

# PROBLEMS AND PROSPECTS OF GROWING VEGETABLES AS INTERCROPS IN COCONUT GARDEN

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Vegetables are so common in Indian diet that a meal without vegetable is supposed to be incomplete. In India, vegetable crops occupy only about 1.2 per cent of the total cultivated area and the total production is about 30 million tonnes per year. As against the per capita requirement of 400g of vegetables per day, the average per capita availability in India is less than 75g. To provide 200g vegetables per head per day as per the projections of National Commission on Agriculture about 55 million tonnes of vegetables are to be produced by 2000 A.D. In Kerala, vegetables are grown in an area of two lakh ha with a production of 1.6 lakh tonnes. Nearly 45 per cent of the area under vegetables is concentrated only in two districts namely Thiruvananthapuram and Kollam. The vegetables grown is very meagre and fall too short of the demand of around 3 lakh tonnes per annum. Hence, most of the vegetables is imported from neighbouring states. Since cultivable area is restricted in Kerala, it is unthinkable to grow vegetables as pure crops. As such there exists a great scope to grow vegetables as intercrops in coconut gardens. The coconut in Kerala is grown in about 7.1 lakh ha and it is the most important crop next only to paddy.

Considerable scope exists for intercropping in coconut gardens and this could be attributed to several agronomic, ecological and socio-economic considerations.

Coconut is committed to the land for more than one generation and the realization of returns begins after a gap of 8 to 10 years of planting. Because of the growth habit and crown shape, coconut palm is grown with a wider spacing of 7.5m x 7.5 m. Studies have revealed that two basic resources of the crop production viz., soil and solar energy are not being utilized to the fullest extent in coconut gardens. It has been estimated that about 75 per cent each of the soil and air space goes unutilized in adult coconut gardens. Based on the coconut canopy development and sunlight availability it is suggested to grow intercrops. Among intercrops, vegetables should be recognized as more suitable in our cropping system because :-

- a. they supply both basic and accessory nutrients
- b. taste good
- c. they provide maximum quantity of food for the area planted and
- d. they grow quickly.

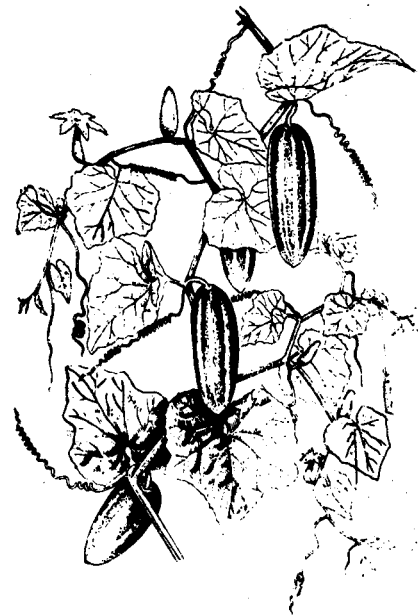
Some of the common problems encountered when vegetables are grown as intercrops in coconut garden are :-

1. Dripping of water in rainy season. So the crops selected during this period should be able to tolerate dripping of water and mechanical damage due to it.
2. Shade : Even in adult coconut gar-

den of about 40 years old only 40 per cent of light is transmitted to the ground. So the crops selected should be able to tolerate shade and yield satisfactorily without major insect and disease problems.

3. Crops suffer due to intermittent nut and leaf fall. So regular harvesting and removal of old leaves is to be attended to, thereby assuring minimum damage.

In the studies conducted at Central Plantation Crops Research Institute, Kasaragod, performance of some of the vegetable crops was found to be encouraging when grown in association with coconut. The prospects of cultivation of vegetables



Coccinia

as intercrops in coconut garden and problems encountered in their cultivation are discussed below. Cultivation details of different vegetable crops are given in Table 1.

**1. Amaranthus (*Amaranthus* spp.):** This can be grown throughout the year but the most appropriate time to sow is June and January months. Suitable varieties are Kannara local and Co. 1. Kannara local is red in colour and flowers in about 50-55 days. Co.1 is dark green in colour and high yielding. The yield ranges from 4500 to 6000 kg per ha.

