CHAPTER-IV
THE STUDY OF REQUIRED ATMOSPHERE LAND AND IRRIGATION FACILITY

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4.1 Introduction

India is one of the important fruit and vegetable producing countries of the world the increased industrialization urbanization in India is bringing about shifts a food consumption pattern. His in term has resulted in increased demand for protective and nutrition rich food, such as fruits and vegetables. The improvements in the production scenario as well as demand are determined by the improvement in the marketing system, the adage that marketing that even starts before production conveys the significance of the role of marketing in the development of agriculture. The development of an efficient marketing system is one of the major factors contributing to a quantum jump in agriculture production.

India has the unique distinction to grow almost all the varieties of the fruits and vegetables. India is second largest producer of the fruits in the world (9 percent) after China. India is the second largest manufacturer of fruits and vegetables in the world with 74.877 million metric tons production of fruits and 146.554 million metric tons production of vegetables for the year 2010-2011. Within India Tamilnadu is the largest producer of fruits accounting for 13.30 percent of India’s total fruits production followed by Andhra Pradesh (12.6 percent), Maharashtra (12.2 percent), Gujarat (9.7 percent) and Karnataka (8.4 percent) in 2010-11, major fruits cultivated in India are Banana (39.9 percent), Mango (20.3 percent), Citrus (10 percent), Papaya (5.6 percent), Apple (3.9 percent) and Guava (3.3 percent). Citrus is the third most important tropical fruit crop of India after mango and banana with an area of 846 thousand hectares and 7464 thousand metric tons of production (8.8 Million Tones productivity)
The most important citrus growing states in India are Andhra Pradesh, Maharashtra, Orissa, Gujarat and Uttarakhand. Maharashtra is the second largest producer of citrus after Andhra Pradesh in the country and contributes to about 18.9 Percent of the total production of citrus in the country. The state produces 1.41 MT of citrus from an area of 0.28 m./hact. Having productivity of 5.1 MT/ha. The production of citrus is concentrated in the belts of Amravati, Nagpur, Akola, Aurangabad, and Jalna. Maharashtra produces twelve percent of the total production of lime/lemon in the country and is the third largest producer in the country.

4.2 Types of Sweet Oranges

Varieties of sweet orange define with atmospheric distribution which is chosen according climatic condition of particular region, here are some important varieties. These all above mention varieties mostly famous in India which is suggested by reputed agriculture universities of India. Sweet orange is very popular with any cultivars to select from the selection at local garden centers is pretty good but as you sort through various pots checking tags for names you would probably like to know more about the individual varieties their qualities and season for instance let’s look at some common sweet orange varieties. Sweet orange has a number of types and it has various types of significance. Sweet orange being one of the important citrus fruits of the world occupies a prominent place in the horticultural field.

Scientific Information

Botanical name Citrus species Family Rutaceae and Origin-tropical and Sub-tropical Regions of South-East Asia. Citrus fruits are
of a group of fruits comprising of Mandarins, Sweet oranges, grapefruit, Lime and lemons etc., Citrus fruits have a prominent place among popular, extensively grown tropical and sub-tropical fruits. In India Citrus is considered to be the third most importance fruit crop. Citrus fruits are not only delicious and refreshing but also they provide minerals and many other substances. Citrus fruits contain considerable amounts of Vitamin ‘C’. Fruits are also good source of vitamin and pH. The mild bitterness in juice is due to the presence of glycoside called Maringa which is said to have a medicinal value. The rind of the citrus fruits is rich in pectin and essential oils. Archeologists and historians believe that by the beginning of the first millennium Chinese farmers set aside land for orchards where sweet orange, apples, figs and a variety of other trees of other fruits were grown. Sweet orange and apples in particular were very popular amongst the nobility and orchardists were known to compete with each other for the pleasure of their lord by growing ever larger, sweeter, or more perfectly rounded and colorful fruits. It is now known that the sweet orange had been grown for many centuries in China and had apparently reached an advanced stage of cultivation before it became known to Europeans.

