809       809       809         ost of fire dust (Ra/ac)       1077       220       203       211       204         'otal material cost (Ra/ac)       19445       7780.5       6839       6534.5       6313.5         'memport cost       under of 4WTs of fibre dusts       50       50       50       515.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25       315.25		3545				
oet of suckers (Ra/ac)     \$153.5       bire dust - number of 4WTs     50       rice (Ra/4WT)     71       ost of fibre dust (Ra/ac)     3550       writilowr (kg/wc)     737     747     626     595     569       werage price of fartilizer (Ra/ac)     3550     3.5     3.5     3.5     3.5     3.5       ost of fibre dust (Ra/ac)     737     747     626     595     569       werage price of fartilizer (Ra/ac)     6264.5     6349.5     5321     5057.5     4836.5       ost of fibre/dust     0329     494     506     457     464       oat of weedicide (Ra/ac)     .901     717     809     809     809       oat of weedicide (Ra/ac)     .901     717     220     203     211     204       'otal material cost (Rs/ac)     .19445     .7780.5     6839     6534.5     6313.5       'masport cost		2.3				
rice (Rs/4WT) 71 ost of fibre dust (Rs/ac) 3550 wersag price of fartilizer (Rs/kg) 8.5 8.5 8.5 8.5 8.5 8.5 ost of fartilizer (Rs/kg) 8.5 8.5 8.5 8.5 8.5 8.5 ost of framecticide and fungicides (Rs/ac) 329 494 506 4.57 464 ost of neecticide and fungicides (Rs/ac) 329 494 506 4.57 464 ost of neecticide and fungicides (Rs/ac) 301 717 809 809 809 ost of flowering hormone (Rs) 177 220 203 211 204 'otal material cost (Rs/ac) 19445 7780.5 6839 6534.5 6313.5 "ransport cost umber of 4WTs of fibre dusts 50 ost for transport cost (Rs/ac) 7450 lanting material transport cost (Rs/ac) 341 ertilizer transport cost (Rs/ac) 341 ertilizer transport cost (Rs/ac) 341 ertilizer transport cost (Rs/ac) 341 ertilizer transport cost (Rs/ac) 1881 'otal mathing material cost (Rs/ac) 1881 'otal machinery and preparation (Rs/ac) 1881 'otal variable cost (Rs/ac) 29432 8095.75 7154 6850 6628.75 iross Margin (Rs/ac) 29432 65297 75159 52731 25321 Notes: Errors in sums are due to rounding. * - (3545 plants per ac), ** - labour was not valued	ost of suckers (Ra/ac)	8153.5				
out of fibre dust (Ra/ac)     3550       initiation (kg/ac)     737     747     626     595     569       werage price of fartilizer (Ra/kg)     8.5     8.5     8.5     8.5     8.5     8.5       out of fibre dust     6264.5     6349.5     5321     5057.5     4836.5       out of fibre dust     399     494     506     457     464       out of flowering hormone (Rs/ac)     901     717     809     809     809       out of flowering hormone (Rs)     177     220     203     211     204       Total material cost (Ra/ac)     19445     7780.5     6839     6534.5     6313.5       Transport cost     umber of 4WTs of fibre dusts     50     50     515.25     315.25     315.25       otal transport cost (Rs/ac)     7450     149     150     152.5     315.25     315.25     315.25       otal transport cost (Rs/ac)     315     315.25     315.25     315.25     315.25     315.25       otal transport cost (Rs/ac)     1881     1881     152     152.5     315.25     315.25       dathinery     and preparation (Rs/ac)     1881     1881     152     152.5     152.5     152.5       otal machinery cost (Rs/ac)     29432	ibre dust - number of 4WTs	50				
initiation (kg/ac)       737       747       626       595       569         werage price of fartilizer (Rs/kg)       8.5	rice (R#/4WT)	71				
werage price of fartilizer (Rs/kg)       8.5       3.5						
ast of fertilizer (Rs/ac)       6264.5       6349.5       5321       5057.5       4836.5         ost of insecticide and fungicides (Rz/ac)       399       494       506       457       464         oat of weedicide (Rz/ac)       901       717       809       809       809         ost of flowering hormone (Rs)       177       220       203       211       204         'otal material cost (Rz/ac)       1944.5       7780.5       6839       6534.5       6313.5         'ransport cost       umber of 4WTs of fibre dusts       50       0       6839       6534.5       6313.5         'ransport cost       lanting material transport cost (Rz/ac)       7450       149       149       149       149       149       149       152.5       315.25		100.000				
ost of insecticide and fungicides (Ra/ac)       399       494       506       457       464         oast of weedicide (Rs/ac)       901       717       809       809       809         ost of flowering hormone (Rs)       177       220       203       211       204         Total material cost (Rs/ac)       19445       7780.5       6839       6534.5       6313.5         Transport cost       umber of 4WTs of fibre dusts       50       6839       6534.5       6313.5         Transport cost       umber of 4WTs of fibre dusts       50       6839       6534.5       6313.5         Insting material transport cost (Rs/ac)       7450       149       149       149         ibre dust transport cost (Rs/ac)       341       315.25       3						
coast of weedicide (Rs/ac)       901       717       809       809       809         cost of flowering hormone (Rs)       177       220       203       211       204         cotal material cost (Rs/ac)       19445       7780.5       6839       6534.5       6313.5         'rensport cost       index of fibre dusts       50       6639       6534.5       6313.5         'rensport cost       index of fibre dusts       50       6839       6534.5       6313.5         'rensport cost       (Rs/ac)       7450       149       149       149         ibre dust transport cost (Rs/ac)       7450       181       15.25       315.25						
ost of flowering hormone (Rs)         177         220         203         211         204           Total material cost (Rs/ac)         19445         7780.5         6839         6534.5         6313.5           Transport cost         umber of 4WTs of fibre dusts         50         6839         6534.5         6313.5           Total material cost (Rs/ac)         7450         149         149         149         149           thre dust transport cost (Rs/ac)         7450         1841         315.25						
Total material cost (Rs/ac)         19445         7780.5         6839         6534.5         6313.5           Transport cost umber of 4WTs of fibre dusts         50 out for transport one load of 4WT         149 thre dust transport cost (Rs/ac)         7450           Ianting material transport cost (Rs/ac)         341 estilizer transport cost (Rs/ac)         341 stilizer transport cost (Rs/ac)         315         315.25<						
amber of 4WTs of fibre dusts 50 ost for transport one load of 4WT 149 ibre dust transport cost (Rs/ac) 7450 lanting material transport cost (Rs/ac) 341 ertilizer transport cost (Rs) 315 315.25 315.25 315.25 315.25 Total transport cost (Rs/ac) 8106 315.25 315.25 315.25 315.25 dachinery and preparation (Rs/ac) 1881 Total machinery cost (Rs/ac) 1881 Total variable cost (Rs/ac) 29432 8095.75 7154 6850 6628.75 Gross Margin (Rs/ac) -29432 65297 75159 52731 25321 Notes: Errors in sums are due to rounding. * - (3545 plants per ac), ** - labour was not valued	cost of flowering hormone (Rs) Cotal material cost (Rs/ac)					
amber of 4WTs of fibre dusts 50 ost for transport one load of 4WT 149 ibre dust transport cost (Rs/ac) 7450 lanting material transport cost (Rs/ac) 341 ertilizer transport cost (Rs) 315 315.25 315.25 315.25 315.25 Total transport cost (Rs/ac) 8106 315.25 315.25 315.25 315.25 dachinery and preparation (Rs/ac) 1881 Total machinery cost (Rs/ac) 1881 Total variable cost (Rs/ac) 29432 8095.75 7154 6850 6628.75 Gross Margin (Rs/ac) -29432 65297 75159 52731 25321 Notes: Errors in sums are due to rounding. * - (3545 plants per ac), ** - labour was not valued	Comport cost					
oet for transport one load of 4WT         149           ibre dust transport cost (Rs/ac)         7450           lanting material transport cost (Rs/ac)         341           ertilizer transport cost (Rs)         315           Total transport cost (Rs/ac)         8106           and preparation (Rs/ac)         1881           Total machinery cost (Rs/ac)         1881           Total variable cost (Rs/ac)         29432           S095.75         7154         6850         6628.75           Gross Margin (Rs/ac)         29432         65297         75159         52731         25321           Notes:         Errors in sums are due to rounding.         * - (3545 plants per ac), ** - labour was not valued         **         -         -		50				
ibre dust transport cost (Rs/ac)       7450         lanting material transport cost (Rs/ac)       341         ertilizer transport cost (Rs)       315       315.25       315.25       315.25       315.25         Total transport cost (Rs/ac)       8106       315.25						
Ianting material transport cost (Rs/ac)       341         ertilizer transport cost (Rs)       315       315.25       315.25       315.25       315.25         Total transport cost (Rs/ac)       8106       315.25       315.25       315.25       315.25       315.25         Machinery       and preparation (Rs/ac)       1881       1881         Total machinery cost (Rs/ac)       1881       1881         Total variable cost (Rs/ac)       29432       8095.75       7154       6850       6628.75         Gross Margin (Rs/ac)       -29432       65297       75159       52731       25321         Notes:       Errors in sums are due to rounding.       * - (3545 plants per ac), ** - labour was not valued       **       -						
ertilizer transport cost (Rs)       315       315.25						
Total transport cost (Rs/ac)         8106         315.25			315.25	315.25	315.25	315.25
and preparation (Rs/ac)       1881         "otal machinery cost (Rs/ac)       1881         "otal variable cost (Rs/ac)       29432       8095.75       7154       6850       6628.75         "otal variable cost (Rs/ac)       29432       65297       75159       52731       25321         "otal variable cost (Rs/ac)       -29432       65297       75159       52731       25321         Wotes:       Errors in sums are due to rounding.       * - (3545 plants per ac), ** - labour was not valued       **	Cotal transport cost (Rs/ac)			S		
Total machinery cost (Rs/ac)         1881           Total variable cost (Rs/ac)         29432         8095.75         7154         6850         6628.75           Stross Margin (Rs/ac)         -29432         65297         75159         52731         25321           Notes:         Errors in sums are due to rounding.         * - (3545 plants per ac), ** - labour was not valued         ** - (3545 plants per ac), ** - labour was not valued	Aachinery					
Cotal variable cost (Ra/ac)         29432         8095.75         7154         6850         6628.75           Gross Margin (Ra/ac)         -29432         65297         75159         52731         25321           Notes:         Errors in sums are due to rounding.         * - (3545 plants per ac), ** - labour was not valued         ** - (3545 plants per ac), ** - labour was not valued	and preparation (Rs/ac)					
Bross Margin (Ra/ac)     -29432     65297     75159     52731     25321       Notes:     Errors in sums are due to rounding.     * - (3545 plants per ac), ** - labour was not valued	"otal machinery cost (Rs/ac)	1881				
Notes: Errors in sums are due to rounding. * - (3545 plants per ac), ** - labour was not valued	otal variable cost (Rs/ac)					
* - (3545 plants per ac), ** - labour was not valued	iross Margin (Ra/ac)	-29432	65297	/5159	52731	25321
			valued			

