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INTERCROPPING FOR ENHANCED PROFITS FROM COCONUT PLANTATION

INTERCROPPING with annuals like elephant-foot yam, tapioca, sweet-potato, ginger, turmeric, coleus and yam can bring handsome profits to the coconut grower, according to experiments carried out at the Central Plantation Crops Research Institute, Kasaragode.

Growth habits and crown shape of coconut palm necessitate a wider spacing of 7.5×7.5 m giving a plant population of about 175 palms per hectare. However, the studies conducted so far at the institute have shown that the basic resources of crop production, namely, soil and solar energy are not being utilised to the maximum extent possible in a pure stand of coconut. The concentration of roots of coconut is confined laterally to an area of 2 m radius around the palms. On area basis, this would mean that over 75 per cent of total soil mass is not being utilised effectively by coconut roots. Further, during the early stages of growth of the palms, a major portion of the solar energy is not being intercepted by coconut leaves, as the palm canopy develops with age, the percentage of utilisation increases progressively during the pre-bearing period, with a corresponding decrease in transmission of light. At the stage of stabilised bearing (8 to 10 years after planting), about 75 per cent of the surface is covered by the canopy of coconut. The magnitude of coverage continues almost steadily till about 20 years of age of the palms. Subsequently, as the trunk elongates, the amount of slant rays of sun falling on the ground increases and consequently, the apparent coverage of ground by the canopy of coconut decreases progressively. Thus, except during the period between 8 to 20 years of age, interspaces in coconut receive filtered sunlight of varying amounts, which may be adequate to raise various crops tolerant and adaptable to such conditions.

A large number of annual and perennial crops have been introduced for feasibility studies and to evolve different crop combinations with coconut. Perennials such as cacao, cinnamon, pepper, etc. require meticulous care during the early stages of their establishment, whereas annuals could be grown as rainfed crops with relatively lesser ease of management. This article describes the results of trials with some such annuals during 1973-74 and analyses the problems and prospects of such intercropping programmes.

History of the Plots. The crops were grown in the contiguous interspaces of coconut in Blocks C, D and G of the CPCRI farm. Palms were all of the variety West Coast Tall, in the age group of 40 to 60 years, planted at 7.5×7.5 m spacing and fertilised at the recommended dose of 0.5: 0.32 : 1.2 kg N, P_2O_5 and K_2O per palm in two splits per year. The soil is red sandy loam with a pH range of 5.00 to 6.00.

Intercrops

Intercrops included elephant-foot yam, tapioca, sweet-potato, ginger, turmeric, coleus, yam, and lesser yam. The time schedule of different crops is shown below. The crops were raised under rainfed conditions in fairly large-sized plots.

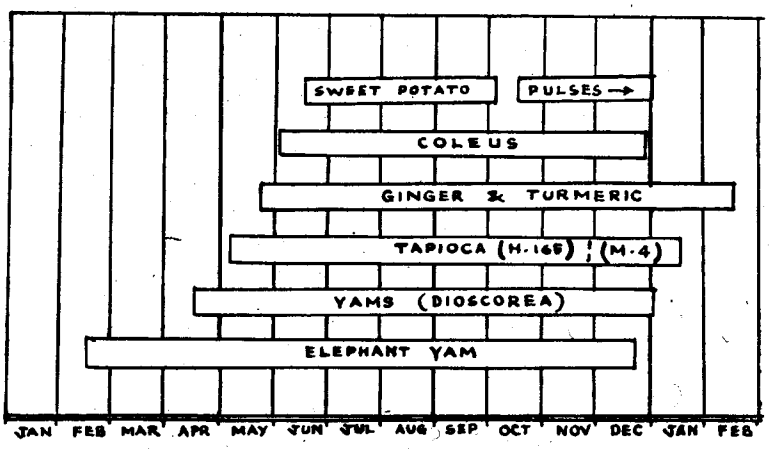

Fig.1. Time schedule of different intercrops

However, owing to the permanent layout of the farm and the availability of interspaces, different plots were of unequal sizes, varying from 130 to 3000 sq m in size. Also, all crops could not be replicated equal number of times or tried in equal area of interspaces. Details of the varieties of different crops, area under each and number of plots are given in Table 1.