The history of citrus fruit is fairly long. One of the best known early books is about the oranges of Wen-Chou, factually KeeJia Citrus Record (Citrus records of JiJia) has written in 1178 AD by Han Yanzhi the governor of the region. The book was translated in 1923 by Michael J. Hagerty as Monograph on the oranges of Wen-Chou, Chekiang. It describes the 26 citrus varieties grown in the region, their cultivation techniques and use. He also described citrus, kumquats and
the trifoliate orange and discussed nursery methods, grove management and diseases. (Webber: 1967). Though the records say that the fruit is believed to be originated in China, the cultivation of sweet orange was found in almost all the other parts of the world. The cultivation extends involvement to the economy of the producing countries. It was the Arab traders who initiated to spread sweet orange through the Mediterranean areas. The Portuguese, the Spanish, the Spaniards, the French all indirectly or directly contributed to the spread of sweet orange as a part of their trade purpose to different countries during the middle of the 16th century. The medicinal value of the fruit was given importance in the European countries. Combined with the medicinal value its luscious quality inspired wealthy persons to establish sweet orange orchards. An important observation was made by Webber that it was Columbus who transported oranges to America in 1493. The same fact is supported by History deals India’s by Bartolommeo de Las where it is declared that Columbus sailed from the Bay of Cadiz on his second Expedition on 25th September, 1493 to America and carried citrus seeds on the sail. As observed by Webber, the naturalist Oviedo Y Valdes wrote that four sweet orange trees from Castile were brought to Santo Domingo they had multiplied abundantly. Later on, the sweet orange cultivation travelled to West Indies, Brazil, the world’s largest producer of sweet orange. Brazil was introduced with this cultivation by the Portuguese traders. In the first half of the seventeenth century, the accounts of Spanish and Portuguese voyagers contained many reference to the spreading of citrus in the new world. Webber also mentioned about a Spanish book entitled Historia del nuecomundo (History of the New World) by
Bernata Cobo (1580-1657) where it is mentioned that by the second half of the 17th century the varieties of orange were available in Spain. Let’s see certain types of varieties of sweet orange like many tree crops come in early mid-season and late varieties.

1) Nuceller

It is a one kind of variety of Sweet orange. It is a combination of GFE and DISSA (from Gujarat). There are certain types of sweet orange in Maharashtra and these are well known by various kinds. The atmosphere of Maharashtra is good for nuceller so that farmer plant it very well and they get good benefit. The plant of new seller is fast growing plant it looks like doom, luscious, palatable, big and deep green. The fruits and peels of new seller are very big or we can say bigger than fruit of Sathgudi. If we look the fruits of same kind’s plant it looks like very attractive and it gets golden colour. If we focus towards these categories fruit for eating it has great feature basically its oriole taste, yellowish juice. The percentage yellowish juice is 38 to 42 percent. It has 12 to 15 blisters and seed are almost 14 to 16 and the percentage of sugar is 8.6 to 9.2 percent acid 0.55 to 0.52 percent vitamins 100 percent and the percentage of ‘C’ vitamins in juice is 35Percent ml.

2) Sathgudi

The name of ‘Sathgudi’ has been given on the basis of ‘Sathgur’ in Tamilnadu. We can call ‘Chilly-Orange’ to the Sathgudi. There is no proper information about from where it originates. These kinds of fruits are like big, small, talc, mushy, slime, spongy and attractive etc. the peel of that fruit is like thin and there is small-small spot over there
and little bit shiny, and juice tasty and yellowish. It has 10 to 12 blisters and seed are almost 12 to 20 and the percentage of sugar is 6 to 6.6 Percent acid 0.7, in 100 gram juice the percentage of ‘C’ vitamins is 35 gram. These types of fruits we can find out in market in the month of October to February because some farmer cut it as early as harvesting time. Mostly the farmer of Andhra-Pradesh, Karnataka, Tamilnadu and Maharashtra state who plant it, and now days it increases in Marathwada.

3) Batavian

It is a one kind of sweet orange, and it came in south India from Batavia. These kinds’ of fruits are as like as Sathgudi due to we get difficulty to identify it, but sweetness is more than Sathgudi fruits, and colour is whitish green and yellow and it mostly plant at the sea shore of Andhra-Pradesh. Harvesting time of that kinds of fruit come more early than other kinds, if we could not cut it on time it infected of certain diseases and insects due to that diseases we can’t get juice of good quality. The quality of Batavian fruits is not good as compare as Sathgudi.

4) Hamlin

Sweet orange, discovered in Deland, Florida in 1879, are early-season producers that are ready to pick from about October through January. Hamlin trees are very cold tolerant and generally are harvested well before any frosty weather threatens the fruit. The fruit store well on the tree and yields are very height. Splitting is however noted on the fruit from time to time with six or less seeds per fruit. Hamlin has a light colour juice.
5) Jaffa

It came to India from Palestine country. The fruits of these kinds are like round and narrow shape and its top and trunk is like roundtable, colour is like red and season of ripeness at riverside January to March, peel is like soft and spotty, Jaffa and Joppa look similar externally but Jaffa is seedier and sweeter at this time. Both are typical sweets, not like as Shamouti. The description from The Citrus Industry Vol. 1 (1967). Fruit medium-sized, globose to slightly ellipsoid or obviate basal end commonly collared and with radial furrows: areole inconspicuous or absent seeds comparatively few. Well-colored under favorable conditions. Rind medium-thick, finely pitted, and moderately pebbled. Flesh color light sweet orange medium-tender, juicy flavor good. Stores poorly on tree but ships rather well and Mid season in maturity. Tree vigorous, upright, medium-large foliage dense cold-resistant moderately productive, but with alternate bearing tendency.