UTPUT amber of leaves	1	2	3		
		-	3	4	5
	132984	217460	511052	610000	610000
verage price (Ra/leave)	0.38	0.34	0.17	0.12	0.1
come form leaves (Rs/1000 sticks)	50534	73936	86879	73200	61000
ross return (Ra/1000 sticks)	50534	73936	86879	73200	61000
PUT					
abour (md)					
nd clearing	3				
loughing (by mammoty)	6.5				
essing	2.5				
ed preparation	6				
lanting	3				
hasting	0.5				
leating sticks	3				
rganic fertilizer application	7.5	6	7	6	6
organic fertilizer application	13.5	14	13	13	13
nining young vines	3				
reparation of wooden supports	7				
stailing wooden supports	8				
Veeding	8	9	8	2.5	2.5
aking earthen drains	12.5				
Vetering	32	31	27	19	19
ervesting and staking leaves	75	80	89	120	120
leaning drains		5	4	4	
lenting sticks		6.25	2		
otal labour use (md/1000 stocks)	191	151.25	150	164.5	160.5
rage rate (Ra/md)  otal labour cost ===	104	104	104	104	104
Laterials amber of sticks	1000				
verage price (Ra/stick)	2				
ont of sticks (Ra/1000 sticks)	2000				
ost of organic fertilizer (Ra/1000 sticks)	3517	2992	2703	2563	2563
sorganic fertilizer (kg)	422	442	522	860	860
rice (Ra/kg)	12	12	12	12	12
surganic fertilizer cost (Rs/1000 sticks)	5064	5304	62.64	10320	10320
under of shoots	2000		1.00		
rice (Rs/shoot)	0.62				
ost of shoots (Rs)	1240				
ost of binding wire (Rs)	386				
ost of material for wooden supports (Rs)			192		
ost of arecanst trees (Rs)	328				
umber of sticks		100	114		
rice (Rs/stick)		2.75	3		
ont of sticks (Rs)		275	342		
ost of twines (Rs)		50	25		
otal material cost (Ra)	12535	8621	9334	12883	12883
resport					
masport cost of sticks (Rs)	236				200
susport cost of leaves to the fair (Rs/trip)	100	100	100	100	100
umber of trips per year	14	50	50	50	50
masport t cost of leaves (Rs/year)	1400	5000	5000	5000	5000
ertilizer transport cost (Rs)	293.5	293.5	293.5	293.5	293.5
ansport cost of arecasat trees (Rs)	400				
anaport cost of sticks (Rs)		100	100		
otal transport cost (Rs)	2329.5	5393.5	5393.5	5293.5	5293.5
fachinery		200			
ump hiring cost for watering (Ra/day/1000 sticks)	17.5	17.5	17.5	17.5	17.5
umber of days watering practiced per year	240	240	240	240	240
ost for pump hire (Rs)	4200	4200	4200	4200	4200
'otal machinery cost (Rs)	4200	4200	4200	4200	4200
	19064.5	18211.5	18927.5	22376.5	22376.5
fariable cost (Rg/1000 sticks)	31469	55722	67951	50823.5	38623.5

OUTPUT		
No of nuts per year	2,946	
Average price (Rs/nut)	3.16	
Cross Return (Rs)	9,309	
INPUTS		
Labour use (in md)		
Weeding	6	
Fertilizer application	3	
nut collection	3	
Total and	11	
Average wage rate(Rs/day)	0	
Harvesting (Rs contract labour)	582	
Sub Total 1 -labour cost (Rs)	582	
Materials cost (Rs)		
Fertilizer (kg/ac)	125	
price (Rs/kg)	9	
Fertilizer cost (Rs)	1,063	
Sub Total 2 - mareials cost (Rs)	1,063	
Transport cost		
Fertilizer transport (Rs)	208	
internal field transportation of coconut (Rs)	238	
Sub Total 3 - transport cost (Rs)	446	
Variable costs (Rs/ac)	2,091	
CM (R,/ac)	7,219	

Table A5 Gross margin of coconut monoculture systems (Rs/ac)

Notes: Errors in sums are due to rounding.

Average age of coconut palms = 41 years.

Average number of bearing palms per acre = 64 md -mandays.

