

## INTERCROPPING IN COCONUT GARDENS

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With a view to maximising productivity per unit area of land and unit time in coconut plantations, various cropping systems have been evolved. Growing one or more short duration annuals in the interspace of coconut is termed 'intercropping'. Intercropping is an age-old practice in many coconut growing regions. Krishna Marar (1964) estimated the extent of inter/mixed cropping in coconut gardens as 78% in Kerala, 65% in Tamil Nadu and 35% in Andhra Pradesh. In Philippines 68% of the coconut farmers were reported to raise intercrops, whereas in Fiji 14% of the total area under coconut was intercropped (Plucknett, 1979).

The short duration annuals grown as intercrops are mostly raised under rainfed conditions. As such it is of greater importance for small and marginal farmers, who cannot invest on irrigation. Plucknett (1979) summarised the advantages of intercropping in coconut as follows:

1. Intercropping offer better stability, higher food/crop production and enhanced farm income.
2. Closer care and attention given to intercrop, often improves coconut growth and yield.
3. Suppress<sup>es</sup> weed growth.
4. Provides income during the pre-bearing period.
5. Offers scope for better utilization of labour and better land use especially in gardens with thin<sup>er</sup> economical stands.
6. Ensures better utilization of applied nutrients and water.

### Selection of intercrops:

Allen (1955) stated that a subsidiary crop grown under or between a tree crop should be tolerant of partial shade and should not:

1. grow as tall as the main crop, but its root system should exploit different soil horizons
2. be more susceptible than the main crop to diseases they have in common

3. demand harvesting or other operations, which would damage the main crop or induce soil erosion or damage soil structure, and
4. have an economic life longer than that of the main crop.

In addition Hartley (1977) added that

1. Soil should be suitable for both crops
2. Combined yield of the two crops should be greater in monetary terms than the sole main crop and  
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3. If and when the subsidiary crop come to end of its bearing life, the yield of main crop shall continue at an economic level unaffected by the previous presence of subsidiary crop.

Plucknett (1979) suggested that in addition to the above factors, the market demand for the produce, rainfall and irrigation facilities available, age, height and spacing of the palms and nutritional requirement of crops should also be considered while selecting intercrops. However, it is neither easy nor very necessary always to fulfil all these exacting requirements to have successful crop combinations (Nair, 1979).

In India research on intercropping in coconut gardens was initiated in thirties at the then Coconut Research Stations at Kasaragod and Pilicode. However, the research was intensified only after the late sixties (Gopalasundaram and Nelliatt, 1979). A variety of crops have been tested for their suitability as intercrops. They include cereals (finger millet, rice, maize, sorghum, pearl millet, wheat and minor millets), pulses (mung beans, green gram, cowpea, redgram, winged beans, Dolichos and bengal gram), oil seeds (groundnut, soybean, sesame and sunflower), root crops (cassava, sweet potato, yams, taro/colocasia, elephant foot yam, coleus and arrow root) spices and condiments (ginger, turmeric, chillies, coriander and fenugreek), fruits (banana and pineapple) and vegetables (cabbage, tomato, eggplant, cucurbits, greens, cowpea, cauliflower, french beans and potato), besides other crops like sugarcane, cotton, jute, kenaf, ramie and abaca.

Management of intercropping systems:

1. A circular area of about 2 m radius around the coconut is left without any intercrop to facilitate manuring and other operations for coconut.

2. Under Kerala conditions intercrops are generally sown/planted taking advantage of summer showers or in the first week of June with the onset of South West monsoon. However, crops like pulses which cannot withstand heavy rains were better sown in August-September after heavy rains are over. In Sri Lanka Linyanage (1970) recommended sowing of cowpea with the onset of rains for obtaining maximum seed yield. Delayed sowing resulted in reduction in plant height, weight of shoots, number of pods, number of seeds/pod and seed size.

3. Land preparation and other package of practices should be followed as in the case of pure stands of the subsidiary crops. The net area occupied by the intercrop varies from 65 to 75% of the gross area depending upon the method of planting.