In the literature and otherwise, this variety has sometimes been confused with Shamouti or Palestine Jaffa, the principal variety of Palestine and Israel, which it resembles only slightly. On the other hand, it somewhat resembles Joppa. Almost certainly both Jaffa and Joppa are clones of the Palestine bleed seeding group. Jaffa was introduced into Florida by H. S. Sanford about 1883, whether as bud wood or seeds is not known, but presumably the latter. Joppa was named about 1877 in California as a seedling from seeds obtained in Joppa, Palestine.
6) **Pineapple**

Pineapple is a very good variety moving into a mid-season sweet orange which has been around in Florida since 1860 with good colour and internal quality. ‘Pineapple’ is harvested from December to February. Moderately seedy, ‘Pineapple’ is less coed hardy than the other sweet orange varieties.

7) **Malta Blood Red**

The origin of these kinds is from middle sea Malta surroundings. From surroundings of Malta it came to India. We can find out Malta plants vary easily because these are like humpty and leaves are very thick. Its leaves are very tiny and round-oval and there is no featherbone stalk of leaves. The fruits of that kind are big, round and little bit oval and colour is yellow, peel is thin, good, shiny and constrict, and juice is vary tasteful, yummy, juicy, piquant, spicy etc. Mostly in India these plants we observes in Punjab, Haryana, Rajasthan, Uttar Pradesh, and Madhya-Pradesh, West-Bengal etc.

8) **Washington Naval**

It is originate from Bahiya in Brazil. Washington Naval is an American kind, in California trader always chose to plant it, due to we can it Washington Naval. The fruit is big and vertical and colour is yellow-orange. It is seedless and trunk is round peel is soft and sticky, middle-thick. Juice is very thick, and yellow-orange.

9) **Shamouti**

It is interest to note that Shamouti is considered to have originated as a limb sport in a Palestinian tree. Because of its comparatively low seed content, cold resistance, and good quality,
Jaffa early became popular in Florida and attained the status of a major midseason variety. This variety has sometimes been confused with Shamouti or Palestine Jaffa, the principal variety of Palestine and Israel. Alight-bearing tree. With fruit which is large and resembles Shamouti is a medium to large, oval-shaped sweet orange. It is nearly seedless, and has a thick, leathery rind. Shamouti peels well, and ships and stores well. It is a midseason fruit. Although Shamouti is the preferred name of the fruit, it has also been called Jaffa in Europe. The tree is sensitive to heat and aridity, and so it is not adapted to hot desert or semitropical climates. Fruit medium-large to large, collar or shoulder, commonly with short radial furrows apical and evenly rounded areola ring usually present but faint. Seedless or nearly so and well-cultured under favorable conditions. Rind thick, tough, and leathery surface finely pitted but relatively smooth inconspicuous oil glands. Flesh colour light sweet orange firm, tender, juicy fragrant and pleasantly sweet-flavored. Fruit peels and segments separate readily. Ships and stores unusually well, but does not process well. Midseason in maturity.

10) Parson Brown

Another early season sweet orange is the Parson Brown is often ready to pick slightly before ‘Hamlin’ Parson Brown is noted for their seediness and can have up to 30 seeds per fruit making it more difficult to eat as a fresh fruit.

11) Ambersweet:

Ambersweet is an additional early season sweet orange that you might find available, looking similar to a navel orange ‘Ambersweet’
can vary in seediness but is easy to pad and has good fruit and juice colour making it good for fresh eating of juice.

12) Cara-Cara

The Navel orange is very different from other sweet orange. The navel portion at the bottom of the fruit is actually a small second fruit embedded predominantly inside the larger fruit. While nearly seedless and easy to peel and section, it is known for its precipitate fruit drop. The juice should be used soon after squeezing as a bitter flavor will progress if kept too long one cultivar cara-cara is a crimson fleshed variety often used in fruit salads.

13) Midsweet

Midsweet is ready from January to March, this sweet orange is very cold hardy and less apt to produce fruitdeopthan pineapple the yield and quality are on par with ‘Hamlin’ and juice colour is deeper sweet orange.

14) Valencia

Which is available from March through June. The most notable late-season sweet orange is Valencia this late orange will actually have to crops on at once with both current and past season’s crop on tree. If you have the opportunity try several types of sweet oranges to see what you really like before you invest in a tree or two as citrus comes into the market select your favorite variety and search out a young tree at your local nursery or garden center.

