

Coconut cultivation making small farmers cheerful

Coconut is committed to the land for many years. Coconut palms start giving return only after 5-7 years. It is mostly a crop of small farmers in India, the average size of a land holding being 0.22 ha. More than 90% of five million coconut holdings in our country are less than one ha in size. Due to long pre-bearing period, occurrence of pests and diseases and fluctuating market prices apart from small size of holdings, its crop has failed to generate sufficient income to sustain even the small families. The farm yields under mono cropping system in traditional coconut-growing states in India, are poor and farmers are under employed spending only 100 and 120 mandays, under rainfed and irrigated systems of cultivation, respectively. Thus, diversifying the cropping system including more crops per unit area may be necessary to sustain the small and marginal coconut farm families.

THE land holding for coconut is usually very small and marginal. These farmers cannot afford single crop cultivation for their livelihood. Therefore, they need to follow other cropping patterns. There the technological information are furnished for their better livelihood.

TECHNOLOGIES FOR MORE RETURN

CROPPING SYSTEMS

The recommended spacing for coconut is 7.5 m × 7.5 m, which is based on the canopy cover of the palm over years. At this spacing, the crop fails to utilize the two of the basic natural resources, viz., soil and solar energy efficiently. The research over the years reveals that 75% of the land area and 25-70% of light are not being utilized efficiently in coconut gardens. Thus, the crop provides ample opportunity for growing annual, biennial and perennial crops as intercrops in coconut gardens of varying stages. Research on coconut based cropping systems was initiated during thirties in the erstwhile Coconut Research Stations and intensified in the seventies with the establishment of Central Plantation Crops Research Institute (CPCRI) at Kasaragod and All India Coordinated Research Programme

on Palms with centers in different coconut growing states. Field trials were conducted with different crops, viz., pulses, oilseeds, tubers, vegetables, flowers, fruits and spices with the main objective of identifying compatible and remunerative crops for intercropping. It was observed that intercropping is having complementary and additive effect on coconut productivity.

Age of plantation: The life span of coconut palm could be divided into 3 distinct phases. The first phase last from planting to full development of canopy (about 8 years). During this period when the canopy size increases gradually, interspaces could be utilized for growing annuals or other relatively short duration crops, which do not compete with the developing palms. The period from 8 to 25 years is the second phase when the coverage of ground canopy is about 80% and there is little scope for intercropping. However, crops which can sustain more

shade can be grown as intercrop during this period. After 25 years, there is gradual increase in magnitude of light penetration to the ground and this third phase is more suitable for multiple cropping and multistoried cropping models.

Choice of crops:

The selection of crop for intercropping depends on the soil type, rainfall pattern, availability of irrigation, local



Coconut based high density multi-species cropping system model



Pepper vines trailed on the coconut + grass



Coconut + tuber crops

demand and the ability of the crops to withstand shade. Further the crops should not compete with the main crop for nutrient and water. The crops should not have common disease and pests problems.

TYPES OF CROPPING SYSTEM

Vegetable Intercropping

Intercropping of vegetables in coconut garden are found successful and the yield of these crops related to quantum of light transmission, assured irrigation facilities, timely adoption of plant protection measures and family involvement. Raising of chillies, potato and french beans was found to be a profitable practice in maidan areas of Karnataka. Experiments conducted at Kasaragod have indicated vegetables like snake gourd, bottle gourd, amaranthus, coccinia, brinjal and bitter gourd as compatible crops with coconut. Intercropping with vegetables helped to generate additional employment to the tune of 215 to 365 mandays/ha/year and among the different sequences tried snake gourd, ridge gourd, amaranthus was found to be the most remunerative one (₹22,217/ha/annum) followed by amaranthus, bottle gourd, brinjal (₹20,920/ha/annum). In sandy soils, soil moisture conservation measures like coir pith application in the pits and sowing of pumpkin, resulted in higher pumpkin yield of 10.1 tonnes/ha. Similarly, crops viz., bhendi, different varieties of brinjal (Pusa Purple, Pusa Round and Hareetha), varieties of elephant-foot yam (Gajendran, Padma and local), ash gourd, ridge gourd and cowpea can be grown

as intercrops in coastal sandy soil with soil moisture conservation measures. In general, growing vegetables as intercrops has generated an additional net income of ₹50,580/ha.



Goat unit

Management of Crops

The success of cropping system depends on how it is managed. The competition between the crops should be minimum in the system. The nutrient and water requirement of the intercrops should be taken care along with the main crop. The planting of the intercrops should be taken up leaving 2.0 m radius around the palms to avoid competition among the crops. The sandy soils which have very low moisture and nutrient holding capacity where coconut is a major crop, intercropping can be made possible by adopting appropriate technologies.

Medicinal and Aromatic Crops

There is a growing demand for aromatic crops from the Indian perfumery industries. However, as their availability from natural resources is limited, there is a scope to incorporate these crops in coconut-based cropping systems.

