Mixed Farming in Coconut Gardens : Economics and its Effect on Root (wilt) Disease

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Abstracts

A mixed farming programme, consisting of cultivation of fodder grasses and legumes in the interspaces of coconut, maintaining milch cows, and recycling of cattle wastes, is in progress at the Institutes at Kasaragod and Kayangulam. Increase in nut yield, improvement of soil nutrient status, and increased activity of beneficial microorganisms were observed in the experimental plots. At Kayangulam, where the palms are affected by root (wilt) disease, foliar yellowing was reduced but the treatment had no effect on the other symptoms like flaccidity and leaf necrosis. An evaluation of the economics of the practices, taking into account all the inputs and income from coconut and milk, showed that mixed farming could increase per hectare income considerably. Employment potential also increased several fold due to introduction of this system in coconut gardens.

Introduction

In systematically planted gardens, the rooting pattern of coconut provides sufficient interspace for intercropping without adversely affecting the main crop (Kushwah *et al.*, 1973). The canopy of coconut also permits about 30% of the light to filter through it when the palm is grown up. The forage crops, whose economic produce consists of vegetative tissues, can grow well under this partial shade. These conditions have been well exploited in Sri Lanka, the Philippines, and Malaysia by introducing mixed farming in coconut gardens by growing pastures and maintaining milch cows which are allowed to graze (Goonasekera, 1954; Rodrigo, Emilio, and Lorenzo, 1960; Childs and Groom, 1964; Santhirasegaram, 1966; Ohler, 1972).

Under the conditions existing in Kerala, India, where coconut is grown in 7 lakh ha and per capita land holding is only 0.22 ha, there is even a greater need to increase the productivity of coconut gardens. Hence trials were taken up at two centres of the Institutes at Kasaragod and

Krishnapuram to test the overall benefit of mixed farming by growing fodder grasses and legumes and maintaining milch cows. The results are presented here.

The coconut plantations in central Kerala are affected by root (wilt) disease which reduces the yield of coconut considerably and thus causes considerable economic loss to cultivators. Because of this, this trial gave special emphasis to study the effect of mixed cropping on root (wilt) affected gardens.

Materials and Methods

1. *Trials with fodder grasses and legumes.* Four grasses and legumes were tested as pure crops or mixtures in a field trial laid out in randomized block design with four replications. The treatments were : hybrid napier (T_1); *Stylosanthes gracilis* (T_2); *Pueraria javanica* (T_3); *Centrosema pubescens* (T_4); Hybrid napier+*Stylosanthes gracilis* (T_5); Hybrid napier+*Pueraira javanica* (T_6), and hybrid napier+*Centrosema pubescens* (T_7). The total area under trial was 1.3 ha with 471.5 m^2/plot. Further details about seed rate, spacing, manuring, etc. are given elsewhere (CPCRI, 1976). The observations/analyses done were for (1) nutrient status of soil and coconut leaf tissues; (2) soil microflora; (3) yield of coconut; and (4) foliar conditions of the palms by indexing for root (wilt) disease.

Soil and leaf samples were collected twice, before the start of the dairy unit and after running the experiment for three years. The soil samples were analysed for available K and P, and exchangeable Ca and Mg, besides pH. Leaf samples were analysed for major and secondary nutrients. For microbiological studies, total bacteria, nitrogen fixing bacteria, and denitrifiers were estimated. The yield data of the experimental palms indexed into four groups according to the intensity of disease (cf. Radha and George, 1973) were compared to pre-treatment yield; as also control palms (where no intercropping was done) of the same age groups and intensity of disease. The data on production of flower bunches and female flowers were also gathered.

2. *The dairy unit.* Eight graded Brown Swiss cows supplied by the Indo-Swiss Project were maintained for five years (1971-1975). For details about the management of animals, please see CPCRI (1976). The animal wastes were returned to the experimental fields.

3. *Economics.* The records of all inputs and outputs of the experimental field and dairy were maintained for evaluation of economics.

Results and Discussion

The fertility status of the soil did not show any significant difference between treatments. Leaf nutrient content, especially of potash, was however increased in the mixed farming plots (Table 1). Similarly, the beneficial

TABLE 1. Effect of mixed farming on leaf nutrient status

	N	P	K	Ca	Mg
Pre-treatment (1971) Mean values (per cent)	1.63	0.15	0.92	0.23	0.17
Post-treatment (1974) Mean values (per cent)	1.81	0.18	1.46	0.42	0.22

microflora also proliferated in all the treatments. The highest number of soil bacteria was observed in *S. gracilis* plots, but the nitrogen fixing organisms were maximum in the hybrid napier+*C. pubescens* plots. The highest number of denitrifiers was found in plots cultivated with hybrid napier, which is definitely a disadvantage when the crop is grown alone. The *S. gracilis*+hybrid napier combination proved to be the best among the combined treatments because of its low level of denitrifiers and comparatively high proliferation of nitrifiers.