➢ Effect on Production

While doing ‘A Geographical Study of Sweet orange Production in Jalna District’. We have to focus on a point called effect on
production, it is essential think in study of sweet orange, so what are the essential particles, situation, place, and what is the responsible point to bringing out changes in the production under the family-farm system. The owner of each farm takes his own managerial decisions such as methods of production, adoption of technology, introduction of varieties, production planning, traditional knowledge inherited from the society, from the experience, training and education. Knowledge of climatic factors like rainfall, temperature, humidity etc. also impact on product. There are certain types of effect on production we shall site it as follows

4.3 The Study of Sweet Orange Plantation

Sweet orange is the third largest fruit in India in terms of production. It is the second largest citrus fruit cultivated in the country and the major sweet orange growing states are Andhra Pradesh, Maharashtra, Karnataka, Punjab, Rajasthan and Haryana. Sweet orange trees are much more specific in their water requirement than any other fruit crops. Higher requirement of water is needed to produce satisfactory crop. Most of the santra plantations in India are rain fed conditions. Irrigation requirement of santra trees in the plains is similar to that of sweet orange. Irrigation should be given when the top of the soil goes dry of once in 7-15 days depending on the soil and Weather. Irrigation water should not directly touch the trees trunk as it spreads diseases like gummosis and the soil should not be allowed to get excessively dry as it results in leaf fall. Irrigation should be given immediately after maturing. Water is very essential during blossoming
and fruiting periods. Any shortage of water during maturity periods causes shrinking of the fruit and drying up of the pulp.

➢ Preparation of the field

The land is ploughed until a fine tithe is obtained. If it is a virgin land all the existing vegetation should be removed along with the roots. The land is leveled and pits are marked as per the system of planting to be adopted.

➢ Lay out

The square system of layout is commonly followed for planting the citrus crop. In order to facilitate orchard management practices economically and efficiently. Citrus trees should be planted in straight rows.

➢ Digging of Pits

Pits of $\frac{1}{2}$ m x $\frac{1}{2}$ m x $\frac{1}{2}$ m size may be dug at required distances 3-4 weeks prior to planting. But where the soils are shallow or under laid with hard pan, pits of 1mx1mx1m may be dug to facilitate better root penetration. Before planting the pits are filled with 25 kg of FYM, 1kg of bone meal, 3kg of wood ash and 50 g of alien dust powder for control of termites.

➢ Accurate time for planting

Temperatures get changed according to their climate. If we take a review of our country than we come to know that in North India farmer sow seed in the beginning of September to February, and in the South India and Vidarbha farmer sow their seeds in the month of May, June or September to October. For growing good kinds of seeds
we need temperature should be in between 10 to 15 °C. If it is less than that would not sow, while we sowing seeds we should heed of the distance of two lines should be 8 to 10 cm, and distance between seeds should be 2 to 2.5 cm. When farmer plant seeds at the time farmer should add mixture of sands, soil, and dung and should not give water directly, use a shower. When seeds grow well give water in other methods. Farmer should take care that means if we want 100 plants than plant more than 100s, it gives us chance to take good quality plant. If we want to go through for a single eye graft plant than sow 5 lemon seeds, and 3 Jamberi seeds.

There will be the effect of ‘Citasila’ of in December to June only. If we want to remove impact of ‘Citasila’ than make mixture of 20 ml ‘Nuwa-cron’ in 1ltr water and give to the plants, or for removing fungi give a mixture of 3grm ‘Copersicoloride’ nd l liter water. Take care of plant from too hotness or coldness. Approximately plant grow 1foot in a year, if the plants are not grow in that much height consider that plants carrying diseases with it, so we have to remove it, and good quilted plant place in another flower-bed. Flower-bed should have 45 to 50 cm width and 15 to 30 cm high and keep distance as per our rules. Plant that plants between 300 cm double line and distance should have 30 cm. and press it very well, if we plant it in double line it will be the help full for eye graft method.