The growth and yield of arrowroot and kacholam are higher when grown as intercrops in coconut garden (6.1 tonnes/ha) than in open space (4.8 tonnes/ha). Coconut + arrowroot (*Maranta arundinacea*) cropping system resulted in a fresh rhizome yield of 17.1 tonnes/ha. In addition to higher yield, starch content and crude protein content were higher in intercrops compared to the arrowroot grown in open space.

Medicinal plants, viz., Orila (*Desmodium gangeticum*), Moovila (*Pseudartheia viscida*), Chittadalodakam (*Adhatoda beddomei*), Karimkuriinji (*Nilgiranthus ciliatus*) and Nagadanthi - *Baliospermum montanum* are showing promising results when grown under coconut shaded conditions. Among annuals, orila recorded highest net return (₹14,929/ha) compared to moovila in 8 months duration. Among the biennials, the highest net return obtained was with Nilgiranthes cultivation (₹1,93,049/ha) in 18 month duration, followed by ₹1,65,290/ha in Nagadanthi crop.



Coconut + flower crop



Fish pond

Tuber and root crops: Tropical tuber crops, tapioca (*Manicot esculenta*), amorphophallus (*Amorphophallus campanulatus*), greater yam (*Dioscorea alata*), lesser yam (*Dioscorea esculenta*), taro (*Colocasia esculenta*), cocoyam (*Xanthosoma sagitifolium*), sweet potato (*Ipomea batatas*) and Chinese potato (*Coleus parviflorus*) are ideal for cultivation in coconut gardens. All the three species tolerate shade and hence perform well in coconut gardens. Tapioca and elephant foot yam are most profitable. In a 50-year-old coconut garden, intercropping with tapioca, colocassia, and other cereal and pulse crops gave an average yield of 15.4 tonnes/tubers per ha, increasing productivity of coconut by 30.3%. However, tapioca gives highest net return. Greater yam (*Dioscorea alata*), lesser yam (*Dioscorea esculenta*), Chinese potato (*Coleus parviflorus*), and Colocasia (*Xanthosoma sagitifolium*) give yields of 5.6-10.3 tonnes/ha.

Rhizomatous spice crops: Ginger and turmeric are important rhizomatous spice crops commonly intercropped in coconut gardens. Better performance under partially shaded conditions, assured market demand, easy processing and long storage life are some of the factors that favour growing of these intercrops. Higher rhizome yield and higher curcumin content for turmeric under intercropping stand was reported compared to open space.

Ornamental crops: Marigold and Globe amaranth are potential flower crops with high market demand. In their sequential cropping system in coconut garden, marigold can be cultivated during October-April by supplying adequate quantity of organic and inorganic nutrients while *Gomphrena* as catch crop during May-September. This crop rotation ensures continuous growing of flower intercrops throughout the year. The crops give additional

income of ₹2,10,000/year. *Heliconia* is other flower crop which remains in field for 3-4 years once planted and gives more income to farmers. There is great potential for growing shade-loving *Heliconia* as intercrop in coconut gardens. The cultivation of *Heliconia* opens up scope for employment generation and youth empowerment through

export, value-addition such as bouquet making, flower arrangement, stage decoration etc. Additional labour employment of 1,000 man days/ha in first year, 1,800-2,000 man days/ha in second year and 2,500 man days/ha in third year is expected. The average net return from *Heliconia* grown in one hectare of coconut garden is ₹48,00,000. China aster and gladiolus are also important flower crops which can be profitably cultivated in coconut garden. The flowers crops,

marigold (*khariif*) and china aster (*rabi*) grown as sequential crops in coconut garden realized a net return of ₹1,23,656 from one hectare of coconut garden as additional income over and above income from coconut. Similarly the crops, gladiolus (*khariif*) and gomphrena (*rabi*) realized a net return of ₹3,09,392/ha in complete.

SUMMARY

These findings clearly proved the complementary effects of intercrop on coconut productivity and under line the necessity of inclusion of intercrops in the system towards enhancing coconut productivity. Thus, adoption of intercropping system in coconut garden helps in enhancing the productivity and income from the unit area and improves the socio-economic condition of dependant farm families.

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Fruit Crops

Banana and pineapple are fruit crops which come up successfully in association with coconut. Banana is a highly profitable intercrop in areas with good irrigation facilities. Banana varieties are best suited for intercropping. Varieties like Gros-michel and Peda pacha are highest-yielding, followed by Dwarf Cavendish. Nendran banana is profitable as an intercrop in early phase of coconut. It yields 10-12 kg/plant and provide net profit of ₹ 6,400/- from 0.1 ha coconut garden. Under root (wilt) affected coconut garden, Palayankodan (13-18 kg bunch/plant) and karpooravalli (20-24 kg bunch/plant) varieties produced highest per plant yield, followed by Poovan (15-20 kg bunch/plant), Njalipooan (14-19 kg bunch/plant), Nendran and Robusta.