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ECONOMIC ANALYSIS OF COCONUT- BASED MIXED FARMING SYSTEMS

BY

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ABSTRACT

Coconut-Based Mixed Farming System which evolved from the Central Plantation Crops Research Institute is one of the technologies recommended for sustainable coconut production. The economic analysis of this system for the period 1989-90 to 1997-98, realized a net return between Rs. 49,700 to Rs. 126,900. The Cash Flow Analysis preformed using a discount rate of 14% realized the Benefit-Cost Ratio (BCR) of 1.36,, the Net Present Worth of the system was Rs.286,500,, the Internal Rate of Return was 27.44%, and, the Pay Back Period was five years.

INTRODUCTION

Coconut is a smallholder's crop in India and more than 90% of the five million coconut holdings in the country are less than one ha in size. These smallholding coconut farms, often do not provide adequate income to the dependent families (Das, 1991).They do not provide gainful employment opportunities for thc family labor throughout the year. However, there are possibilities for increasing the productivity and net returns from coconut stands by raising compatible subsidiary crops and

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integrating livestock (Gopalasundaram *et al.*, 1993). Adoption of coconut based farming systems is one of the ways to augment the productivity by improving soil characters and coconut nutrition (Maheswarappa *et al.*, 1998) as well as the income per unit area.

One such system was being maintained at the Central Plantation Crops Research Institute, Kasaragod. This paper aims to test the economic worthiness of investment in coconut based farming system model under optimum management conditions based on experimental data.

MATERIALS AND METHODS

The study was based on the field experiment entitled, "Coconut Based Mixed Farming Systems" in sandy loam soil at the Central Plantation Crops Research Institute, Kasaragod from 1988-89 to 1997-98 in an 18 year old coconut garden in which pepper was trained on the coconut trunk and banana all along the border. Following were the livestock enterprises included in the system:

Dairy Unit

Five to six Jersey and Holstein Friesian breed cows were maintained in the system.

Poultry Unit

100 numbers of layers and 100 numbers of broiler (for each batch) birds were maintained in the system. In a year six batches of broilers were reared. 100 numbers of quail birds were also maintained.

Biogas unit

Biogas unit of $3m^3$ was installed for generating biogas. The cowdung slurry from the gas plant and cow shed wastes along with urine were recycled within the experimental area.

Rabbits

10 female and 4 male Russian chinchilla breeds were maintained.

Aquaculture (625 m^2 surface area):

About 4-6 cm long fingerlings of four selected species viz. Catla (*Catla catla*), Rohu (*Sebeo rohita*), Mrighal (*Cirrhinus mrighala* and Grass carp (*Ctenopharngdodon idellus*) were reared in the pond.

Input and output details were collected and the market prices prevailed during the corresponding years in northern Kerala were considered to workout the economics of the system. All the calculations were performed for one hectare. The fixed cost was reduced to an annuity using a discount rate of 14% considering the economic life span of the system as 10 years. Tabular analysis was performed to identify the individual share of factors of production in the total cost. Based on the total return and total cost, the net return was worked out for individual years. Cash flow analysis (Sairman *et al.*, 1999) was performed, using a discount rate of 14% and the economic viability of the system was assessed through economic indicators *viz.*, Benefit-Cost Ratio, Net Present Worth, Internal Rate of Return and the Pay Back Period.

RESULTS AND DISCUSSIONS

Costs

The details on the cost of mixed farming system over years is furnished in Table 1. It could be inferred from the table 1989-1990 to 1997-98, among the different factors of production, the share of cattle feed and hired labor together had accounted between 56.33% to 75.72% of the total cost (Fig. 1). In addition, the entire system is maintained by 365 mandays for one male and one female labor. This system is labor intensive and under the present socio-economic conditions of state like Kerala, in which hired labor is both scarce and costly, the economic viability of this system could be improved, only through active participation by the family labor. Hence, it could be inferred that this model is more suitable for medium or larger coconut holdings with more number of persons depending on agriculture.