➢ **Spacing**

Spacing adopted for different citrus species are.
Table No.4.1

Spacing Citrus Species

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Citrus Fruits Name</th>
<th>Miter.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sweet Orange</td>
<td>6-8 m</td>
</tr>
<tr>
<td>2</td>
<td>Mandarin orange</td>
<td>6-8 m</td>
</tr>
<tr>
<td>3</td>
<td>Acid lime</td>
<td>5-6 m</td>
</tr>
<tr>
<td>4</td>
<td>Lemon</td>
<td>6-8 m</td>
</tr>
<tr>
<td>5</td>
<td>Pummelo</td>
<td>6-8 m</td>
</tr>
<tr>
<td>6</td>
<td>Grape Fruit</td>
<td>6-8 m</td>
</tr>
</tbody>
</table>

Source:-www.mahaagri.gov.com

Manure and fertilizer

In generally citrus growers apply large quantities of farmyard manure and organic cakes (Castor, Neem, Pongamia etc) to improve soil structure and to create favorable conditions for healthy grown. Further to meet the high demands for nutrients and to maintain plant productivity. Organic manures are supplemented with chemical fertilizers. The fertilizers schedule recommended for sweet range. (Table No.4.2)
Table No.4.2

Fertilizer Distribution for Sweet Orange

<table>
<thead>
<tr>
<th>Age of Plant</th>
<th>Sathgudi</th>
<th></th>
<th>Acid Lime</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>P₂O₅ gms</td>
<td>K₂O</td>
<td>N</td>
</tr>
<tr>
<td>1 Year</td>
<td>300</td>
<td>70</td>
<td>80</td>
<td>375</td>
</tr>
<tr>
<td>2 Year</td>
<td>600</td>
<td>140</td>
<td>160</td>
<td>750</td>
</tr>
<tr>
<td>3 Year</td>
<td>900</td>
<td>210</td>
<td>240</td>
<td>1125</td>
</tr>
<tr>
<td>4th Year</td>
<td>1200</td>
<td>280</td>
<td>320</td>
<td>1500</td>
</tr>
<tr>
<td>5th Year &amp; above</td>
<td>1500</td>
<td>350</td>
<td>400</td>
<td>1500</td>
</tr>
</tbody>
</table>


Fertilizers should be applied in a circular band at a radial distance of 120 cm from the trunk of the plant is the most beneficial. Deep placement of fertilizers should be avoided. In fact the maximum root activity in sweet orange plantation was found with in a depth of 25 cm while in acid lime they are more surface oriented, 80 to 955 being located in the top 10 cm.
Table No.4.3

Fertilizer Calcification in Citrus

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Fertilizer Name</th>
<th>G/Kg/lit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Zinc Sulphate</td>
<td>500g</td>
</tr>
<tr>
<td>2</td>
<td>Copper Sulphate</td>
<td>280g</td>
</tr>
<tr>
<td>3</td>
<td>Magnesium Sulphate</td>
<td>200g</td>
</tr>
<tr>
<td>4</td>
<td>Ferrous Sulphate</td>
<td>200g</td>
</tr>
<tr>
<td>5</td>
<td>Borax</td>
<td>100g</td>
</tr>
<tr>
<td>6</td>
<td>Manganese Sulphate (Amorphous)</td>
<td>200g</td>
</tr>
<tr>
<td>7</td>
<td>Lime</td>
<td>900g</td>
</tr>
<tr>
<td>8</td>
<td>Urea</td>
<td>1000g</td>
</tr>
<tr>
<td>9</td>
<td>Water</td>
<td>100 lit.</td>
</tr>
</tbody>
</table>

Source: Kharpudi Krushi Vidnyan Kendra. (2012)

As such, fertilizers are worked in shallow into the surface soil. A composite nutrient spray prepared and sprayed twice or thrice at 20 to 25 Days interval commencing from the appearance of new flush will correct deficiencies and increases the yield and quality of fruits. It is prepared as follows. (Table No.4.3)

Training and pruning

In order to allow the growth of a strong trunk, all shoots in the first 40 to 50 cm from ground level developed in the early stage should be removed. The centre of the plant should remain open. Branches should be well distributed to all sides. Cross twigs and water suckers are to be removed early. The bearing trees require little
or no pruning. All diseased, injured and dropping branches and dead wood are to be removed periodically for initiating citrus greening.

**Planning Season**

June-September.

**Propagation Method**

Budded plants (Root stock: Rangpar lime is best, how rough lemon is also preferred) Plants to be free from virus and to be sourced from a certified nursery.

**Main field Preparation**

Dig pits at 75 cm × 75 cm ×75 cm in size, fill up the pits with top soil and 10 kg of gym. Plant the budded plants in the centre of the pits and stake it.