All crops were grown according to recommended package of practices for each. Because of the varying spacings and methods of planting of different crops, the net area utilised for intercropping per gross unit area (hectare) of coconut garden is worked out on area basis and the figures are also indicated in Table 2.

Yields of economic produce of different intercrops were expressed in tons per hectare of gross area as well as per hectare of net area of intercrop. Varieties such as H. 165 (tapioca), H. 42 (sweet potato), Rio-de-Janeiro (ginger) and Armour (turmeric) are known to be high yielders. The superiority of these varieties over other varieties of the same crop was maintained when they were grown as intercrops also.

Cost-benefit Analysis. The cost of cultivation was calculated for different intercrops based on the current rates of fertilizers and other inputs and the daily labour rates of Rs 8 and 5 per man and woman respectively. The prices of all commodities were also calculated at current market rates. The cost:benefit ratios were worked out for all crops, as net return per rupee invested. In the case of crops where more than one variety was studied, the cost-benefit analysis was done for the better of the varieties (Table 3).

The maximum favourable cost: benefit ratio was for ginger and the minimum for turmeric (net returns of Rs 2.46 and 0.29 respectively per rupee invested). This lower return for turmeric was mainly due to the lower market rate of the commodity. The cost benefit analysis of food crops like tubers cannot be compared with that of cash crops like ginger. A net return of more than a rupee per rupee invested is a very encouraging economic consideration in case of food crops, especially when these are grown as intercrops. The value of these crops can be compared in terms of their nutritive values also.

Pattern of labour utilisation and generation of employment potential under intercropping. Under this intercropping programme, all cultural operations were done manually except the initial tractor ploughing. For all the crops studied, there are two labour peaks during the sowing/planting and harvesting time. However, unlike in the case of other food crops, the date of harvest of the tubers is not very exacting, and slight variations in the time of harvest are not likely to cause serious loss to most of these crops. Therefore, the harvesting can be staggered to suit the availability of labour and market demand. The total manpower required for the maintenance of a pure plantation of coconut is about 150 man days per hectare per year. The small farmers who form the majority of the coconut growing community in India are experiencing a feeling of inertia due to this underemployment. The employment potential generated by the intercropping programme is doubly advantageous, for in addition to the diversification of farm production, it opens up greater scope for better employment of the farmer and his family, and thus strengthens the concept of family farm.

Problems and Prospects

The analysis of the foregoing results reveals the tremendous potentialities and possibilities of intercropping with promising annuals in coconut plantations. According to the principles of scientific multiple cropping, intensive cropping programme is based essentially on the principle of time dimension in land use, where even a reduction in the yield of the main crop in such a crop mix is not unwarranted, provided the total return per unit area and time is increased. However, earlier works at CPCRI have shown that annuals such as elephant-foot yam and tapioca can be grown as intercrops in coconut gardens with no adverse effects on growth and yield of coconut, provided both the main crop and intercrop are adequately and separately manured. The yield of intercrops themselves may be viewed in the context of effective utilisation of interspaces which are otherwise being unutilised, and not in comparison with the performance of pure crop of these. Moreover, the weeding and intercultural operations required for pure plantation of coconut can be dispensed with, because the operations for intercrops will serve the purpose.

Having explored and established the feasibility of raising these crops, the immediate problem facing the research workers is to perfect the agrotechniques of each of these crops. The weather conditions at adjoining areas of Kasaragod are characterised by a heavy rainfall during June-August, and a hot dry spell during November-May. Because of this dry spell, the period between the harvesting of these crops in December-January and subsequent sowing/planting in March-April cannot be used for raising rainfed crops. One possibility for overcoming this difficulty is an early planting of the tuber crops with 2 or 3 crop sustaining irrigations to facilitate sprouting so that the crop could make rank vegetative growth as soon as the conditions become favourable with the onset of the first monsoon rains. This enables an earlier harvest of the tubers in September-October, which would facilitate a shade tolerant short-duration crop of pulses such as horse gram, black gram, green gram, etc. to be raised taking advantage of the North-east monsoon rains. Trials in this direction have already been initiated in the Institute. So also, a large number of other annuals and biennials such as groundnut, sunflower, cowpea, banana, pine-

apple, etc. are being studied for their feasibility performance as intercrops. The results obtained so far are encouraging.