It could be further observed from Table 1 that the cost of poultry feed which was Rs. 4,930 during 1989-90, had increased to Rs. 18,610 during 1997-98 (+277.5%). The total cost of the system (including the annuity value) which was Rs. 134,800 during 1989-90, had increased to Rs. 167,000 during 1997-98 (+23.9%).

Returns

The output data from the different components of the system is furnished in Table 2. From the table it was inferred that during the period 1989-90 to 1997-98, the total production of coconut had exhibited an increasing trend. The same in the case of milk was fluctuating since the number of milch cows had declined. This was mainly due to the reduction in the number of milch cows reared under this system, which declined to three from 1996-97 onwards. Pepper was removed from the system during 1993-94 since high mortality rate had occurred due to quick wilt disease. The yield performance of banana was not satisfactory till 1992-93, however, the same had significantly improved in later years. The yield performance of other livestock components like rabbitry, poultry, and fishery was optimum over the years.

The details on the returns over years from the coconut based mixed farming system are given in Table 3. It could be inferred from the table that the returns from coconut and milk was maximum accounting for 50-70% of the total (Fig. 2). The returns from coconut had increased from Rs. 50,361 during 1989-90 to Rs. 88,200 during 1997-98 (+ 75.1%). The share of coconut in the gross returns was stable over years. However, inter year fluctuations was there due to price fluctuations for coconut. In case of milk, the total returns had decreased from Rs. 92,071 to Rs. 78,576 (–14.7%) since the number of milch cows was reduced. The share of milk in the gross return exhibited a declining trend. The returns from broiler birds had exhibited an increasing trend, and the same, which was Rs. 10,600 during 1989-90 had increased to Rs. 70,800 during 1997-98 and its share in gross return had increased from 5.96% to 26.45%. The share of fish in the gross cost also exhibited an increasing trend. One of the major advantages of this system is that it produces and recycles organic manures like farm yard manure, biogas slurry and poultry manure at regular intervals. This could

meet about 75% of the organic requirement for coconut and other subsidiary crops and their value was worth about 1% to 2.62% of the gross return. The realized gross returns had increased from Rs. 184,500 during 1989-90 to Rs. 293,900 (+59.29%) and the net returns from Rs. 49,700 to Rs 126,900 (+155.33%).

Cash Flow Analysis

To assess the economic viability of this coconut based mixed farming system model, the cash-flow analysis was performed to work out the Benefit-Cost Ratio, Net Present Worth, Internal Rate of Return and Pay Back Period using a discount rate of 14%. The results are shown in Table 4. The Benefit-Cost Ratio (BCR), Net Present Worth were 1.36 and Rs. 276,520, respectively. This indicated that for every one Rupee of investment in this system, the additional returns was Rs.0.36 which confirmed that under well managed conditions, coconut based mixed farming system is economically viable. The NPW of about Rs. 286,520 further indicates that this system would be more profitable. The Internal Rate of Return was 27.44% indicating the economic worthiness of financing this system. The Pay Back Period of five years indicated that the total initial investment of 2.6 lakhs could be recovered in five years. These indicators confirmed the economic worthiness of investment in coconut-based mixed farming system.

This system is able to provide fodder grass for feeding the cows worth Rs. 4,800 to Rs. 6,400 per year and if value is not imputed to the cattle feed cost, the BCR could increase to 1.41 and the Net Present Worth to Rs. 315,400. However, there was change in the values of IRR and Pay Back Period.

SUMMARY

The economic analysis of coconut-based mixed farming system for the period 1989-90 to 1997-98 under optimum management conditions was performed using the experimental data. It was observed that the total cost of

the system, which was Rs. 134,800 during 1989-90, has increased to Rs. 167,000 during 1997-98. During the same period, the gross returns had increased from Rs. 184,500 to Rs.293,900 and the net returns from Rs. 49,800 to Rs. 126,900. The cash flow analysis performed using a discount rate of 14% realized the Benefit-Cost Ratio (BCR) of 1.36 and the Net Present Worth of the system Rs. 286,520. The Internal Rate of Return was 27.44% and the Pay Back Period was five years. These results clearly indicate the economic viability of the system in medium and larger coconut holdings under irrigated conditions. Future research and developmental efforts should be initiated to understand and improve the existing status of coconut based farming systems under different agro-climatic and socio-economic environment of all the coconut growing states.