**Spacing**

7 m × 7m, 6 m× 6m

**Nutrient Management**

Nitrogen to be applied in two doses during March and October. Fym, p 205 and k 20 are to be applied in October. Manures are applied in the basin 70 cm away from the trunk and in containing-Zinc Salphate (0.5percent), Manganese (0.05 percent), Iron (0.25 percent), and Magnesium (0.5percent). Born (0.1 percent) Molybdenum (0.003 percent). Once in 3 months at the time of new flush production. (Table No.4.4)
Table No. 4.4

Nutrient Management for Sweet Orange Fruit Crop

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Age of the tree</th>
<th>1st Year</th>
<th>Annual increase</th>
<th>6 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fym (kg)</td>
<td>10</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>2.</td>
<td>N (g)</td>
<td>0.2</td>
<td>0.1</td>
<td>0.6</td>
</tr>
<tr>
<td>3.</td>
<td>P₂O₅ (g)</td>
<td>0.1</td>
<td>0.02</td>
<td>0.2</td>
</tr>
<tr>
<td>4.</td>
<td>K₂O (g)</td>
<td>0.1</td>
<td>0.04</td>
<td>0.3</td>
</tr>
<tr>
<td>5</td>
<td>Bio- Fertilizers</td>
<td>50</td>
<td>0</td>
<td>50</td>
</tr>
</tbody>
</table>

Source:- www.mahaagri.gov.com

In addition to that, apply 50 g in each of zinc sulphate, manganese and iron per tree per year.

Citrus special

Citrus special is a micronutrient formulation developed by IIHR Bangalore. 75 gram citrus special, 3ml soap or 1 sachet shampoo to be mixed in 15 Liter water and to be sprayed at an interval of 30 days to get higher yield and better quality fruits. No other micronutrient sprays required if we are using. Citrus special for foliar spray.

Germination and the way of growth

To plan sweet orange there is various methods such as sowing seeds or a piece cut from one living plant and fixed to another plant so that it grows there, it called eye graft method. Graft method is a very essential for growing seeds. While using graft method we have to choose a good quality of stick for good quality fruit and to regulate on ripeness. When we create plant in that method that plant doesn’t have
throne. The plant look like very small, attractive, strong and having branches, it gives fruit very early. In that method plant take all qualities from its mother plant it increase its saline in to shortage-affected condition as well as the quality of that fruits lives same in whole hangman. Neither farmer now a day choose the growth method for planting sweet orange nor someone refer to do it, because in that in that method plants have too much small throne and it is not like Asexual method, and these types of method gives fruit too late. It has not resistance power against certain diseases as well as it can’t live in unfavorable condition. Due to that reason and for trade farmer should go through asexual methods for sweet orange.

**To do a nursery for doing graft**

To do a good and quilted plant we need soil like fertile, fecund, water shady and light weighted. We need soil like less cultivated but soft and fertile. We should not use again and again a particular soil for nursery, as if we use than it should be kept barren for some days and use after insecticide. While making nursery of sweet orange we should place it very far from other types of citrus because it will harm to the sweet orange plants. Approximately in two years the plant will be ready for plantation in the farm.

**To make plant-bed for graft**

While making plant-bed, we have to follow some infrastructure like that plant-bed (Gadiwafa) should be 0.6 to 0.9m width and 10m long. And for making water drainage put 5cm to 10cm layer of sands. The height of plant-bed should be 15 to 20cm. If there are a number of plant-bed than keep a way for reach there. Before sowing seeds should
follow some rule such as place on the soil some dung, muck, shit sullage and some rubbish for 10 to 20 days, it will help to remove germ, so spray 1 percent thorium-captain or Bordo-mixture on the soil same proportion we should give in the plant-bed before 10 days.

**Germination**

Whenever we want sow any crops at times or before that sowing germination is very important because of good quality of crops, and prevent propagation. When we choose some plant for germination then first of all we have to remove ripe fruits from that plant and cut it and make separation of seeds, and hide into ash for 6 to 7 days. After 7 or 8 days use that seed for sowing, if we sow seed late it will be harmful for farther impact and it can’t grow well. So that we should sow it as early as possible. We should wash that ash from seeds and add ‘Thorium, capton or Baavistin’. We should add any one of them for to prevent that fungi and keep that seeds in the measure like 3grm for 10 kg seeds with the help of that method we can remove fungi from seeds. For increasing power of growing seeds add liquid of ‘I.A.A., 100ppm for a day, use that seeds for sowing.