**Problem:** No serious pest is found on the crop. However, caterpillars (like *Plugia* sp.) do considerable damage. The caterpillar attack makes the leafy vegetable unattractive though it does not affect the nutrient value. To control the insects in severe cases spray carbaryl (0.1%) (sevin 2g per litre), but care must be taken not to harvest for at least 7 days after the spraying.

**2. Bhendi (*Abelmoschus esculentus* L.):** Although this crop can be raised throughout the year, the best time for planting is January-February. Pusa Sawani and IIHR-20-31 are the suitable varieties. The yield ranges from 3500 to 4000 kg per ha.

**Problems :** i) **Fruit borer :** This damage is caused by *Erias vittella* Fabr. Caterpillars bore into tender shoots, flower buds and fruits and feed inside. As a result of attack shoots, buds and fruits dry up and drop. Fruit borer damage is severe in summer season and moderate in June planting. To control the insect, destroy all infested shoots and fruits, spray carbaryl 0.1 per cent (2g per litre of water) once in 15 days during fruiting season.

ii) **Yellow vein mosaic virus :** Veins turn yellow, later all the leaves show severe chlorosis. Fruit setting is reduced. The virus is transmitted by

white fly *Bemesia tabaci*. To control the disease:-

- i) Rogue out the infected plants.
- ii) The vector population can be controlled by foliar application of Dimethoate (0.03%) or Monocrotophos (0.05%).

**3. Vegetable Cowpea (*Vigna unguiculata* L.) :** This vegetable is ideal to be grown during rainy season. Recommended varieties are Pusa Phalguni and Pusa Basati in addition to various local varieties available. The yield realised will be about 3500-4500kg per ha.

**Problems :** (1) Delayed ripening and poor fruit set. This will be mainly due to excessive vegetative growth under shade. To overcome this problem it is advised to nip off leaves on the main and secondary branches. Major insects which attack the crop are :-

i) **Bugs :** Several species of bugs like *Coptosoma cribraria* are found on this vegetable. The nymphs and adults feed gregariously on tender shoots and pods as well as foliage. Spraying with dichlorvos (0.05%) gives effective control.

ii) **Bruchids (*Callosobruchus chinensis*) :** This beetle infests the pods when the crop is in the field and later feeds on the seed in the stored condition. The seeds should, therefore, be thoroughly cleaned and sun dried before storage. The storage space may be sprayed with malathion (0.5%).

The major diseases encountered are:

**1. Rust :** Characteristic rust pustules are formed mainly on the underside of the leaves. In severe infections leaf withers. For controlling the disease spray Benlate (0.1%) or Dithane-M-45 (0.2%) or Plantavax (0.2%) at 15 days interval.

**2. Powdery mildew :** White powdery

growth is observed on leaf and stem. Severe defoliation takes place and pods will be smaller in size. To control the disease spray Calixin (0.05%) or Bavistin (0.1%) or Sulfex (0.2%)

**4. Bottlegourd (*Lagenaria leucanthi*) / Snakegourd (*Trichosanthes anguina*) / Bittergourd (*Momordica charantia*) / Ridgegourd (*Luffa acutangula*) / Coccinia (*Coccinia indica*).**

These crops come up very well in rainy season. Ridgegourd was found to fare very well, when sown in September-October. Coccinia is ideal to be planted in August-September. Seeds are to be sown on raised beds and plants allowed to spread on pandal. Recommended varieties are:-

**Snakegourd :** (i) Co-1 (ii) Arka sheetal. The average yield realized is about 5000-6500kg per ha.

**Bittergourd :** Arka Harit and Coimbatore long. Fruit yield as intercrop



Ridgegourd

will be about 4000-6000kg per ha.

**Coccinia** : Locally improved types with oval or elongated fruits can be used depending upon the local preferences. Yield will be around 14000 to 16000kg/ha.

**Bottle gourd**: This is ideal to be grown in rabi season (September-October). The best suited varieties are Arka Bahar and Pusa summer, prolific long. The yield realized will be about 7500-9000kg per ha.

#### Problems :

**1. Red Pumpkin beetle (*Aulacophora foveicollis*)** : The adult beetles feed voraciously on foliage and are destructive to seedlings. The grubs feed on the roots and stems below the ground. To control the insects effectively, grow a few scattered cucurbit plants as trap crop near the plot and destroy the attracted beetles by foliar spray of malathion or carbaryl (0.2%). At the early stages of the crop spray with monocrotophos (0.05%).