4. When intercrops are grown, both the main and subsidiary crop should be manured adequately as if they were grown as sole crops so as to ensure satisfactory yields and profitability of the practice. In an experiment at Kasaragod during 1967-70, Varghese *et al.* (1978) observed that there was a greater reduction in coconut yield (16 nuts/palm/year) when intercrop was manured compared to plots where coconut alone was manured (10 nuts/palm/year). However, no such reduction was noticed when both the crops were manured as per recommendations. Besides, the yield of intercrops (Cassava and Elephant foot yam) was also poor when intercrop alone was manured. The results reinforce the need for proper management of intercropping systems.

5. Need for intercrop rotations: Varghese *et al.* (1978) reported that when cassava was grown as intercrop in the same plot every year, it yielded  $4.5 \text{ t ha}^{-1}$  only compared to  $6.3 \text{ t ha}^{-1}$  in rotation with elephant foot yam. Similarly growing elephant foot yam every year gave only  $6.4 \text{ t ha}^{-1}$  of tubers as against  $11.8 \text{ t ha}^{-1}$ , when it was grown alternated with cassava. The results emphasised the need for intercrop rotations rather than growing the same intercrop year after year.

6. Select crops according to rainfall or irrigation facilities available: Linyanage *et al.* (1984) suggested that intercrops should be selected based on the quantum and distribution of rainfall and listed suitable crops for different rainfall zones of Sri Lanka.

For the wet zone, which receives 1900 to 3800 mm rainfall without any dry period suitable intercrops are cassava, sweet potato, taro, yams winged beans, banana, pineapple, chillies, ginger, turmeric, fodder and pasture crops, coffee, cacao and rice. For the intermediate zone which receives 1500-2500 mm with dry spells in February and June to August, cowpea, green gram, groundnut, sesame, rice, sorghum during south west monsoon and groundnut, cassava and chillies during the north east monsoon were suggested. For the dry zone which receives only 1250 to 1900 mm of rainfall with a prolonged dry period during February to August, finger millet, groundnut, cassava and chillies were recommended as intercrops during north east monsoon only.

Similarly under Kasaragod conditions, even though intercropping of banana is highly profitable it could be grown only with irrigation facilities.

7. Select intercrops according to their shade tolerance and light availability: Availability of light to subsidiary crops grown as inter/mixed crops in coconut plantation varies according to the age of palms (Nelli et al. 1974). The crops will have to be selected according to the light available and their shade tolerance.

Lalitha Bai and Nair (1982) studied the shade response of common intercrops, viz. sweet potato, coleus, colocasia, ginger and turmeric. Sweet potato was highly etiolated under partial shade and growth parameters, total dry matter and harvest index showed exponential decrease with increase in the intensity of shade. This showed that not only the photosynthetic efficiency, but also partitioning of assimilates was affected. Hence sweet potato was classified as shade sensitive.

In coleus and colocasia only slight etiolation was noticed and Leaf Area Index increased upto 50% shade. Growth parameters showed linear decrease with increasing shade intensity. Dry matter accumulation and tuber yield showed that photosynthetic efficiency was more involved than partitioning and hence these crops were classified as shade tolerant

Growth parameters of ginger and turmeric except harvest index exhibited quadratic response to shade levels. The LAI, NAR, dry matter production and rhizome yield recorded maximum values in between 25 and 50% shade. They were identified as shade loving crops and 25 to 50% shade is optimum for their growth.

8. Selection of varieties: Different varieties of the same crop show considerable variations in their response to shade levels and their performance as intercrops in coconut gardens. At Kasaragod, upland rice could be successfully grown as an intercrop in coconut if it was sown immediately after the onset of south west monsoon. The variety Rohini yielded 1.65 t. ha<sup>-1</sup> of grain and performed better than culture 12814 and Chennellu (Gopalasundaram and Nelliath, 1979).

Potty *et al.* (1979) studied the performance of nine turmeric varieties as intercrops in coconut gardens and concluded that the varieties Sugantham, Wynad Local and T.Sundar are adaptable to conditions of partial shade in coconut gardens. These varieties showed higher accumulation of dry matter in fingers and mother rhizomes. They also produced fewer No. of fingers, but development of fingers was better.

In sugarcane, Liyanage (1980) suggested that varieties like Q68 and Co 775 with few internodes of greater length and diameter and moderate capacity for tillering are desirable for intercropping in coconut plantations.

Ramanathan *et al.* (1982) reported that both culinary and table types of banana performed equally well as intercrops in coconut garden. At Veppankulam, banana varieties Kachi and Karpooravalli performed better as intercrops yielding 11.4 kg fruits per bunch.

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