

VIII. MIXED FARMING IN COCONUT GARDENS

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Mixed farming programme in coconut garden involves establishing of pastures or cultivation of fodder grasses in the interspace of coconut palms, maintenance of milch animals on the fodder produced and recycling the cattle manure in the coconut-fodder mixed stand. Considerable interest is now being evinced in this country and outside in developing the coconut—fodder—milch animal mixed farming system as it enhances the output from unit area and increases the employment potential substantially.

Ohler (1969) has presented an excellent review on cattle under coconut. He pointed out that grazing of cattle under coconut, without affecting the yield of palms, was possible, provided sufficient soil moisture and plant nutrients were available for both crops throughout the year. Thomas (1978) discussed the problem of integrating pastures, livestock, and tree crops, with special reference to rubber, oil palm and coconut, and concluded that the greatest potential for integration existed in mature coconut plantations, where the Tall variety of coconut was grown. In the young plantations, the low light intensity would limit pasture growth. In a juvenile stand, though sufficient amount of light reaches the ground, grazing by cattle would damage the young palms.

Though grazing under coconut had been practised for a long time in many countries, the technical and economic merits of the

practice have been doubted as much as they have been praised, probably due to the differences in ecological factors, management practices, etc. under which this system was carried out. When establishing a pasture under coconut the existing weeds are replaced by grasses and legumes, that provide forage of good quality in sizable quantities. The undergrowth, viz., fodders cannot compete with the much taller coconuts for light and air, but competition for soil moisture and nutrients can certainly be substantial. According to Santhirasegaram (1966), the reduction in yield of coconuts caused by the pasture was negligible in soils with low or high availability of moisture and nutrients. His experience in Sri Lanka was that, in the absence of additional manuring, the yield of coconut was reduced by the pasture. When both were adequately manured, the depressive effect was completely removed.

Published reports mention only about the establishing of pastures in coconut gardens and allowing cattle to graze. This may be possible because of the large size of the holdings and less pressure on land. In India, since coconut is mainly a small holder's crop, this may not be feasible. Under these circumstances, raising of fodders and legumes and cutting them and stall feeding the cattle appear to be more suited. Two field experiments were carried out at CPCRI, Kasaragod to spot out suitable fodder species and varieties and to work

out the economics and benefits of mixed farming.

Fodders

Screening trials conducted at Kasaragod showed that the fodder grasses Guatemala (*Tripsacum laxum*), hybrid napier (Pusa giant and NB 21) and guinea grass (*Panicum maximum*) gave an yield of 50-60 t of green fodder/ha/year under coconut shade; and the legumes, Brazilian lucerne (*Stylosanthes gracilis*) and cowpea (*Vigna unguiculata*), about 30 t/ha (Sahasranaman and Pillai, 1976). The cutting interval was 30-40 days. At a feeding rate of 30-40 kg of green fodder per animal per day, with grasses and legumes in the ratio of 3:1, an area of one ha could support four milch animals. All these crops, except cowpea, will normally be in the field for a period of three years, after which they require replanting.

Family farm

The mixed farming experiment was started in 1972. The project envisaged a study on the benefits and support a small holder family could get by mixed farming practice. Hybrid napier (*Pusa giant*) and *Stylosanthes gracilis* were planted in a coconut garden in an area of 1.04 ha. The coconut palms, 191 in number, were approximately aged 60 years, at the time of starting the experiment, and were under good management in rainfed condition. There were 42 underplanted young palms also. Before planting the grass slips, the interspace was given a deep ploughing after applying 10 t compost, 80 kg P_2O_5 as superphosphate and 80 kg K_2O as muriate of potash per ha. The slips were planted in rows 50 cm apart and at a spacing of 30 cm within the row, with about 60,000 slips per ha. A circular area of 2m radius around the palm was left free. Twenty-three kg N per ha as urea was applied at the time of planting and again after every cutting. In addition, 8 kg P_2O_5 and 60 kg K_2O per

ha, were given in two equal split doses, before and after the monsoon. The grass was ready for cutting 70-80 days after planting and afterwards at 30-40 days intervals. In the initial period, cattle manure was put back to the soil in areas where the fodder was cut. Summer irrigation using sprinklers, was provided to ensure steady growth of fodder throughout the year.

