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Sweet lime cultivation for increasing the productivity, profitability and sustainability

Sweet lime (*Citrus limetta*) popularly known as *Mosambi* is an important citrus fruit that has plenty of health benefits. The fruit is directly consumed as raw or more commonly in the form of juice. It is a rich source of vitamin C, helps in detoxification of body, boosts immunity, regulates digestion keeping the bowels healthy and prevents constipation. The juice is also rich in vitamin B complex and carotene which enhance the body immune system, improve eye sight and skin health. In India, it is grown in an area of 20.65 M hectares with a production of 33.15 M tons. The important states growing this crop are Andhra Pradesh, Maharashtra, Telangana, Madhya Pradesh, Punjab and Rajasthan. Andhra Pradesh ranks first in the area, production and productivity followed by Maharashtra, Telangana and Madhya Pradesh.

THE sweet lime crop is grown under tropical and sub-tropical conditions with moderate rainfall i.e. 750 mm. A well-drained loamy soil of uniform texture up to a depth of 2 – 3 meters having good fertility is considered as the best for its cultivation. The red sandy loam soils are also ideal for sweet lime cultivation.

Varieties

There are three popular varieties which are extensively grown in different parts of the country.

Sathgudi: It is a high yielding (1,000 – 2,000 fruits/tree) variety popular in south India. The fruit weighs about 150 g. The fruit skin is thin and the no. of segments are 10-12. The brix ranges from 8.5 to 9 degree. Juice content is about 50% with 0.65% acidity.

Batavian: Batavian variety (*Bathayee*) closely resembles *Sathgudi* except for the green and yellow patches that develop due to basketing. It is mostly grown in coastal districts of Andhra Pradesh.

Mosambi: It is grown in some parts of Telengana. The fruit develops prominent furrows on skin and a circular groove at the stylar end. It has hard and thick skin. It tastes sweeter and has more number of seeds compared to *Sathgudi*. It lacks flavour and has inadequate blending of acidity with sugars. The fruit is spherical, smooth and weighs about 200 g; it has 14 segments; 8.5° brix; 0.44% acidity and 43% juice content.

Propagation

Healthy and vigorously growing buds from desired sweet lime variety are selected and budded on *Rangapur lime* root-stock.

Planting

The plants selected should be free from virus, pest and disease. While planting the bud joints should not go into the soil. The plants have to be staked immediately to avoid wind damage. An intra-row spacing of 4 – 5 m and inter row spacing of 6 – 8 m will be sufficient depending upon the fertility status of the soil. This will facilitate

Sathgudi

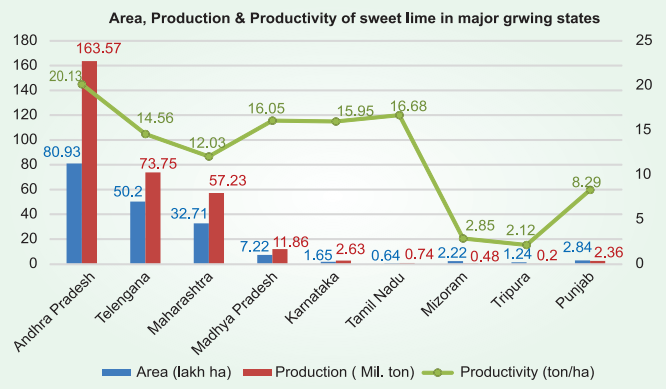
Batavian

Mosambi

Table 1. Area, Production and productivity of sweet lime crop in major growing states (3 years' average data 2015-18)

State	Area (lakh ha)	Production (M tons)	Productivity (tons/ha)
Andhra Pradesh	80.93	163.57	20.13
Maharashtra	32.71	57.23	12.03
Tamil Nadu	0.64	0.74	16.68
Telangana	50.20	73.75	14.56
Madhya Pradesh	7.22	11.86	16.05
Karnataka	1.65	2.63	15.95
Mizoram	2.22	0.48	2.85
Tripura	1.24	0.20	2.12
Punjab	2.84	2.36	8.29
All India*	206.54	331.45	16.23

(Source: ICAR Data Book, 2019) * including all growing states



operating tillage machinery and taking up plant protection measures. Pits of 1 meter cube are dug and filled with mixture of tank silt, red earth and farm yard manure in equal proportions. 2 – 3 kg bone meal or super phosphate per pit to be applied. Planting may be done preferably after the rainy season to avoid water stagnation.

Manures and fertilizers

Nitrogen is applied in the form of FYM and oil cakes each at 25% and the remaining 50% as chemical fertilizer while P_2O_5 is applied in the form of superphosphate and K_2O in the form of sulfate of potash. Manures are applied in 2 – 3 equal doses i.e. first dose in December-January, 2nd dose in June-July and 3rd dose in September.