1 Sterling pound is approximately Rs 95, in July 1997. Source: Farmer survey; 1995.

# Table A6

i)	Computation of NPV (R	s/ac) of the coco	nut monocultu	ure systems		
		Year 1	Year 2	Year 3	Year 4	Year 5
Gros	ss margin (Ra/ac)	6074.86	6074.86	6074.86	6074.86	6074.86
	NPV of five years of GN	l (at 15 % interes	st rate) = Rs 20	0363. 8 per acr	e	
	NPV of five years of GM	(at 20 % interes	st rate) = R9 1	8168.0 per acr	е	
	NPV of five years of GM	(at 25 % interes	t rate) = Rs 16	337.0 per acre	)	
ii)	Computation of B/C ratio	o of the coconut	monoculture	systems		
	B/C ratio = 9309.36/3234	4.5 = 2.87814				
iii)	Computation of returns	to labour				
	- cost * of non-labour inp	outs (RR/ac)				2,090.5
	- gross return less cost o	f non-labour inpu	its (Rs/ac) non	-labour inputs	(Re/ac)	7,218.86
	- total labour use (md/ac	/year)				11
	Returns to labour (Rs/m	ıd)				656.26
iv)	Computation of returns	to variable costs	6			
	Total farm variable cost	(RS/ac)				3,234.5
	Gross return (Rs/ac)					9,309.36
	Returns to variable cost					2.87814
	(Rs/Rupee)					

Notes: \* - contract labour cost was also included, and - tuna day, 1 Sterling pound was approximately Rs 95, in July 1997.

Source: Farmer survey, 1995.

Table A7 Economics of intercropping system 1 (cocomut + pineapple + banana)\*

			Years			_
24.9	1	2	3	4	3	5
Gross Return (Rs/ac)						
cocoma	9309	9309	9309	9309		
pineapple	0	73393	82313	59581	31950	)
banana	21961	29706	26103	19740	15285	5
Total gross return (Ra/ac)	31270	112408	117725	88630	56544	
INPUTS						
Labour (md/ac)						
coconst collection	3.5	3.5	3.5	3.5	3.5	
contract cost for picking coconuts (Rs/ac)	1920	1920	1920	1920		
pineapple	44.5	29.5	31.25	20		
United the second se	28	11	11	13		
common activities	24.75	9.25	8.5	7		
Total (md/ac)	100.75	53.25	54.25	43.5		
wage rate (Ra/md)	104	104	104	104		
Total labour cost including contract labour cost (Rs/ac)		7458	7562	6444		
Materials cost						
cocousts (Rs/ac)			1.1	2	1	
pineapple (Rs/ac)	15895	7780	6839	6534	6313	2
benana (Ra/ac)	4156	2093	1904	2031	1895	
common activities (Rs/ac)	3442	2073	1504	2031	1933	
Total material cost (Ra/ac)	23493	9873	8743	8565	9709	
a name anamat row and a firm on i	63473	70/3	6/43	8363	8208	
Framsport cost			12,240	23404		
cocomute (Ra/ac)	500	500	500	500	500	53 - E
pineapple (Rs/ac)	341					
anana. (Rs/ac)	238	2	1000			
common activities (Rs/ac)	7915	500	500	500	500	
'otal transport cost	8994	1000	1000	1000	1000	
Aachinery						
	1648					
Total machinery cost for common activities (Rs/ac)		19221	17204	16000	16146	
otal machinery cost for common activities (Rs/ac) otal variable cost (Rs/ac)	46533	18331 94077	17305 100420	16009 72621	16146 40398	
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Fotas Margin (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 ac and it comprises 64, 35	46533 -15263 45, and 158 mm	94077 mbers of co	100420	72621	40398	-
Fotal machinery cost for common activities (Rs/ac)         Fotal variable cost (Rs/ac)         Frows Margin (Rs/ac)         Notes:       Errors in sums are due to rounding.         * This system is 1 as and it comprises 64, 35 md - man days, 1 Sterling pound was approximated and the stated and th	46533 -15263 45, and 158 mm	94077 mbers of co	100420	72621	40398	-
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Fotal variable cost (Rs/ac) Fotal variable cost (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approxi- fource: Further survey, 1995.	46533 -15263 45, and 158 ma imately Ru 95, 1	94077 mbers of con n July 1997	100420	72621	40398	-
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Fotal variable cost (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approxi Source: Furmer survey, 1995. NPV of five year GMs at 15% discount rate	46533 -15263 45, and 158 ma imately Ra 95, i - 1	94077 mbers of co n July 1997 as 185498/a	100420 const paims,	72621	40398	-
<ul> <li>This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approxi</li> <li>Source: Furner survey, 1995.</li> <li>NPV of five year CIMs at 15% discount rate</li> <li>Discounted benefits (at 15% discount rate)</li> </ul>	46533 -15263 45, and 158 ma imately Ra 95, i = I - F	94077 mbers of com n July 1997 as 185498/a as 263381/a	100420 const paims,	72621	40398	-
Cotal machinery cost for common activities (Rs/ac)         Cotal variable cost (Rs/ac)         Grows Margin (Rs/ac)         Brows Margin (Rs/ac)         Notes:       Errors in sums are due to rounding.         * This system is 1 as and it comprises 64, 35 md - man days, 1 Sterling pound was approxibates:         Future:       Future: survey, 1995.         VPV of five year CIMs at 15% discount rate         Discounted benefits (at 15% discount rate)	46533 -15263 43, and 158 ma imately Rs 95, 1 - F - F - F	94077 mbers of com n July 1997 Ls 185498/a ls 263381/a ls 82833/ac	100420 const paims,	72621	40398	-
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) From Margin (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approx Source: Further survey, 1995. NPV of five year CMs at 15% discount rate Discounted benefits (at 15% discount rate) Benefit-cost ratio (at 15% discount rate)	46533 -15263 43, and 158 ma imately Rs 95, 1 - F - F - F	94077 mbers of com n July 1997 as 185498/a as 263381/a	100420 const paims,	72621	40398	-
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Gross Margin (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approxi Source: Furner survey, 1995. NPV of five year GMs at 15% discount rate	46533 -15263 445, and 158 ma imately Ra 95, - E - F = F = 3	94077 mbers of con n July 1997 ts 185498/a ts 263381/a ts 82833/ac .24	100420 const paims, c	72621 pineapple	40398 and banana	- uplenna re
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Gross Margin (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approxi Source: Furmer survey, 1995. NPV of five year GMs at 15% discount rate Discounted benefits (at 15% discount rate) Discounted costs (at 15% discount rate) Benefit-cost ratio (at 15% discount rate) Calculation of return to labour	46533 -15263 445, and 158 ma imately Rs 95, 1 - F = F = 3	94077 mbers of con n July 1997 ts 185498/a s 263381/a s 82833/ac .24	100420 const paims,	72621 pineapple	40398 and banana year 4	.pienna re year 5