**The method of eye binding for sweet orange**

**Eye graft**

To plant sweet-orange we find out eye graft method. We call it ‘Graft’ or ‘Buding’ in to English language. It has some sub-kinds such as ‘Ring- buding , Patch-buding etc. in that method on the trunk farmer plant good quality plants it means eye of plants. It is called ‘Sion’. If we bound same ages good eye graft with good trunk than that plant will be good quilted. The trunk of ‘Jamberi or Rangpur lime’ has been
mostly used for filling up of sweet orange’s eye. For making sweet orange plant trunk is an important factor. For planting sweet-orange farmer always chose eye graft method. In the method of ‘T’ on the main stick give shape of ‘T’ and remove skin and place there an eye of sweet-orange, an eye should be open and make a cover of ‘Polithinpatti’. If the eye keeps open on that stick, then that eye will be dry or useless. While attaching that eye on the stick farmer keeps it on their tongue to make it wet and after they make it use for graft. After bound eye keep it 3 weeks and if the eye of sweet orange will green, or if the stalk of that eye remove than consider that eye is good with trunk or it is mingled with that stalk. Keep 10 to 15cm part on that eye and cut other part because when the sprout come out from main stalk it will be good. From the bound of eye means that eye grows in one year 75 to 90cm and the width of trunk should be in a year as 1.25cm. When we make out a graft from nursery to plant that plant should be 2 to 2.50 feet, if the plant ready to plant in other place pluck it from its roots and its roots should have some soil and bind in the sackcloth for traveling one place to other.

**Taking care of graft stick while choosing**

The quality of graft stick comes to the next graft or next plant so while choosing graft-stick it is very important. The importance of graft-stick or eye-stick looks at the follows.

1) Graft stick should have pure quilted or pure blooded.
2) The age of mother tree should have not less or more.
3) We should take care of choosing the mother tree such as it should give always good quilted fruits.
4) Graft stick must have in succulent stage.
5) Place eyes of eye-stick or sprout.
6) The mother-tree should not have any kinds of diseases, or physical damage.
7) On the eye-stick should have 3 to 5 bulgy eyes.
8) To take precaution while cutting eye-stick.
9) Eye-stick should have bracing, lusty.

**Sweet orange root nematode**

Apply pseudomonas fluorescents at 20 g per tree at a depth of 15 cm and 50 cm away from the trunk for the management of slow decline due to the citrus root nematode. Soil application of phorate and 2g followed by drenching with metalaxyl plus mancozeb 72 wp and 0.1 Percent 50 ml/poly bag/kg of nursery soil for citrus decline.

**Status of Horticulture in Maharashtra**

Maharashtra produces about 17.54 MT of horticultural produce from an area of 2.49 (hector) accounting for 7.30 percent of horticulture production in the country. Major share of production is from fruits (54.24), the main fruits being Banana, Citrus group, and Grapes other fruits grown are Mango, Pomegranate and Guava. The vegetable produces forms about 42.78 percent of the horticulture production in the state. The state produces 0.26 m MT of Lime/Lemon from an area of 0.04 m.ha. With productivity of 6.0 MT/ha. The major lime/lemon producing belts in the state area Pune, Wardha, Satara, Solapur, Akola, Nagpur, Beed, and Aurangabad. Maharashtra is the largest producer of sweet orange in the country and contributes to about 49 percent of the total production of sweet orange in the country. The state produces 0.65 MT of sweet orange from an area of 0.11 m.ha. With productivity of
6.1 MT/ha. Major Sweet orange producing belts in the state area Ahemadnager, Aurangabad, Jalgaon, Amrawati, Jalna and Pune.

The state is producing about 15 percent of the total production of mandarin orange in the country. The state produces 0.50 m/MT of mandarin orange from an area of 0.13 m./ha with productivity of 3.9 MT/ha. The major orange producing belts are in the Vidarbha region of the state covering the districts of Nagpur, Akola, Amarawati and Wardha. The main variety grown is Nagpur mandarin. The National

**Table No.4.5**

**Sweet orange Production in Jalna District**

*Production in Tans*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
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<td>4000</td>
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<td>Jafrabad</td>
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<td>3124</td>
<td>6102</td>
<td>4000</td>
<td>3600</td>
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<td>50100</td>
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<td>59940</td>
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<td>8</td>
<td>Mantha</td>
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<td>4456</td>
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<td>405756</td>
<td>345153</td>
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</table>

Figure No.4.1
Sweet orange Production in Jalna District
(Production in Tans)

Source: Compiled by Researcher
Table No.4.6

Horticulture Crops Production in Jalna District

(Production in Tans)