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Table 1. Details on the Cost of Coconut Based Mixed Farming Systems in Rs./ha (1989-90 to 1997-98)

YEAR	Labour	Cattle Feed	Poultry Feed	Vet. Medicine	Broiler Birds	Paddy Straw	Fert.	Finge rlings
1989-90	20000	53800	4930	3890	-	480	3500	-
1990-91	20000	49180	9340	1780	-	2370	3670	-
1991-92	24000	55870	13740	2350	3900	2640	3800	1150
1992-93	26000	50160	16630	2650	3900	3620	6080	1150
1993-94	26000	68680	16690	4930	1000	2500	6130	1200
1994-95	30000	64540	17640	3440	1000	2230	6200	1200
1995-96	30000	63080	34240	2610	3000	5500	6300	1250
1996-97	34000	57620	40580	1970	8360	-	7000	1250
1997-98	40000	40190	18610	1880	5220	3000	7200	1300

YEAR	Fish Feed	Fodder Grasses	Irriga-tion	Miscell aneous	Total Cost	Annuity	Total*
1989-90	-	4800	1000	1927	94300	36400	130700
1990-91	-	5200	1000	114	93500	36400	129900
1991-92	3200	5830	1000	1117	118700	36400	155100
1992-93	3200	5940	1500	1159	122000	36400	158400
1993-94	3350	6360	1500	1320	139700	36400	176100
1994-95	3350	6360	1500	1333	138800	36400	175200
1995-96	3400	6360	2000	1514	159300	36400	195700
1996-97	3500	6360	2000	1573	164300	36400	200700
1997-98	3500	6360	2000	1229	130600	36400	167000

* Rounded total

Table 2. Production of Different Components in Coconut Based Farming Systems

Year	Coconut No.(1 ha)	Milk (litres)	Pepper (kgs)	Banana (kgs)	Quails (Nos.)	Hen egg (Nos.)
1989-90	16787	13153	90	530	100	7990
1990-91	21347	12719	96	319	100	1729
1991-92	16733	9305	62	608	112	965
1992-93	17674	7877	60	307	80	2819
1993-94	18404	10873	-	320	86	2696
1994-95	19125	9235	-	526	90	3500
1995-96	19388	10701	-	502	100	2887
1996-97	19412	5948	-	1090	80	272
1997-98	19600	6543	-	885	80	-

Year	Quail egg (Nos.)	Rabbits (kgs)	Fish (kgs)	Green grass (kgs)	Poultry manure (kgs)	FYM (tones)
1989-90	3768	87.5	-	4800	2000	15
1990-91	3948	45	-	5200	2500	16
1991-92	3359	24	400	5830	2000	15
1992-93	4084	28	400	5940	2500	16
1993-94	2515	20	380	6360	3000	16
1994-95	1100	10	400	6360	3000	16
1995-96	1018	-	390	6360	2000	15
1996-97	2077	-	380	6360	2000	14
1997-98	2096	-	380	6360	2500	13

Table 3. Details on Returns from Coconut Based Mixed Farming Systems in Rs./ha (1989-90 to 1997-98)

YEAR	Coco-nut	Milk	Pepper	Banana	Broiler	Quail	Hen egg	Quail egg
1989-90	50361	92071	3150	1250	10600	1500	11985	1884
1990-91	64041	89033	3360	981	7975	1500	2594	1974
1991-92	50199	74440	2790	1500	18240	2240	1448	1680
1992-93	61859	63016	2700	2304	10745	1600	4229	4084
1993-94	64414	97857	-	4200	16000	1720	5392	2515
1994-95	76500	92350	-	4000	28930	1800	7000	1100
1995-96	77552	117711	-	4400	32630	2500	5774	1018
1996-97	87354	71376	-	4800	76300	2000	544	2596
1997-98	88200	78516	-	4000	70800	2000	-	2620