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) From Margin (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 as and it comprises 64, 35 md - man days, 1 Sterling pound was approxi- Source: Furmer survey, 1995. NPV of five year CMs at 15% discount rate Discounted benefits (at 15% discount rate) Discounted costs (at 15% discount rate) Benefit-cost ratio (at 15% discount rate) Calculation of return to labour cost of non-labour inputs - Rs/ac, (contract labour also in	46533 -15263 445, and 158 ma imately Rs 95, 1 - F = F = 3 ncluded)	94077 mbers of co- n July 1997 ts 185498/a ts 263381/a ts 82833/ac .24 rear 1	100420 const paims, 	72621 pineapple rear 3 1663	40398 and benana year 4 11485	year 5 11123
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Gross Margin (Rs/ac) Notes: Errors in sams are due to rounding. * This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approx Source: Furture survey, 1995. NPV of five year CIMs at 15% discount rate Discounted benefits (at 15% discount rate) Discounted costs (at 15% discount rate) Benefit-cost ratio (at 15% discount rate) Calculation of return to labour cost of non-labour inputs - Rs/ac, (contract labour also in Gross return less cost of non-labour inputs (Rs/ac)	46533 -15263 45, and 158 ma imately Rs 95, i = F = F = 3 ncluded)	94077 mbers of con a July 1997 ts 185498/a ts 263381/a ts 82833/ac .24 /ear 1	100420 const paims,	72621 pineapple	40398 and benana year 4 11485 77145	year 5 11123 45416
Fotal machinery cost for common activities (Rs/ac)         Fotal variable cost (Rs/ac)         Gross Margin (Rs/ac)         Notes:       Errors in sums are due to rounding.         * This system is 1 ac and it comprises 64, 35 md - maa days, 1 Sterling pound was approxisource:         Furmer survey, 1995.         NPV of five year CMs at 15% discount rate         Discounted benefits (at 15% discount rate)         Senefit-cost ratio (at 15% discount rate)         Calculation of return to labour         cost of non-labour inputs - Rs/ac, (contract labour also in Gross return less cost of non-labour inputs (Rs/ac)         Total labour use (md/ac)	46533 -15263 45, and 158 ma imately Ra 95, - E - E = F = 3 ncluded)	94077 mbers of con a July 1997 as 185498/a as 263381/a as 263381/	100420 const paims,	72621 pineapple rear 3 1663 16052 54.25	40398 and banana year 4 11485 77145 43.5	year 5 11123 45416 43.25
Fotal machinery cost for common activities (Ra/ac) Fotal variable cost (Ra/ac) Gross Miargin (Ra/ac) Notes: Errors in sums are due to rounding. * This system is 1 as and it comprises 64, 35 md - man days, 1 Sterling pound was approxi Source: Furmer survey, 1995. NPV of five year CIMs at 15% discount rate Discounted benefits (at 15% discount rate) Discounted costs (at 15% discount rate) Benefit-cost ratio (at 15% discount rate) Calculation of return to labour cost of non-labour inputs - Ra/ac, (contract labour also in	46533 -15263 45, and 158 ma imately Ra 95, - E - E = F = 3 ncluded)	94077 mbers of con a July 1997 ts 185498/a ts 263381/a ts 82833/ac .24 /ear 1	100420 const paims,	72621 pineapple	40398 and benana year 4 11485 77145	year 5 11123 45416
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Gross Margin (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approx Source: Furmer survey, 1995. NPV of five year CIMs at 15% discount rate Discounted benefits (at 15% discount rate) Discounted costs (nt 15% discount rate) Senefit-cost ratio (at 15% discount rate) Calculation of return to labour costs of non-labour inputs - Rs/ac, (contract labour also in Gross return less cost of non-labour inputs (Rs/ac) Fotal labour use (md/ac)	46533 -15263 45, and 158 ma imately Ra 95, - E - E = F = 3 ncluded)	94077 mbers of con a July 1997 as 185498/a as 263381/a as 263381/	100420 const paims,	72621 pineapple rear 3 1663 16052 54.25	40398 and banana year 4 11485 77145 43.5	year 5 11123 45416 43.25
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Fotal variable cost (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approxi Source: Furner survey, 1995. NPV of five year CMs at 15% discount rate Discounted benefits (at 15% discount rate) Discounted benefits (at 15% discount rate) Benefit-cost ratio (at 15% discount rate) Calculation of return to labour Fost of non-labour inputs - Rs/ac, (contract labour also in Gross return less cost of non-labour inputs (Rs/ac) Total labour use (md/ac) teturns to labour (Rs/md) Calculation of returns to variable costs (Rs/rupee)	46533 -15263 45, and 158 ma imately Ra 95, - E - E = F = 3 ncluded)	94077 mbers of con a July 1997 Is 183498/a is 263381/a is 82333/ac .24 rear 1 y 16055 1 4783 5 00.75 47.49	100420 const paims,	72621 pineapple rear 3 1663 6662 54.25 1955	40398 and banana year 4 11485 77145 43.5	year 5 11123 45416 43.25
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Fotal variable cost (Rs/ac) Fotal variable cost (Rs/ac) Pross Margin (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 ac and it comprises 64, 35 md - man days, 1 Sterling pound was approxi Source: Furmer survey, 1995. NPV of five year CIMs at 15% discount rate Discounted benefits (at 15% discount rate) Discounted benefits (at 15% discount rate) Benefit-cost ratio (at 15% discount rate) Calculation of return to labour fross return less cost of non-labour inputs (Rs/ac) Fotal labour use (md/ac) Returns to labour (Rs/md) Calculation of returns to variable costs (Rs/rupee) year 1	46533 -15263 445, and 158 ma imately Rs 95, i - F - F = F = 3 ncluded)	94077 mbers of con n July 1997 Ls 183498/a ls 263381/a ls 26381/a ls 2638181/a ls 263818181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 263818181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 2638181/a ls 26381818181/a ls 2638181/a ls 263818181/a ls 2638181/a ls 2638	100420 const paims,	72621 pineapple rear 3 1663 16662 54.25 1955	40398 and banana year 4 11485 77145 43.5	year 5 11123 45416 43.25
Fotal machinery cost for common activities (Rs/ac) Fotal variable cost (Rs/ac) Gross Margin (Rs/ac) Notes: Errors in sums are due to rounding. * This system is 1 as and it comprises 64, 35 md - man days, 1 Sterling pound was approx Source: Fermer survey, 1995. NPV of five year CMs at 15% discount rate Discounted benefits (at 15% discount rate) Discounted benefits (at 15% discount rate) Discounted costs (at 15% discount rate) Calculation of return to labour cost of non-labour inputs - Rs/ac, (contract labour also in Gross return less cost of non-labour inputs (Rs/ac) Fotal labour use (md/ac) Returns to labour (Rs/md) Calculation of returns to variable costs (Rs/rupee) year 1 y Total farm variable cost (Rs/ac) 46533 11	46533 -15263 445, and 158 ma imately Rs 95, 1 - E - F = F = 3 ncluded) 1 	94077 mbers of con n July 1997 ts 185498/a ts 263381/a ts 26381/a ts 263	100420 const paims,	rear 3 1663 6062 54.25 1955	40398 and banana year 4 11485 77145 43.5	year 5 11123 45416 43.25

