IX. MIXED FARMING IN COCONUT GARDENS

ROOT (WILT) AFFECTED TRACT

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Out of the 0.74 million ha under coconut in Kerala, about 0.25 million ha is affected by root (wilt) disease—a malady of uncertain etiology. Reduction in yield of root (wilt) affected palms is proportional to the intensity of the disease and it varies from 10-80% (Anonymous, 1976*a*). Because of the reduced yield and added expenditure on plant protection measures, the net return from the disease affected coconut garden steadily decreases. Improving the yield of the root (wilt) affected palms is not immediately feasible as there are no effective control measures. Raising some additional crops in such coconut gardens could augment the income from the land. It could have added advantage if the system involves recycling of organic matter enriching the soil.

Considering these points, studies on mixed farming in root (wilt) affected coconut gardens were initiated in 1970 at the CPCRI Regional Station, Kayangulam. The objectives were to develop a system of mixed farming in disease affected coconut gardens, with fodder grasses and legumes for building up and maintaining soil fertility and to assess its effect, if any, on the disease affected palms.

Screening trials were conducted to identify suitable fodder grasses and legumes and to assess their capacity to yield maximum quantity of forage under the partially shaded condition in coconut stands, low susceptibility to pests and diseases and palatability and quality of the forage.

The mean yield of green fodder by the various grasses under rainfed and irrigated conditions in coconut garden is shown in Table 29. Among the grasses N.B. 21 gave maximum green fodder yield under irrigated condition. Under rainfed condition, guinea grass var. *Mackuenii* gave maximum yield (Nayar and Sahasranaman, 1978). Hence, depending upon the availability of irrigation facilities, one of these graminaceous fodder crops could be selected for growing in coconut stands.

Table 29. *Yield of fodder grasses (Nayar and Sahasranaman, 1978)*

Fodder grasses	Yield (t/ha/yr)			Percentage increase in yield due to irrigation
	Rainfed	Irrigated	Mean	
Pusa Giant	37.07	53.21	45.15	44.00
N. B. 21	41.61	64.43	53.02	55.00
Guinea grass (*var. Mackuenii*)	46.91	51.51	49.21	9.80

Among the legumes tried, *Stylosanthes* was found to perform better than others and it yielded 8 t of green fodder/ha/year.

Mimosa invisa was observed to be toxic to the animals, when fed alone, in large quantities (Anonymous, 1976*b*).

Slips of fodder crops were planted adopting a spacing of 50×30 cm leaving 2m radius around the base of the palms. Stylosanthes was established by dibbling the seeds in rows 30 cm apart. Fertilisers were applied at the rate of 150 kg N, 50 kg P_2O_5 and 100 kg K_2O/ha/year. The entire quantity of P and K were applied as basal dressing and the N in 4 and 8 splits, under rainfed and irrigated conditions, respectively. The farm yard manure obtained from the dairy was applied to the fodder crops. Irrigation during the dry months was given at weekly intervals, the depth of irrigation being 28 mm. The fodder crops could be cut at intervals of 40-45 days.

As the fodder component of the daily feed of a milch animal is about 40 kg of good quality green matter, the green fodder yield from one ha of irrigated hybrid napier grass was found sufficient to feed four animals. On the other hand, the yield from guinea grass under rainfed condition was sufficient to meet the requirement of only three animals.

Selection of the right breed of milch animal is very important for successful mixed farming programme. The breed of dairy cows recommended for Southern Kerala, graded Brown Swiss (F1), viz., *Sunandini* was maintained. The average milk yield of this breed maintained at Kayangulam was 2400 kg per lactation of 285 days duration. Cows yielding upto 3 kg milk/day get all the required nutrients from good quality green fodder (grass plus legume in the ratio of 75:25) fed @ 35-40 kg/day. For higher milk yielders, concentrates and mineral mixtures were fed in addition to the green fodder as per the schedule shown in Table 30.

Table 30. *Feeding schedule*

Milk yield/ day (kg)	Grass+legume 75:25 (kg)	Concentrates (kg.) (L & P or Hindlever)	
4	40	0.5	
5	38	1.0	+30 gm mineral mixture and 30 gm common salt
6	35	1.5	
7	35	2.0	
8	32	2.5	
9	32	2.5	
10	32	3.0	
11	30	3.5	
12	30	4.0	

Note:—From 7th month of pregnancy an additional quantity of 1 kg conc./day should be given.

Coconut yield

In the root (wilt) affected area, a 28% increase in nut yield was obtained by adopting mixed farming practice over a period of five years (Sahasranaman et al., 1976). It was also reported that the increase in yield was the highest in palms of the disease early group (disease index 11-25) and the lowest in palms of the disease advanced group (disease index above 51). Increase in production of inflorescences as well as female flowers was also reported (Anonymous, 1976*b*).

The data obtained from the field experiment on mixed farming initiated in 1975 also indicated that the production of female flowers, percentage of female flower set and the yield of coconut were not adversely affected by raising fodder crops in the interspaces of coconut palms, both under rainfed and irrigated conditions.

Disease symptoms

In the mixed farming plot, amelioration of the foliar yellowing of the root (wilt)

affected palms was reported by Sahasranaman et al (1976). But progressive increase in the other symptoms of the disease, viz., flaccidity and necrosis was observed (Anonymous, 1976*b*) indicating that the practice had little curative effect on the disease.

Study of the root growth of the palms in the mixed farming area (with grass and irrigation), and control (without grass and no irrigation) indicated regeneration of roots in the former (Anonymous, 1976*b*).

Soil properties

Mixed farming had little effect on the size of soil aggregates when observed after a period of five years. But significant increases in the organic carbon, available P, exchangeable Ca and Mg contents were noticed in the soil samples drawn at depths of 0-50 and 50-100 cm (Sahasranaman et al 1976). Increase in the available K was noticed only 50-100 cm depth. No significant change in available N and pH was observed after five years of mixed farming.

Microbial activity

An evaluation of microbiological status of the soil under different fodder crops was carried out. The highest number of soil bacteria was observed in plots cultivated with *Stylosanthus gracilis*. Maximum number of nitrogen fixing organisms was found in plots under hybrid napier and *Centrocema pubesence*. Highest number of denitrifiers and cellulolytic organisms were encountered in soil samples from plots cultivated with hybrid napier, and hybrid napier and *Pueraria javanica*, respectively (Anonymous, 1976*b*).

Economics of mixed farming

Cost accounting of the project on mixed farming at CPCRI Regional Station, Kayangulam revealed that the annual net profit per hectare increased from Rs 860 in the case of coconut alone (pre-experimental period) to Rs 2780 from coconut and dairying (Anonymous, 1976c). The cost benefit ratio of mixed farming project in the root (wilt) affected coconut stand worked out at 1:1.15. An increase in the employment generated, from 150 man days per ha to 1000 man days by mixed farming was also reported by Sahasranaman et al (1976).

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