**2. Fruit fly (*Dacus cucurbitae*)** : This pest attacks mostly at the early stage of fruit development. Affected fruits mostly do not develop and those which develop become unfit for consumption as they contain maggots inside. It is advised to spray carbaryl (0.2%) (sevin 50% wp 4g/litre) or malathion (0.1%) (cythion 50 EC 2ml/litre) and 5% jaggery, 2 to 3 times at 10 days interval from the time of flowering.

Important diseases encountered are :

**1. Downy mildew** : The disease is characterized by angular yellow spots on the upper leaf surface. The corresponding underside of these spots are covered with greyish, mouldy growth. Infected leaves wither and dry. To control the disease spray Dithane-M-45 (0.2%).

**2. Powdery mildew** : The fungus

forms white floury patches on the leaves and other succulent parts. For controlling the disease, dust with sulphur @ 20-24 kg per ha on the affected parts.

**5. Brinjal (*Solanum melongena*)** This crop can successfully be grown during June and January sowings. Transplanting the seedlings beyond March 1st week will affect the yield due to high temperature. The varieties recommended are Arka Sheel, Arka shirish, Arka navneet, Pusa purple cluster and West coast round. The yield will be about 4500-6000 kg per ha.

#### Problems:

**Insects** (1) Shoot and fruit borer (*Leucinodes orbonalis*): Damage is severe in June sown crop. During vegetative stage the caterpillars bore into shoots, near the growing tip resulting in withering of terminal portion. Later during fruiting the larvae feed on the young fruits and contaminate with excreta, thus rendering them unfit for human consumption. As a control measure remove the affected shoots and fruits and destroy along with caterpillars. Spray Carbaryl (sevin 50% w.p. @ 2g per litre) or endosulfan (0.05%) at fortnightly intervals commencing from first fruit set. For the control of the pest during vegetative stage spray Quinalphos (0.05%) (Ekalux 25 EC @ 2 ml per litre) or Monocrotophos (0.03%) (Nuvacron 36 EC @ 1.25 ml per litre of water).

#### Diseases

**1. Bacterial wilt**: This disease is severe in January sown crop than the June sown crop. It is suggested to grow bacterial wilt tolerant varieties like West Coast Round and promising lines released from Indian Institute of Horticultural Research, Bangalore i.e. IIHR-12, IIHR-21 and IIHR-54. Follow crop rotation. Avoid plant-

ing solanaceous crops in the same plot every year. Application of bleaching powder @ 15 kg per ha before planting is found effective.

**6. Chilli (*Capsicum frutescens*)** : This can be conveniently grown if transplanted in August - September. Suitable varieties are NP-46-A, Jwala and Selection-1. The yield realized will be about 6000-8000kg per ha.

#### Problems:

**Insects** (1) Thrips (*Scirtothrips dorsalis*), mites and aphids:- These insects suck the sap from leaves resulting in stunted growth and curling of leaves. Spray with 17 ml dimethoate or 5ml phosphamidon or 10ml Monocrotophos or 10ml methyl parathion with 28g wettable sulphur or 25ml dicofol or 10g quinomethoate in 10 litre of water at 2 weeks and 5 weeks after transplanting.

**Leaf curl** : Leaf margins curl inward and outward and in severe cases leaves fall down and plant growth becomes stunted and bushy. Flowers and fruits will be few with curling ends. This virus disease is transmitted by whitefly *Bemisia tabaci*. For control remove and destroy the plants which are showing symptoms. Spray phosphamidon @ 5ml per 10 litres of water at fortnightly intervals; the last spray should be 15 days prior to picking. Resistant variety Pant C-1 can be cultivated in disease prone areas.

**7. Radish (*Raphanus sativus*)** : Being the cool season crop it is ideal to be sown in September-October. Variety 'Arka Nishant' is found to be ideal. The yield will be around 6000-7500 kg per ha.

#### Problems:

**Splitting of roots** : On the shoulder end of roots the splitting is seen. This can be overcome by timely and careful earthing up and judicious irrigation.

Fibrous root growth : Here roots will be smaller and will be more fibrous. To avoid this, it is suggested to give a deep ploughing of the land and to provide fine bed.