Table A8	Economics of intercropping system	21	(coconsut + banana)*
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and the second se					Years			
			1	2	3	4	5	
Gross Return (Ra/ac)								14
Coconat			9309	9309	9309	9309	9309	
Banana			21961	29706	26103	19740	15285	
Total gross return (Rs/ac)			31270	39015	35412	29049	24594	
INPUTS								
Labour (md/ac)								
coconst collection			3.5	3.5	3.5	3.5	3.5	
contract cost for picking coconuts (Rs	/ac)		1920	1920	1920	1920	1920	
Banana			41	19	16	19	27.5	
Total (md/ac)			44.5	22.5	19.5	22.5	31	
wage rate (Ra/und)			104	104	104	104	104	
Total labour cost including contract la	bour cost (R	u/ac)	6548	4260	3948	4260	5144	
Materials cost								
coconuts (Rs/ac)			-	-		-	1.17	
banana (Rs/ac)			6600	2093	1904	2031	1895	
Total material cost (Rs/ac)			6600	2093	1904	2031	1895	
Transport cost								
cocounts (Rs/ac)			500	500	500	500	500	
banana (Rs/ac)			5756	122	122	122	122	
Total transport cost			6256	622	622	622	622	
Machinery								
Total machinery cost for banana(Rs/a	c)		1415	-	-	-	-	
Total variable cost (Rs/ac)		-	20819	6975	6474	6913	7661	
					04/4	0212	1001	
Notes: Errors in sums are due to r		1	10451	32040	28938	22136	16933	•
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling ; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount	t comprises 6 pound was ap	4 and 158 proximatel = Rs	numbers y Rs 95, 73417/a	of coconut in July 19 c	28938 paims and	22136	16933	vely.
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount Discounted benefits (at 15% discount	t comprises 6 pound was ap rate rate)	4 and 158 proximatel = Rs = Rs	numbers y Rs 95, 73417/a 108813/	of coconu in July 19 c ac	28938 paims and	22136	16933	vely.
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling ; Source: Farmer survey, 1995. NPV of 5 year GMs at 15% discount Discounted benefits (at 15% discount rat Discounted costs (at 15% discount rat	t comprises 6 pound was ap rate rate) e)	4 and 158 proximatel = Rs = Rs = Rs	73417/a 108813/ 35396/a	of coconu in July 19 c ac	28938 paims and	22136	16933	vely.
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling ; Source: Farmer survey, 1995. NPV of 5 year GMs at 15% discount Discounted benefits (at 15% discount rat Discounted costs (at 15% discount rat	t comprises 6 pound was ap rate rate) e)	4 and 158 proximatel = Rs = Rs	73417/a 108813/ 35396/a	of coconu in July 19 c ac	28938 paims and	22136	16933	vely.
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling p Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount Discounted benefits (at 15% discount ran Discounted costs (at 15% discount ran Benefit-cost ratio (at 15% discount ran	t comprises 6 pound was ap rate rate) e)	4 and 158 proximatel = Rs = Rs = Rs	73417/a 108813/ 35396/a	of coconus in July 19 c ac c	28938 2 palms and 97.	22136 banana pla	16933 ats respecti	
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount Discounted benefits (at 15% discount ran Benefit-cost rutio (at 15% discount ran Benefit-cost rutio (at 15% discount ran Calculation of return to labour	t comprises 6 pound was ap rate rate) e) b)	4 and 158 proximatel = Rs = Rs = Rs = 3.0	aumbers y Rs 95, 73417/a 108813/ 35396/a 7	of coconus in July 19 c ac c	28938 2 palms and 97. year 2	22136 banana plar year 3	16933 zta respecti year 4	year 5
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount Discounted benefits (at 15% discount rat Benefit-cost ratio (at 15% discount rat Benefit-cost ratio (at 15% discount rational costs (at 15% discount rational costs) Calculations of return to labour cost of non-labour inputs - Ra/ac, (con	t comprises 6 pound was ap rate rate) e) be) tract labour s	4 and 158 proximatel = Rs = Rs = Rs = 3.0	aumbers y Rs 95, 73417/a 108813/ 35396/a 7	of coconut in July 19 c c c c year 1 16191	28938 t palms and 97. year 2 4635	22136 banana piar year 3 4446	16933 zts respecti year 4 4573	year 5 4437
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount Discounted benefits (at 15% discount rat Benefit-cost ratio (at 15% discount rat Benefit-cost ratio (at 15% discount rat Calculation of return to labour cost of non-labour inputs - Rs/ac, (con Gross return less cost of non-labour in	t comprises 6 pound was ap rate rate) e) be) tract labour s	4 and 158 proximatel = Rs = Rs = Rs = 3.0	aumbers y Rs 95, 73417/a 108813/ 35396/a 7	of coconau in July 19 c ac c year 1 16191 15079	28938 t paims and 97. <u>year 2</u> 4633 34380	22136 banana piar year 3 4446 30966	16933 zim respecti year 4 4573 24476	year 5 4437 20157
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling ; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount Discounted benefits (at 15% discount rat Discounted costs (at 15% discount rat Benefit-cost ratio (at 15% discount rat Calculation of retarn to labour cost of non-labour inputs - Rs/ac, (con Gross return less cost of non-labour in Total labour use (md/ac)	t comprises 6 pound was ap rate rate) e) be) tract labour s	4 and 158 proximatel = Rs = Rs = Rs = 3.0	numbers y Rs 95, 73417/a 108813/ 35396/a 7 r	of coconui in July 19 c ac c year 1 16191 15079 44.5	28938 t paims and 97. year 2 4635 34380 22.5	22136 banana piar year 3 4446 30966 19.5	16933 da respecti year 4 4573 24476 22.5	year 5 4437 20157 31
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling ; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount Discounted benefits (at 15% discount rat Discounted costs (at 15% discount rat Benefit-cost ratio (at 15% discount rat Calculation of retarn to labour cost of non-labour inputs - Rs/ac, (con Gross return less cost of non-labour in Total labour use (md/ac)	t comprises 6 pound was ap rate rate) e) be) tract labour s	4 and 158 proximatel = Rs = Rs = Rs = 3.0	numbers y Rs 95, 73417/a 108813/ 35396/a 7 r	of coconau in July 19 c ac c year 1 16191 15079	28938 t paims and 97. <u>year 2</u> 4633 34380	22136 banana piar year 3 4446 30966	16933 zim respecti year 4 4573 24476	year 5 4437 20157
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling ; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount Discounted benefits (at 15% discount rat Discounted costs (at 15% discount rat Benefit-cost ratio (at 15% discount rat Benefit-cost ratio (at 15% discount rat Calculation of return to labour cost of non-labour inputs - Rs/ac, (con Gross return less cost of non-labour in l'otal labour use (md/ac) Returns to labour (Rs/md)	t comprises 6 pound was ap rate rate) e) be) tract labour s puts (Rs/ac) s (Rs/rupee)	4 and 158 ( proximate) = Rs = Rs = 3.0	numbers y Rs 95, 73417/a 108813/ 35396/a 7 ed)	of coconu in July 19 c ac c c l6191 15079 44.5 338.85	28938 28938 2 paims and 97. 4635 34380 22.5 1528	22136 banana piar year 3 4446 30966 19.5 1588	16933 da respecti year 4 4573 24476 22.5	year 5 4437 20157 31
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount of Discounted benefits (at 15% discount ran Benefit-cost ratio (at 15% discount ran Benefit-cost ratio (at 15% discount ran Calculation of return to labour cost of non-labour inputs - Rs/ac, (con Gross return less cost of non-labour in Cotal labour use (md/ac) Returns to labour (Rs/md) Calculation of returns to variable cost	t comprises 6 pound was ap rate rate e) e) tract labour a puts (Rs/ac) s (Rs/rupee) year 1	4 and 158 ; proximatel = Rs = Ks = Rs = 3.0 ulso include year 2	oumbers y Rs 95, 73417/a 108813/ 35396/a 7 ed)	of coconut in July 19 c ac c c year 1 16191 15079 44.5 338.85	28938 t paims and 97. <u>year 2</u> 4635 34380 22.5 1528 4 year	22136 banana piar year 3 4446 30966 19.5 1588	16933 da respecti year 4 4573 24476 22.5	year 5 4437 20157 31
Notes: Errors in sums are due to r * This system is 1 ac and in md - man days, 1 Sterling; Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount of Discounted benefits (at 15% discount rational system) Discounted costs (at 15% discount rational system) Calculation of returns to labour Cost of non-labour inputs - Ra/ac, (con Gross return less cost of non-labour in Total labour use (md/ac) Returns to labour (Ra/md) Calculation of returns to variable cost Fotal farm variable cost (Ra/ac)	t comprises 6 pound was ap rate rate) e) bract labour s puts (Rs/ac) s (Rs/rupee) year 1 20819	4 and 158 ; proximatel = Rs = Rs = 3.0 diso include year 2 6975	cumbers y Rs 95, 73417/a 108813/ 35396/a 7 ed) 	of coconut in July 19 c c c c c vear 1 16191 15079 44.5 338.85	28938 t paims and 97. year 2 4635 34380 22.5 1528 4 year 13 766	22136 banana piar year 3 4446 30966 19.5 1588	16933 da respecti year 4 4573 24476 22.5	year 5 4437 20157 31
* This system is 1 ac and i md - man days, 1 Sterling p	t comprises 6 pound was ap rate rate e) e) tract labour a puts (Rs/ac) s (Rs/rupee) year 1	4 and 158 ; proximatel = Rs = Ks = Rs = 3.0 ulso include year 2	oumbers y Rs 95, 73417/a 108813/ 35396/a 7 ed)	of coconut in July 19 c ac c c year 1 16191 15079 44.5 338.85 338.85	28938 28938 2 paims and 97. 4635 34380 22.5 1528 4 year 3 766 9 2459	22136 banana piar year 3 4446 30966 19.5 1588	16933 da respecti year 4 4573 24476 22.5	year 5 4437 20157 31