YEAR	Rabbit	Fish	FYM	Poult. man	Fodder Grasses	Biogas	Byprod. Others	Gross return*	Net return
1989-90	1750	-	2250	1000	4800	900	1000	184500	53800
1990-91	900	-	3875	1250	5200	1000	4600	188300	58400
1991-92	600	20000	3750	1000	5830	1100	5800	190600	35500
1992-93	980	21100	3750	1875	5940	1300	6400	191900	33500
1993-94	900	20000	5400	2250	6360	1500	6200	231700	55600
1994-95	500	20000	5100	2250	6360	1500	6900	254300	79100
1995-96	-	20200	4800	1600	6360	1700	7500	284700	89000
1996-97	-	21500	6000	1600	6360	2000	7700	290100	89400
1997-98	-	22200	7000	2500	6360	2300	7400	293900	126900

* Rounded total

** In case of FYM and Poultry Manure,
the imputed value of quantity produced within the system was considered as return

Table 4 Cash Flow Analysis of Coconut Based Mixed Farming Systems

Years	Total Cost	Total Return	Discounted		
			Cost	Return	Margin
1989-90	134800	184500	118246	161842	43596
1990-91	134000	188300	103109	144891	41782
1991-92	155100	190600	104688	115150	10462
1992-93	158400	191900	93786	113620	19835
1993-94	176100	231700	91461	120338	28877
1994-95	175200	254300	79819	115856	36037
1995-96	195700	284700	78209	113777	35568
1996-97	200700	290100	70357	101697	31340
1997-98	167000	293900	51354	90377	39023
Total			791028	1077547	286520
BCR					1.39
NPW					306770
IRR					27.5
Pay Back					05

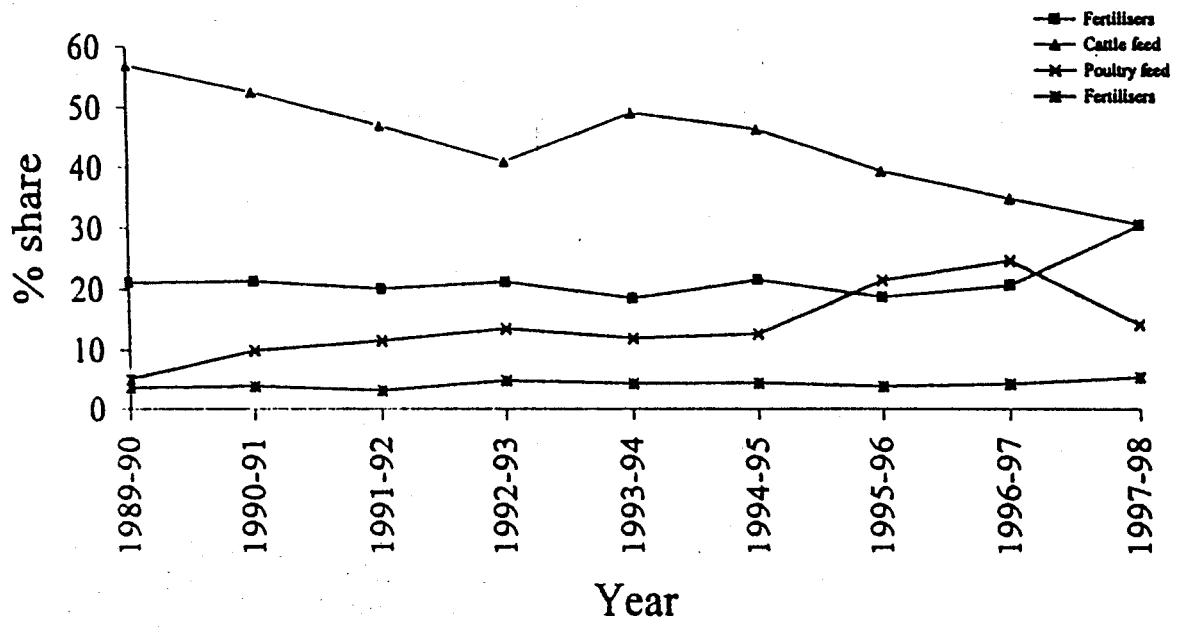

Fig.1: Per cent share of inputs in the variable cost (Rs/ha)