A mixture of Zinc sulfate 0.5%, Manganese sulfate 0.2%, Boric acid 0.1%, Urea 1% and lime 0.4% has to be sprayed two or three times in a year to control chlorosis in leaves.

Pruning and training

The plants should be trained to grow straight and to build a strong framework. Rootstock sprouts, water suckers and dead wood should be removed periodically and Bordeaux/Copper fungicide paste to be applied at the cut ends.

Table 2. Nutrient requirement of sweet lime crop

Age of plant	Plant nutrient to be applied (g/plant)		
	N	P_2O_5	K_2O
1st year	300	70	80
2nd year	600	140	160
3rd year	900	210	240
4th year	1200	280	320
5th year & above	1500	350	400

Intercropping

Short duration rainfed crops like green gram, black gram, cowpea or horse gram can profitably be raised in the inter-row spaces during the rainy season as the crop canopies of sweet lime are shorter.

Weeding and interculture

The interspaces can be kept weed free by operating cultivator. Power weeders are now a days used for weeding and hoeing in the basins. After weeding and manuring, application of dry leaf mulch or paddy husk to a thickness of 6–8 cm in the basin keeps down the weed growth and decreases the number of irrigations.

Irrigation

Scheduling of irrigation depends upon the climatic conditions, soil type and available soil moisture in the root zone. Normally drip irrigation is recommended to save water and labour. Young trees need to be watered regularly during the dry season.

Control of fruit drop

Early and pre-harvest fruit drop is very common. Planofix 10 ppm solution can be sprayed thrice at flowering, after fruit set and one month before harvest. It minimizes the fruit drop and increases yield considerably.

Sweet lime tree bearing fruits in the orchard block of NAARM

Intercrop green gram grown in the sweet lime orchard during rainy season

Plant protection measures

Leaf minor, leaf weevil, citrus butterfly, bark and stem borer, mungo mite, fruit sucking moth are common pests. The orchard to be kept clean and weed free. Integrated pest management involving suitable insect traps, pheromones, biological and chemical methods to be followed.

Diseases

Quick decline or dieback: Tolerant rootstocks such as sweet orange, trifoliate orange and *Rangapur* lime have to be used for propagation. Virus free plants to be planted. Best management practices to be followed and the crop should not experience deficit or excess moisture stress.

Greening disease: Insect vector to be controlled by spraying systemic insecticide.

Root rot: Care must be taken to prevent irrigation water coming in contact with tree the trunk. Bordeaux paste has to be painted on trunks up to 65 cm above the ground level. For effective management of dry root rot, soil drenching with Mancozeb is recommended.

Harvesting and post-harvest technology

The bearing starts from third year onwards. The sweet lime produces 2 – 3 crops in a year in South India. First harvest will be from December to February, second from March to May and third harvest from June to September. The fruits have to be picked at fully matured stage when they develop their characteristic flavor to the maximum and the green colour of the fruit gradually changes to light greenish yellow colour. The fruits after harvest may be treated with ethylene gas to obtain uniform ripening. Sweet lime yields about 1,000 to 2,000 fruits per tree. The fruits are eaten raw and squashes and juices are also prepared. The fruits can be preserved in cold storage at 7 – 8°C for 4 – 8 weeks.

Mosambi based intercropping system

Fruit based Agri-horticulture system mainly focuses on higher income per unit area. The farmer can practice intercropping during the early stages of the fruit trees. The system is helpful in generating more employment especially during the off-season when the crops are not cultivated.

The sweet lime crop canopy is comparatively shorter. It offers good scope for intercropping of short duration and short statured crops like green gram, black gram, cowpea and horse gram. Wherever there is good irrigation facility, crops like groundnut, soybean and vegetables can also be grown in the inter-row space of sweet lime trees.

Economics

One hectare orchard accommodates about 310 plants with a spacing of (8 × 4 m).

- Cost of cultivation per hectare: (Planting material + planting expenses+ fertilizers and manures+ other maintenance expenses) = ₹1,00,000=00 (Approx.)
  The planting material and planting expenses will be in the first year. However, the maintenance expenses will be increasing as the trees grow and it will be approximately ₹ 1, 00,000=00 from 5th year onwards. …… (A)
- Expected yield/ hectare/ year (Approx. from 5th year): (No. of trees/ha x fruit weight/tree) = 310 × 100 kg = 31 tons ……..(B)
- Market price of sweet lime = ₹20,000/ ton (Approx.)……. (C)
- Gross returns/ha/year = B × C = ₹ 6, 20,000=00…….. (D)
- Net returns/ha/year = (D) – (A) = ₹5,20,000=00

Thus, growing sweet lime is sustainable and profitable under suitable soil and climatic conditions. Short duration intercrops can also be raised in the inter-row spaces which increases the productivity and profitability.

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