				Years			
		1	2	3	4	5	-
Gross Return (Ra/ac)							-
Coconut		9309	9309	9309	9309	9309	
Pineapple		0	73393	82313	59581	31950	
Total gross return (Ra/ac)		9309	82702	91622	68890	41259	
INPUTS							
Labour (md/ac)							
cocomit collection		3.5	3.5	3.5	3.5	3.5	
contract cost for picking coconuts		1920	1920	1920	1920	1920	
Pineapple		78	42	46.25	29	24	
Total (md/ac)		81.5	45.5	49.75	32.5	27.5	
wage rate (Rs/md)		104	104	104	104	104	
Total labour cost including contract lab	our cost (Rs/ac)	10396	6652	7094	5300	4780	
Materials cost							
cocomats (Rs/ac)		-	-		-	-	
pineapple (Rs/ac)		19337	7780	6839	6534	6313	
Total material cost (Rs/ac)		19337	7780	6839	6534	6313	
Transport cost							
coconuts (Rs/ac)		500	500	500	500	500	
pineapple (Rs/ac)		8256	315	315	315	315	
Total transport cost		8756	815	815	815	815	
Machinery Total machinery cost for pineapple (R.s. Total variable cost (Rs/ac)	/ac)	1881 40370	15247	14748	12649	11908	
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro		-31061	67455	76874	56241	29351	
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro * This system is 1 ac and it md - man days, 1 Sterling po Source: Farmer survey, 1995. NPV of five year GMs at 15% discount Discounted benefits (at 15% discount rate)	comprises 64 and bund was approxim t rate ste)	-31061 3545 number nately Rs 95, = = =	67455 rs of cocon in July 19 Rs 121291 Rs 190773 Rs 69483/	76874 aut paims an 97. //ac	56241	29351	ective
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro <sup>a</sup> This system is 1 ac and it i. md - man days, 1 Sterling po Source: Farmer survey, 1995. NPV of five year GM s at 15% discount ri Discounted benefits (at 15% discount rate Benefit-cost ratio (at 15% discount rate	comprises 64 and bund was approxim t rate ste)	-31061 3545 number nately Rs 95, = = =	67455 rs of cocom in July 19 Rs 121291 Rs 190773 Rs 69483/i 2.74	76874 nut paims an 97. //ac //ac ac	56241 d pinespple	29351 e plants resp	
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro <sup>a</sup> This system is 1 ac and it md - man days, 1 Sterling pu Source: Farmer survey, 1995. NPV of five year GM s at 15% discount ro Discounted benefits (at 15% discount rate Benefit-cost ratio (at 15% discount rate Calculation of return to labour	comprises 64 and bund was approxim t rate ste) )	-31061 3545 number nately Rs 95, 	67455 rs of cocom in July 19 Rs 121291 Rs 190773 Rs 69483/ 2.74 year 1	76874 nut paims an 97. Mac Ac ac year 2	56241 d pineapple	29351 plants resp year 4	year
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro * This system is 1 ac and it md - man days, 1 Sterling po Source: Farmer survey, 1995. NPV of five year GM s at 15% discount ro Discounted benefits (at 15% discount rate Benefit-cost ratio (at 15% discount rate Calculation of return to labour cost of non-labour inputs - Rs/ac, (conth	comprises 64 and bund was approxim t rate ste) ) ) ract labour also in	-31061 3545 number nately Rs 95, = = = =	67455 rs of cocon in July 19 Rs 121291 Rs 190773 Rs 69483/ 2.74 year 1 31894	76874 aut paims an 97. 1/ac 1/ac ac year 2 10515	56241 d pineapple year 3 9574	29351 e plants resp year 4 9269	year 904
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro * This system is 1 ac and it md - man days, 1 Sterling po Source: Farmer survey, 1995. NPV of five year GM s at 15% discount ro Discounted benefits (at 15% discount rate Benefit-cost ratio (at 15% discount rate Calculation of return to labour cost of non-labour inputs - Rs/ac, (cont Gross return less cost of non-labour inp	comprises 64 and bund was approxim t rate ste) ) ) ract labour also in	-31061 3545 number nately Rs 95, = = = =	67455 rs of cocon in July 19' Rs 121291 Rs 190773 Rs 69483/ 2,74 year 1 31894 -22585	76874 aut paims an 97. 1/ac ac year 2 10515 72187	<u>56241</u> d pineapple year 3 9574 82048	29351 e plants resp year 4 9269 59621	year 904 3221
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro * This system is 1 ac and it md - man days, 1 Sterling po Source: Farmer survey, 1995. NPV of five year GM s at 15% discount ro Discounted benefits (at 15% discount rate Benefit-cost ratio (at 15% discount rate Calculation of return to labour cost of non-labour inputs - Rs/ac, (cont Gross return less cost of non-labour inp	comprises 64 and bund was approxim t rate ste) ) ) ract labour also in	-31061 3545 number nately Rs 95, = = = =	67455 rs of cocon in July 19 Rs 121291 Rs 190773 Rs 69483/ 2.74 year 1 31894	76874 aut paims an 97. 1/ac 1/ac ac year 2 10515	56241 d pineapple year 3 9574	29351 plants resp year 4 9269 59621 32.5	year 904
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro * This system is 1 ac and it md - man days, 1 Sterling po Source: Farmer survey, 1995. NPV of five year GM s at 15% discount ru Discounted benefits (at 15% discount rate) Benefit-cost ratio (at 15% discount rate) Benefit-cost ratio (at 15% discount rate) Calculation of return to labour Cost of non-labour inputs - Rs/ac, (conth Gross return less cost of non-labour inp Total labour use (md/ac)	comprises 64 and bund was approxim t rate ste) ) ) ract labour also in	-31061 3545 number nately Rs 95, = = = =	67455 rs of cocon in July 19' Rs 121291 Rs 190773 Rs 69483/ 2,74 year 1 31894 -22585	76874 aut paims an 97. 1/ac ac year 2 10515 72187	<u>56241</u> d pineapple year 3 9574 82048	29351 e plants resp year 4 9269 59621	year 904 3221
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro * This system is 1 ac and it i: md - man days, 1 Sterling po Source: Farmer survey, 1995. NPV of five year GM s at 15% discount ro Discounted benefits (at 15% discount rate Benefit-cost ratio (at 15% discount rate Calculation of return to labour Cost of non-labour inputs - Rs/ac, (cost Gross return less cost of non-labour inp Total labour use (md/ac) Returns to labour (Rs/md)	comprises 64 and bund was approxin t rate ste) ) ) ract labour also in uts (Rs/ac)	-31061 3545 number nately Rs 95, = = = =	67455 s of cocon in July 19 Rs 121291 Rs 190773 Rs 69483/ 2.74 year 1 31894 22585 81.5	76874 aut paims an 97. 1/ac 1/ac ac 10515 72187 45.5	<u>56241</u> d pineapple year 3 9574 82048 49.75	29351 plants resp year 4 9269 59621 32.5	year 904 3221 27.
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro * This system is 1 ac and it i md - man days, 1 Sterling pu Source: Farmer survey, 1995. NPV of five year GM s at 15% discount ri Discounted benefits (at 15% discount rate Benefit-cost ratio (at 15% discount rate Calculation of return to labour Cost of non-labour inputs - Rs/ac, (cost Gross return less cost of non-labour inp Total labour use (md/ac) Returns to labour (Rs/md) Calculation of returns to variable costs	comprises 64 and bund was approxim t rate ste) ) ) ract labour also in- uts (Rs/sc) (Rs/rupee) year 1 year	-31061 3545 number nately Rs 95, = = = ctuded)	67455 s of cocon in July 19 Rs 121291 Rs 190773 Rs 69483/ 2.74 year 1 31894 22585 81.5 -277	76874 aut paims an 97. 1/ac 1/ac ac year 2 10515 72187 45.5 1586 4 year	<u>year 3</u> 9574 82048 49.75 1649	29351 plants resp year 4 9269 59621 32.5	year 904 3221 27.
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro * This system is 1 ac and it md - man days, 1 Sterling pu Source: Farmer survey, 1995. NPV of five year GM s at 15% discount Discounted benefits (at 15% discount rate Benefit-cost ratio (at 15% discount rate Calculation of return to labour Cost of non-labour inputs - Rs/ac, (conth Gross return less cost of non-labour inp Total labour use (ms/ac) Calculation of returns to variable costs Total farm variable cost (Rs/ac)	comprises 64 and bund was approxim t rate ste) )) )) ract labour also in- uts (Rs/ac) (Rs/rupee) year 1 year 40370 1524	-31061 3545 number nately Rs 95, = = = = ciuded) : 2 year 3 47 14744	67455 s of cocon in July 19' Rs 121291 Rs 190773 Rs 69483/ 2.74 year 1 31894 -22585 81.5 -277 3 year 3 year 3 1264	76874 aut paims an 97. 1/ac	<u>year 3</u> 9574 82048 49.75 1649	29351 plants resp year 4 9269 59621 32.5	year 904 3221 27.
Gross Margin (Rs/ac) Notes: Errors in sums are due to ro * This system is 1 ac and it md - man days, 1 Sterling po Source: Farmer survey, 1995. NPV of five year GM s at 15% discount Discounted benefits (at 15% discount ro	comprises 64 and bund was approxim t rate ste) )) )) ract labour also in- uts (Rs/sc) (Rs/rupee) year 1 year 40370 152- 9309 8270	-31061 3545 number nately Rs 95, = = = = ciuded) : 2 year 3 47 14744	67455 s of cocon in July 19' Rs 121291 Rs 190773 Rs 69483/ 2.74 year 1 31894 -22585 81.5 -277 3 year 3 1264 2 6889	76874 aut paims an 97. 1/ac 3/ac ac 10515 72187 45.5 1586 4 year 19 1190 20 4125	56241 d pineapple year 3 9574 82048 49.75 1649 5 88 9	29351 plants resp year 4 9269 59621 32.5	year 904 3221 27.