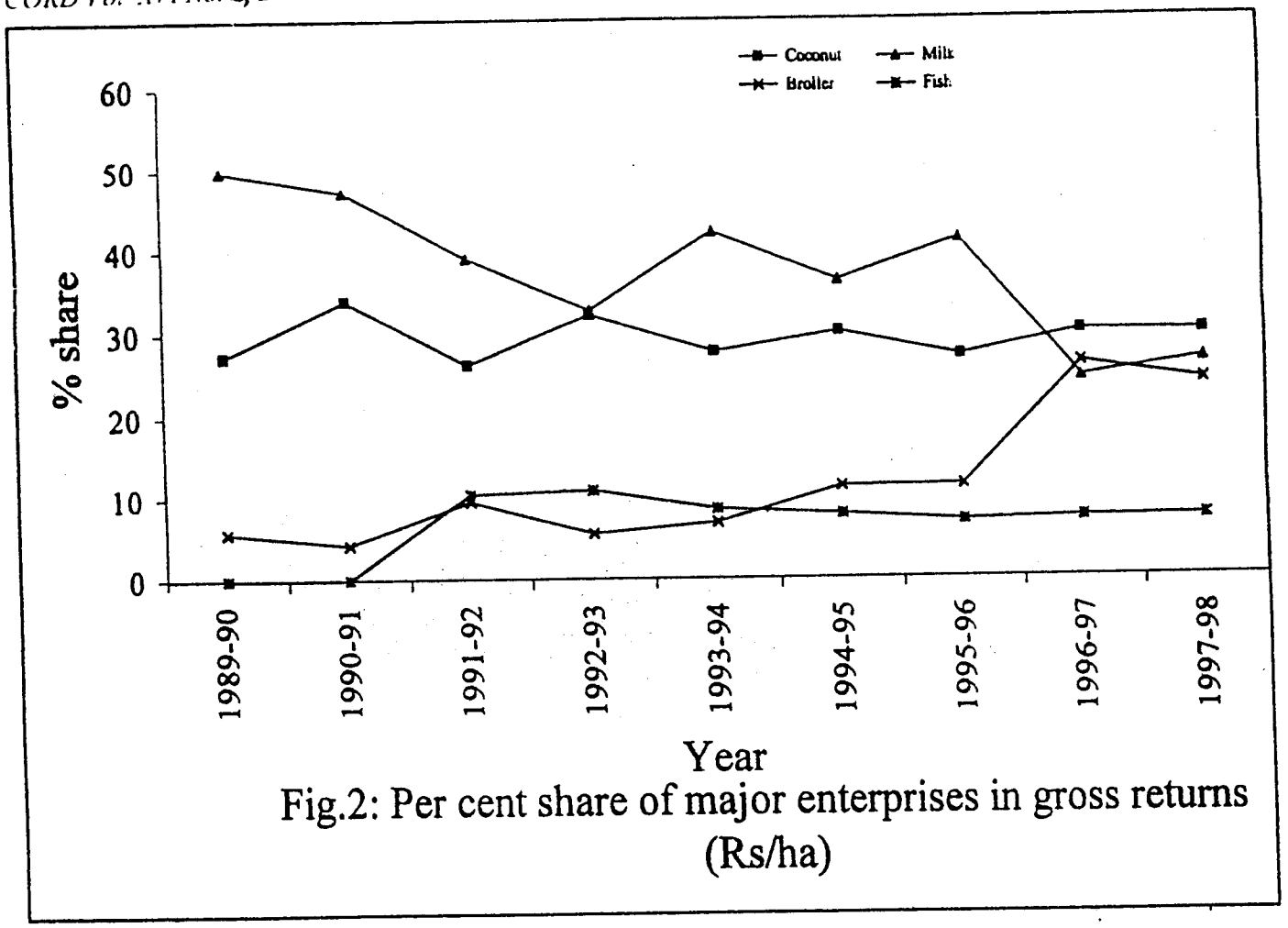

Fig.2: Per cent share of major enterprises in gross returns (Rs/ha)