Along the border and field bunds intercrops like banana, tapioca and vegetables were raised. Pepper was also trailed on some of the coconut palms.

Three milch animals of Jersey Cross breed (first lactation) were handed over to a family which consisted of a man, his wife and children in September 1972. The family was staying in a semipucca house, within the experimental plot. All the operations connected with the mixed farming system, viz., growing of fodder, milking and feeding the animals, and cleaning the cowshed were done by the family. Additional labour was provided only for replanting of grass slips, fertilising and harvesting of coconuts, repairs and maintenance of structures and field bunds. Two more animals were added during July, 1973. Since November 1975, the number of milch animals was restricted to four at any time. The animals in lactation were fed every day with 4 kg of concentrates, 30g each of common salt and minerals, besides about 30 kg of grasses and legumes. The young ones were receiving graded doses of concentrates. Whenever the fodder was insufficient, they were given paddy straw. The milk was sold to the consumers at the prevailing market rates. Every effort was made to dispose off the male calves, at the earliest opportunity. The female calves were reared till the first lactation and if found good yielder, they replaced the least economic among the older generation. This ensured maintaining the dairy production at higher level and disposal of unthrifty and senile animals.

Table 27. Mixed farming in coconut gardens at CPCRI, Kasaragod—Analysis of farm data

A. Capital Investments on the Farm*		(Rs.)	Fertiliser and harvesting charges for coconuts ..	(Rs.)
Cost of cows ..	13,092.00		Other miscellaneous expenses ..	2,168.86
Cost of cattle shed ..	8,935.00			37.20
Cost of utensils and other equipments ..	552.00		Total (cash) ..	14,730.74
Cost of pumpset and pipe fittings ..	12,000.00		Depreciation of animals, buildings & equipments ..	2,706.29
Cost of gas plant ..	5,211.00		Total (cash and non-cash) ..	17,437.03
Total investment ..	39,790.00			
B. Receipts**			D. Returns**	
Sale of milk ..	17,255.07		Total receipts (cash and non-cash) ..	33,148.17
Sale of coconuts ..	11,499.71		Total operating costs (cash and non-cash) ..	17,437.03
Sale of subsidiary crops ..	409.22		Receipts, less operating costs ..	15,711.14
Sale of calves, heifers and cows ..	1,627.67		Interest on investment ..	3,235.89
Total receipts (cash) ..	30,791.67		Return to farmer and family, for labour and management ..	12,475.25
Appreciation of calves and cows ..	2,356.50		E. Comparative Economic Analysis	
Total receipts (cash and non-cash) ..	33,148.17		Costs	
			Coconut alone (233 palms, rainfed) ..	2,820.03
			Coconut + dairy ..	20,672.92
			Incremental cost ..	17,852.84
			Benefits	
C. Operating Expenses**			Coconut alone (60 nuts/palm) ..	10,385.30
Cost of raising fodder ..	2,880.66		Coconut + dairy ..	33,148.17
Purchase of concentrates and straw ..	9,157.27		Incremental benefits ..	22,762.87
Veterinary charges ..	386.75		Cost-Benefit ratio (incremental) ..	1:1.28
Maintenance expenses (lump sum) ..	100.00			

*Totals, spread over four years

**Averages, per year, based on six years data

The cowshed constructed during September 1972 had a floor area of 72 m² with provision to house six animals, a milk room, store room, and a pen for small calves. A *gobar* gas plant of 3 m³ capacity was also built during September 1975. The dung from the animals was generating fuel sufficient to meet lighting and cooking needs of the family and lighting the cowshed, and for sterilising the utensils in the dairy.

The coconut palms received the recommended dose of fertilisers. They were also benefited by the irrigation.

Economic analysis

One of the main objectives of this experiment was to find out the economics of mixed farming in coconut gardens. Since a large majority of coconut growers are marginal farmers, the income from a sole crop of coconut is insufficient to make a satisfactory living. Success of any system will depend upon its economic viability.