				Years				
		1	2	3	4	. 5		
Gross Return (Rs/ac)		10000		5-380.53				
Coconut		9309	9309	9309	9305			
betel Total gross return (Rs/ac)		101068	147872	173758	146400			
toau gross return (ros/ac)		110377	157181	183067	155709	131309		
NPUTS								
Labour (md/ac)								
coconst collection		11	11	11	11	11		
contract cost for picking coconuts		1000	1000	1000	1000	1000		
petei (md)		382	302	300	328	320		
Total (md/ac)		393	212		220	221		
wage rate (Rs/md)		104	313	311 104	339 104			
Fotal labour cost including contract la	bour cost (Ra/ac)	41372	33552	33344	36256			
	or one (reade)	410/2	4666	10044	30230	33424		
Materials cost								
coconuts (Rs/ac)		1062	1062	1062	1062			
oetei (Ra/2000 plants)		25070	17242	17984	25766	25766		
Total material cost (Rs/ac)		26132	18304	19046	26828	26828		
Cransport cost								
		115	145	445				
cocomuts (Rs/ac)		446	446	446	446			
oetel (Rs)		4658	10786	10786	10586	10586		
Cotal transport cost		5104	11232	11232	11032	11032		
Machinery								
otal machinery cost for betel (Rs/ac)		8400	8400	8400	8400	8400		
			0.00	0-00	0400	5400		
otal variable cost (Rs/ac)		81508	71488	72022	82516	81684		
Gross Margin (Rs/ac)		28869	05:00					
Notes: Errors in sums are due to r * This system is 1 ac and it	comprises 64 and	2000 number	85693 a of coconut	111045 paims and be	73193 tel placata	49625 respectively	(modal number	of bet
Notes: Errors in sums are due to r	comprises 64 and : ey per holding was sound was approxin rate rate a)	2000 number 2000 piants nately Rs 95, – –	s of coconut	c c c c			(modal number	of bet
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv md - man days, 1 Sterling p Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount in Discounted benefits (at 15% discount rational states)	comprises 64 and : ey per holding was sound was approxin rate rate a)	2000 number 2000 piants nately Rs 95, – –	s of coconut ). in July 1997 Rs 229434/s Rs 489512/a Rs 260078/a	c c c c			(modal number	at bet
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv md - man days, 1 Starting p Source: Farmer survey, 1995. MPV of 5 year GM s at 15% discount of Discounted benefits (at 15% discount rate Scounted costs (at 15% discount rate Scounted ratio (at 15% discount rate	comprises 64 and : ey per holding was sound was approxin rate rate a)	2000 number 2000 piants nately Rs 95, – –	n of coconut ). in July 1997 Rs 229434/m Rs 489512/a Rs 260078/a 1.33	palms and be c c c		respectively	(modal number	oť beu
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv md - man days, 1 Sterling p Bource: Farmer survey, 1995. NPV of 5 year GM s al 15% discount r Discounted benefits (at 15% discount rat Discounted costs (at 15% discount rat Benefit-cost ratio (at 15% discount rat Calculation of return to labour out of non-labour inputs - Ru/ac, (con	comprises 64 and : ey per holding was sound was approxim rate a) c)	2000 number 2000 plants nately Rs 95, 	s of coconst ). in July 1997 Rs 229434/s Rs 489512/a Rs 260078/a 1.33 year 1 year 1 year 1 year 3	car 2 y 8936 3	tei piacots rear 3 9678	ycar 4 47260	year 5 47260	of beu
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv md - man days, 1 Starting p Source: Farmer survey, 1995. NPV of 5 year GM s at 15% discount r Discounted benefits (at 15% discount rate Senefit-cost ratio (at 15% discount rate Calculation of return to labour cost of non-labour inputs - Ra/ac, (con Gross return less cost of non-labour in	comprises 64 and : ey per holding was sound was approxim rate a) c)	2000 number 2000 plants nately Rs 95, 	s of coconst ). in July 1997 Rs 229434/u Rs 489512/a Rs 260078/a 1.33 year 1 year 1 40636 3 69741	c c c c c c c c c c c c c c c c c c c	tei plants rear 3 9678 3389	ycar 4 47260 108449	<u>year 5</u> 47260 84049	of bet
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv- md - man days, 1 Stering p lource: Farmer survey, 1995. MPV of 5 year GM s at 15% discount r Discounted benefits (at 15% discount ration Discounted costs (at 15% discount ration Calculation of return to labour out of non-labour inputs - Ra/sc, (con loss return less cost of non-labour in Cost labour use (md/ac)	comprises 64 and : ey per holding was sound was approxim rate a) c)	2000 number 2000 plants nately Rs 95, 	s of coconst ). in July 1997 Rs 229434/s Rs 489512/a Rs 260078/a 1.33 <u>year 1 y</u> 40636 3 69741 11 393	c c c c c c c c c c c c c c c c c c c	rear 3 9678 3389 311	year 4 47260 108449 339	year 5 47260 84049 331	of bet
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv- md - man days, 1 Stering p lource: Farmer survey, 1995. MPV of 5 year GM s at 15% discount r Discounted benefits (at 15% discount ration Discounted costs (at 15% discount ration Calculation of return to labour out of non-labour inputs - Ra/sc, (con loss return less cost of non-labour in Cost labour use (md/ac)	comprises 64 and : ey per holding was sound was approxim rate a) c) truct labour also ins	2000 number 2000 plants nately Rs 95, 	s of coconst ). in July 1997 Rs 229434/u Rs 489512/a Rs 260078/a 1.33 year 1 year 1 40636 3 69741	c c c c c c c c c c c c c c c c c c c	tei plants rear 3 9678 3389	ycar 4 47260 108449	<u>year 5</u> 47260 84049	of beta
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv- md - man days, 1 Starting p lource: Farmer survey, 1995. MPV of 5 year GM s at 15% discount ran Discounted benefits (at 15% discount ran Discounted costs (at 15% discount ran Scancfit-cost ratio (at 15% discount ran Calculation of return to labour out of non-labour inputs - Rs/sc, (con Gross return less cost of non-labour in "Cal labour use (md/ac) teturns to labour (Rs/md)	comprises 64 and : ey per holding was sound was approxim rate ) a) c) truct labour also ins puts (Ra/ac)	2000 number 2000 plants nately Rs 95, 	s of coconst ). in July 1997 Rs 229434/s Rs 489512/a Rs 260078/a 1.33 <u>year 1 y</u> 40636 3 69741 11 393	c c c c c c c c c c c c c c c c c c c	rear 3 9678 3389 311	year 4 47260 108449 339	year 5 47260 84049 331	at bet
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv md - man days, 1 Starting p bource: Farmer survey, 1995. MPV of 5 year GM s at 15% discount r Discounted benefits (at 15% discount rate biscounted costs (at 15% discount rate biscounted costs (at 15% discount rate control freturn to labour out of non-labour inputs - Ru/uc, (con it cost of non-labour in otal labour use (md/ac) (cturns to labour (Ra/md) calculation of returns to variable costs	comprises 64 and : ey per holding was sound was approxim rate a) c) truct labour also in puts (Ra/ac) : (Rs/rupee)	2000 number 2000 pianta nately Rs 95, - - - - - - - - - - - - -	s of coconst ). in July 1997 Rs 229434/s Rs 489512/a Rs 260078/a 1.33 <u>year 1 y</u> 40636 3 69741 11 393	c c c c c c c c c c c c c c c c c c c	rear 3 9678 3389 311 461	year 4 47260 108449 339	year 5 47260 84049 331	at bet
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv- md - man days, 1 Stering p lource: Farmer survey, 1995. IPV of 5 year GM s at 15% discount r biscounted benefits (at 15% discount ration control benefits (at 15% discount ration control to a survey, 1995. (control benefits (at 15% discount ration control to a survey, 1995. (control benefits (at 15% discount ration (control benefits) (control b	comprises 64 and i ey per holding was sound was approxim rate atte; s) c) iruct hibour also ins puts (Ra/ac) i (Rs/rupee) year 1 yes 31508 714	2000 number 2000 plants nately Rs 95, 	s of coconst ). in July 1997 Rs 229434/u Rs 489512/a Rs 260078/a 1.33 year 1 940636 3 69741 11 393 177	c c c c c c c c c c c c c c c c c c c	rear 3 9673 3389 311 461	year 4 47260 108449 339	year 5 47260 84049 331	at bet
Notes: Errors in sums are due to r * This system is 1 ac and it plants observed in the surv md - man days, 1 Sterling p Bource: Farmer survey, 1995. NPV of 5 year GM s al 15% discount r Discounted benefits (at 15% discount rat Discounted costs (at 15% discount rat Benefit-cost ratio (at 15% discount rat Calculation of return to labour out of non-labour inputs - Ru/ac, (con	comprises 64 and : eyper bolding was bound was approxim rate a) c) intruct lubour also ins puts (Ra/ac) intruct lubour also ins puts (Ra/ac) intruct lubour also ins puts (Ra/ac) intruct lubour also ins puts (Ra/ac)	2000 number 2000 plants nately Rs 95, 	s of coconst ). in July 1997 Rs 229434/u Rs 489512/a Rs 260078/a 1.38 year 1 393 177 ar 3 year	car 2 y 8936 3 8245 14 313 373 4 year 3 16 81634 99 131305	rear 3 9678 3389 311 461	year 4 47260 108449 339	year 5 47260 84049 331	at bet