8. Tomato (*Lycopersicon esculentum*) : This crop is found suitable to be grown when transplanted in December - January. Suitable varieties are Pusa ruby, NTDR-1 (Nematode resistant), and Arka Vikas. It is possible to get fruit yield of about 6000-8000 kg per ha as intercrop in coconut garden.

**Problems :**

1. Fruit borer (*Heliothis armigera*) : Young larvae feed on flowers and green fruits. Young fruits shrivel and fall down while the fruits attacked later are rendered unmarketable. To control the insect, spray endosufan (1.5 ml per litre) or monocrotophos 1.25ml per litre or carbaryl 3 gm per litre at fortnightly intervals commencing from first fruit set. Avoid spraying 4 days prior to harvest.

Diseases : Among the diseases affecting the crop leaf curl and mosaic

are important where the plants get stunted, leaflets thickened and malformed with chlorotic streaks on the stems. Fruits become small and appear deformed. The disease is caused by virus and transmitted by white flies *Bemisia tabaci*. To control the disease rogue the affected plants. Treat the nursery bed with carbofuron @ 1 kg a.i. per ha at the time of transplanting of seedlings followed by 2-3 foliar sprays with either dimethoate (0.05%) or monocrotophos (0.05%) or methyl oxydemeton (0.04%) at 10 days interval.

Fruit cracking : The fruits develop cracking from the calyx end. This may be due to boron deficiency in the soil, or prolonged dry spell. To overcome the problem spray 0.3 per cent borax at the time of fruiting and repeat after 15 days. Give the third spray at fruit ripening stage and irrigate at regular intervals.

9. Cucumber (*Cucumis sativus*)/ Pumpkin (*Cucurbita moshata*)/ Ashgourd (*Benincasa hispida*)/ Watermelon (*Citrullus vulgaris*): Cucumber, pumpkin and ashgourd are ideal

to be sown in September-October. The varieties recommended are :

Cucumber : Japanese long green, Southern Karnataka type.

Pumpkin : Arka Chandan, C0-4 and Arka Suryamukhi

Ashgourd : Co-1. The yield will be around 12000-15000 kg per ha. Watermelon is recommended to be planted in December-January. The suitable varieties are Arka manik, Sugarbaby and Arka Jyothi. The yield realised will be about 12000-15000kg per ha.

Problems : Insects and diseases are the same as referred to under item 4 (Bottlegourd). Other important problem is delayed flowering and fruit set. This will be accompanied by more number of male flowers and late emergence of female flowers. To overcome this, nip off secondary branches upto 7th node on emergence and allow subsequent ones to develop. Stop irrigation at ripening stage. Spray ethral 250 ppm or maleic hybrazide @ 50 ppm at 2 to 4 leaf stage.

Table 1. Cultivation details of various vegetable crops

Sl.No.	Vegetable crops	Season of planting	Method of planting	Spacing	Fertiliser dose(kg/ha.)		
					N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
1.	Amaranthus	June and January	Flat bed	30cm between rows	100	50	50
2.	Vegetable Cowpea	June	Ridges	45x15cm	25	50	100
3.	Snakegourd	June	Ridges	120x90cm	75	50	50
4.	Bittergourd	June	Ridges	120x90cm	75	50	50
5.	Bottlegourd*	September-October	Basins	180x90cm	50	50	50
6.	Coccinia*	August-September	Pits	1.8mx1.8m	50	100	50
7.	Ridgegourd*	September-October	Basins	180cm x90cm	50	50	50
8.	Cucumber*	September-October	Furrows	2mx90cm	70	25	25
9.	Ashgourd*	June -February	Basins	2.5mx1.2m	50	50	50
10.	Pumpkin*	June -February	Basins	2m x90cm	100	100	40
11.	Watermelon*	June-February	Basins	3mx90cm	100	75	100
12.	Brinjal	June and January	Ridges	75cmx60cm	75	50	25
13.	Chilli*	June	Ridges	45x45cm	75	50	25
14.	Bhendi*	September-October	Ridges	60x30cm	50	25	25
15.	Tomato*	June-February	Ridges	60x60 cm	75	50	25
16.	Radish*	September-October	Ridges	30x10cm	75	40	40

\* Need protective irrigation