Details of receipts received and costs incurred, both fixed and variable, are presented in Table 27. Only the actuals have been taken for cash receipts and payments and the normal norms were followed for calculating the non-cash receipts and payments, viz., appreciation of animals, depreciation of buildings, etc. Appreciation of female calves was calculated at 1:3:5, for the first, second and third years; and during the next three lactations, the value was assumed to be neither appreciating nor depreciating. For subsequent years, the depreciation values—the differences between present value (Rs. 3,000) and the junk value (assumed to be 10% of the present value)—was uniformly charged for the remaining productive period of eight years. For pumpset and gas plant, depreciation was calculated at 10% per year, while for cattle shed it was taken as 5%. Veterinary charges include the cost of medicines and semen only. The underplanted coconut seedlings started giving yield only

from 1976–77 and this also was brought under the sale proceeds of coconuts. Expenses towards planting of grass slips was brought under operating costs on the assumption that replanting is necessary only at the end of third year. One third of the total cost of this item was charged for each year. Interest on capital investment was taken as 10%.

Analysis of farm data showed that the returns to the farmer family for their labour and management was over Rs. 12,000 per annum, during the six year period, from a net area of little over one hectare. The minimum returns received in any year was Rs. 8,500. The differences in the returns, received during the different years, was due to the fluctuations in the price of coconuts and length of lactation/dry periods of the cows. To a lesser extent, it depended on the sex of the calves also, male ones fetching low price.

The capital investment on mixed farming was about Rs. 40,000 per ha of which one third was incurred towards the purchase of cows and another one third on irrigation installations. The balance one third was required for construction of cattle shed, gas plant, etc.

A comparative analysis with a sole crop of coconut garden of 233 palms, under good management in rainfed condition, was made on the assumption that the yield from such a garden could be 60 nuts/palm/year. During the first four years, only 191 palms were assumed to be bearing and later all the 233. Cost of cultivation for monocrop of coconut garden was obtained from the research project on cost of production. Incremental costs incurred and benefits received by superimposing a mixed farming system in coconut garden was worked out (Table 27). Overall cost-benefit ratio (incremental), for the six year period was 1:1.28 and it was above unity, in all the years, showing thereby that this type of investment is sound.

Yield of coconuts

The effect of mixed farming on the yield of coconuts has been doubted, because grasses are vigorous growing and exhaust the nutrients. The data from the experiment showed that, when the management practices for both crops were adequate, the yield of the main crop did not decline (Table 28).

Table 28. Yield of coconuts in the mixed farming plot.

Plot	No. of palms	Mean annual yield per palm 1969-72	1972-78	Increase (%)
Mixed farming	191	64.7	69.5	7.4
Control	24	60.8	51.2	-15.8

The mean annual yield obtained per palm during the pre-experimental (1969-72) and experimental (1972-78) periods were 64.7 and 69.5 nuts, respectively, showing an increase of 7.4%, which was substantial, considering the age of the plantation. Since the palms were already under good management, as reflected in the high pre-experimental yield, and age of the palms, the response obtained was significant. The palms in an adjoining plot of almost same age and good management, had shown a decline of 15.8% in yield, for the corresponding period. Hence, the net response in yield of coconuts, due to mixed farming practice was over 23%. In a younger plantation and/or when the management was average the yield response could be much higher.

Milch animals

The milk yield of cows was found to be satisfactory. The average milk yield per day was 6 to 8 kg during the first lactation, 8 kg during the second lactation and 8 to 9 kg during the third lactation. The lactation period was about 300 days, with a gap of 16 months between calving.

Employment generation

The annual labour requirement of a pure coconut plantation of one hectare was about 150 man days (Nelliath and Krishnaji, 1976), of which about 50 was for harvesting of coconuts. Under mixed farming practice, not only the farmer family (husband and wife) was getting employment round the year, but it could provide 100-150 mandays work for outside labour. Total employment in a normal year was about 800-850 man days, and in years when grass slips were to be planted/replanted, the employment potential rose to about 1000 man days.

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