TABLE 1. DETAILS OF INTERCROPS GROWN

Intercrop	*Scientific name*	*Variety*	*Gross area of intercropping (sq. m.)*	*No. of plots (replication)*
Elephant-foot yam	*Amorphophalus companulatus*	local	7200	5
Tapioca	*Manihot utilissima*	H. 165	2300	3
		M. 4	4000	2
Sweet potato	*Ipomea batatas*	H. 42	500	1
		local	2000	3
Ginger	*Zingiber officinarum*	Maran	1050	1
		Rio-de-Janeiro		
Turmeric	*Curcuma longa*	Armour	600	1
		Sugadham	950	1
Coleus	*Coleus barbatus*	local	130	1
Yam	*Dioscorea alata*	local	420	1
Lesser yam	*Dioscorea esculenta*	local	150	1

TABLE 2. DETAILS OF CULTIVATION PRACTICES FOR DIFFERENT INTERCROPS

Intercrop	*Method of planting*	*Spacing*	*No. of plants per hectare of coconut plantation*	*Percentage of gross area utilised by the intercrop*
Elephant-foot yam	Pits	1.0m × 1.0m	8000	80
Tapioca	Pits	0.9m × 0.9m	9500	80
Sweet potato	Ridges and furrows	50 cm between rows	—	70
Ginger Turmeric Coleus	Beds 1m wide, convenient length	Four rows in bed, 20 cm between plants in rows	100000	65
Yam	Pits	1.0m × 1.0m	8000	80
Lesser yams	Pits	0.75m × 0.5m	21300	80

TABLE 3. COST OF CULTIVATION AND COST: BENEFIT ANALYSIS FOR DIFFERENT INTERCROPS

Intercrop	*Variety*	*Cost of cultivation Rs./ha of gross area*	*Yield t/ha*	*Current market rate Rs./t*	*Gross return Rs./ha*	*Net return Rs./ha*	*Net return (Rs.) per rupee invested*
Elephant-foot yam	Local	2817	12.85	500	6425	3608	1.28
Tapioca	H. 165	1775	10.51	400	4204	2429	1.37
Sweet potato	H. 42	1670	9.53	350	3335	1665	1.00
Ginger	Rio-de-Janeiro	4162	11.57	1250	14420	10258	2.46
Turmeric	Armour	4000	12.93	400	5172	1172	0.29
Coleus	Local	1696	6.00	800	4800	3104	1.83
Yam	Local	2356	12.72	500	6360	4004	1.70
Lesser yam	Local	2356	9.00	600	5400	3044	1.29

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CLUSTER BEAN

also fair amounts of calcium and phosphorus. It contains more protein and calcium than jowar and bajra and in phosphorus content, it is equivalent to bajra but richer than jowar. Though it is mainly used as a cut fodder for stall feeding (excluding its woody stalk), it can also be converted into hay and alongwith wheat *bhusa* into silage. The hay provides over 51 per cent TDN and the digestibility co-efficient of crude protein is about 12 per cent.

Besides the green material, the seeds of cluster bean also serve as nutritious feed stuff for cattle. Its seed is a cheaper substitute for gram, used as a concentrate feed for bullocks. The seed, as a sole feed, is utilized after splitting and cooking and fed to cattle alongwith a little of mustard oil to avoid tympanitis. The whole seed contains 26 to 30 per cent crude protein; in cotyledons it is about 48 per cent and in endosperm about 5 per cent with digestibility co-efficients of crude protein and carbohydrates as 34 per cent and 40 per cent, respectively. When guar seed is fed to cattle, the endosperm is not easily digested. It is this endosperm and not the whole seed which is being exploited in several countries as an important source of gum for several industrial uses. The seed when fed without endosperm still supplies 95 per cent of the total protein which is available to the cattle. It is, therefore, economical to feed guar seed after removing the endosperm.

A CORRECTION

In the article, 'Follow Gingelly-Tobacco Rotation for Better Returns', published in the November 1973 issue (page 26), the fourth author's name may be read as R. Krishna Rao and not S. Krishna Rao.

—Ed.