					Yes	1			
			1		2	3	4	5	
Gross Return (Rs/ac)									
Coconut			309	930	9	9309	9309	9309	
Pineapple			1534	7393		6879	73200	61000	
Benana.			961	2970		6103	19740	15285	
Total gross return (Ra/ac)		81	804	11295	1 12	2291	102249	85594	
INPUTS									
Labour (md/ac)									
coconut collection			3.5	3.	5	3.5	3.5	3.5	
contract cost for picking coconuts		1	920	192	0	1920	1920	1920	
Betel			191	15		150	164	160	
Banana			41		9	16	19	27	
Total (md/ac)		23	35.5	173.	51 - C	69.5	186.5	190.5	
wage rate (Rs/md)			104	10		104	104	104	
Total labour cost including contract lab	our cost (R		412	1996		9548	21316	21732	
Materials cost									
cocoguts (Rs/ac)			12						
Retei		10	535	969		2002	12002	10000	
banana (Rs/ac)				862		8992	12883	12883	
Total material cost (Rs/ac)			600	209		1904	2031	1895	
Colat material cost (RS/BC)		19	135	1071	4 1	0896	14914	14778	
Transport cost									
coconsts (Rs/ac)			500	50	0	500	500	500	
Betel		2	329	539	3	5393	5293	5293	
banana (Rs/ac)		5	756	12		122	122	122	
Total transport cost (Rs/ac)		8.	585	601.	5 (	6015	5915	5915	
Machinery cost (Rs/ac)									
Setel			200	100		1000	1000	1800	
Secon Secon			200	420	4	4200	4200	4200	
			\$15		20 20		122245	and see a	
Total machinery cost (Ra/ac)		50	\$15	4200		4200	4200	4200	
Total variable cost (Ra/ac)			747	40893		0659	46345	46625	
Gross Margin (Ra/ac) Notes: Errors in sums are due to ro		220	057	72058	8 81	632	55904	38969	
<ul> <li>This system is 1 ac and it of md - man days, 1 Sterling po- Jource: Furmer warvey, 1995.</li> <li>MPV of five year CMs s (at 15% discount re Discounted benefits (at 15% discount rate) Benefit-cost ratio (at 15% discount rate)</li> </ul>	ound was aç at rate) atc)	proximately I	Ra 95, in	July 19	= Rs 178 - Rs 337 = Rs 159 = 2.12	678/ac 966/ac		a piana re	specuv
alculation of return to labour									
		2	ye	ar 1	year 2	year 3	year 4	year	5
ost of non-labour inputs - Rs/ac, (contr	act labour :	uso included)		255	22849	23031	-	No. of Concession, Name of Street, or other	the second s
ross return less cost of non-labour inp		,		549	90102	29260			-
'otal labour use (md/ac)				5.5	173.5	169.5			
teturns to labour (Rs/md)				198	519	586	104		5.5
	-		-					20.	-
alculation of returns to variable costs (	(Rs/rupec) year 1	year 2	Yell	3	umm d		1.1		
otal farm variable cost (Rs/ac)	the second s	the second s	Name and Address of the Owner, where the	the second s	year 4	your S			
	59747	40893 112951	4065		46345	46625			
core certain (Dalas)			17770	. 1	02249	85594			
iross return (Rs/ac) .eturns to variable costs (Rs/rupee)	81804 1.37	2.76	3.0		2.21	1.83			