The yield of coconut was increased by 28% (with mixed farming) (Table 2). This increase in yield could be attributed to the build up of beneficial microflora and nutrient status of the soil due to mixed farming practices and higher uptake of nutrients by the palms.

Indexing of palms for disease intensity revealed that foliar yellowing was reduced considerably even though the palms deteriorated further with respect to other symptoms like flaccidity and necrosis of leaves. The improvement in the Mg status of the leaf in treated plots could have been a reason for the reduction of foliar yellowing.

The cost accounting of the Project (Table 3) show that by maintaining eight milch cows in 1.3 ha under mixed farming practices, a profit of Rs 6693.00 was obtained in five years from the dairy alone with a cost benefit ratio of 1:1.06. But, when the income from coconuts was also taken into account, the profit went upto Rs. 18,064.00 with a cost benefit ratio of 1:1.15. If the dairy work is done by the owner family, the cost benefit ratio will go up further to 1:1.37, providing the farmer family with employment worth Rs. 424.00/month.

Trials at Kasaragod. The study at Kasaragod has the specific objective of finding out the economics of raising fodder grasses and legumes in coconut gardens and maintaining milch cows by a farmer family having a small holding. Five graded Jersey cows are being maintained by a farmer family in 1.04 ha coconut gardens. Hybrid napier and *S. gracilis* are grown as fodder crops. The organic recycling and hygienic disposal of animal wastes are carried out through a gobar gas plant of $3m^3$ capacity. This may prove to be of additional advantage since the used-up slurry, in addition to containing more N, mixes completely and quickly with the soil, and improves soil physical properties and moisture holding capacity

TABLE 2. Effect of mixed farming on nut yield

Disease index*	Control plot			Percentage increase/ decrease	No. of palms	Pre-treatment yield/ palm/year	Percentage increase/ over pre-treatment period	Estimated net response (%) (col. 8-5)
	No. of palms	Nut yield/ palm/year at commencement	Nut yield/ palm/year at completion					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0-10	10	58.3	62.4	+7.0	10	50.3	36.0	29.0
11-25	68	31.1	29.2	−6.1	68	33.7	25.5	31.6
26-50	8	20.9	18.1	−13.4	8	22.5	8.9	22.3
51 and above	22	19.5	21.4	+9.8	22	19.0	24.7	14.9
Overall	108	30.5	29.9	−2.0	108	31.4	26.1	28.1

*After George and Radha (1973).

TABLE 3. Economics of mixed farming in coconut gardens (Abstract only)

(In Indian Rupees)

A. Krishnapuram

(a) Capital expenditure for five years (1970-1975)

Total expenditure	26,213.02
Total appreciation	1,300.00
Total depreciation	4,016.10

(b) Income, expenditure, and cost benefit ratios for the experimental period

	Dairy	*Dairy+Coconut*
Total income	1,19,596.95	1,35,010.44
Total expenditure	1,12,903.34	1,16,946.49
Cost benefit ratio (Hire labour)	1 : 1.06	1 : 1.15
Expenditure (Substracting labour charges)	87,441.09	
Cost benefit ratio* if family itself attended to agrostology work	1 : 1.37	

B. Kasaragod

(a) Capital expenditure	*1975-76*	*1972-76*
Total expenditure	5,211.00	39,790.00
Total appreciation	5,251.00	15,121.00
Total depreciation	3,275.00	10,496 00

(b) Income expenditure, and cost benefit ratio for the experimental period

Total income	36,577.55	1,24,547.04
Total expenditure	24,477.65	80,603.46
Cost benefit ratio	1 : 1.50	1 : 1.50
Total income for the farmer family for labour & management	12,099.90	43,943.58
Wages earned by the farmer family	7,921.50	21,094.81

*Note : The owners' family will get an employment worth Rs. 424.00/ month from the project.

of the soil (Srinivasan, 1974). This gas plant meets the full requirements for light and fuel of the farmer family and dairy. The slurry is used in the experimental field as manure. Most of the work in the dairy is carried out by the farmer family. Every item of expenditure and income is accounted for economic evaluation. The data collected for four years were cost-accounted (Table 3).

The beneficial nature of mixed farming was quite evident at this Centre also and the yield of coconuts increased by 18%. The farmer family, which manages the operations of the project, earned Rs. 43,944.00 in a four year period. During 1975-76, the family earned Rs. 12,100.00. The cost benefit ratio in this case worked out to 1 : 1.50.

Taking into account all the labour inputs for the project and as compared to a pure culture of coconut, it has been estimated that the annual employment potential increased from 150 man-days/ha to 1000 man-days by the introduction to mixed farming in coconut gardens.

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