<table>
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<tr>
<th></th>
<th></th>
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<td>42000</td>
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<td>3750</td>
<td>2376</td>
<td>1704</td>
<td>1521</td>
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<td>Orange</td>
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<td>210</td>
<td>280</td>
<td>480</td>
<td>950</td>
<td>0</td>
<td>315</td>
<td>240</td>
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<td>174000</td>
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<td>3350</td>
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<td>7000</td>
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<td>other fruits</td>
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<td>157</td>
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<td>150</td>
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<td>350</td>
<td>8615</td>
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<td>359255.96</td>
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Source:- Department of Agriculture, Pune.
Research Center of citrus, located at Nagpur has been providing technological back up. Phytophotohora is a serious concern for improvement in productivity and citrus decline 4.25 lakh M.T of citrus have been traded in organized markets with average price of Rs. 11.89 /kg. India has the unique distinction to grow almost all the varieties of fruit. India is the second largest producer of fruit in the world 9 percent after china. India is the second largest producer of fruits and vegetables in the world with 74.87 million metric tons production of fruits and 146.55 million metric tons production of vegetables for the year. 2010-2011 within India Tamilnadu is the largest producer of fruits accounting for 13.30 percent of India’s total fruits production followed
by Andhra Pradesh 12.6 Percent Maharashtra 12.2 Percent Gujrat 9.7 and Karnataka 8.4. Major fruits cultivated in India are banana 39.9 Percent mango-20.3, citrus 10 Percent citrus is the third most important tropical fruit crop

**Chi- Square Test (X²) Test**

(0.05 Level Testing)

O - Observed Frequency

E - Expected Frequency

Colum and Row

One – Way $X^2$ Test :-

**Formula:-**

$$(O-E)^2$$

$$X^2 = \Sigma$$

Degree of Freedom

$$CL = 1, \text{C}L = \text{Class}$$

Two – Way $X^2$ Test :-

**Formula:-**

$$(O-E)^2$$

$$X^2 = \Sigma$$

$$E$$

Degree of Freedom: (C -1), (R - 1) C= Colum, R = Row

Degree Freedom = (C -1) $\times$ (R -1)

$$(3-1) \times (3-1)$$
### Table No. 4.7

**Soil Types in Horticulture Fruits**

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Soil Types</th>
<th>Fruits</th>
<th>Sweet orange</th>
<th>Mango</th>
<th>Other Fruits</th>
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<tr>
<td>1</td>
<td>Black Soil</td>
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<td>01</td>
<td>03</td>
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<td>2</td>
<td>Medium Soil</td>
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<td>84</td>
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<td>17</td>
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<tr>
<td>3</td>
<td>Shallow Soil</td>
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<td>26</td>
<td>25</td>
<td>30</td>
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</table>

**Source**: Compiled by Researcher

### Table No. 4.8

**Soil Types and Major Fruits**

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<tr>
<th>Sr.No.</th>
<th>Soil Type</th>
<th>Fruits</th>
<th>Sweet orange</th>
<th>Mango</th>
<th>Other fruits</th>
<th>Total</th>
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</thead>
<tbody>
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<td>1</td>
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<td>38×145</td>
<td>206</td>
<td>26.75</td>
<td>110</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>38×36</td>
<td>206</td>
<td>6.64</td>
<td>110</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>38×25</td>
<td>206</td>
<td>4.61</td>
<td>110</td>
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<tr>
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<td>1</td>
<td>2</td>
<td>38</td>
</tr>
<tr>
<td></td>
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<td>10</td>
<td>16</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>CV&gt;TV</td>
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<td>206</td>
<td>77.43</td>
<td>110</td>
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<td></td>
<td>110×36</td>
<td>206</td>
<td>19.22</td>
<td>110</td>
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<td></td>
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<td></td>
<td>110×25</td>
<td>206</td>
<td>13.35</td>
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<td>Medium Soil</td>
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<td></td>
<td>110</td>
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<td>110×145</td>
<td>206</td>
<td>77.43</td>
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<tr>
<td>3</td>
<td>Shallow Soil</td>
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<td>36</td>
<td>25</td>
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**Source**: Compiled by Researcher
Table No.4.9

Horticulture Fruits

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<th>Sr. No</th>
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<th>E</th>
<th>O-E</th>
<th>(O-E)^2</th>
<th>(O-E)^2/E</th>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>41.48</td>
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</tbody>
</table>

Source:- Compiled by Researcher

**Ha (Alternative)**

There is strong association between the types of soil and horticultural fruits crops. Crop value is more than table value means $H_0$ is rejected and $H_a$ is accepted.

Tahsils wise sweet orange tree height and length in Jalna district
### Table No 4.10

**Medium Soil and Sweet orange Trees Height**

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<tr>
<td>2</td>
<td>Bhokardan</td>
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<td>Jafrabad</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Partur</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Ambad</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Badnapur</td>
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<td>Ghansawangi</td>
<td>13</td>
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<td>8</td>
<td>Mantha</td>
<td>10</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>$\Sigma x = 94$</th>
<th>$\Sigma y = 46.5$</th>
<th>$\Sigma xy = 553$</th>
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</thead>
<tbody>
<tr>
<td>$\Sigma x^2$</td>
<td>1120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Compiled by Researcher.
Rejection level = 0.05

\[ \text{cov}_{xy} = \frac{\sum xy}{n} - \bar{x} \bar{y} \]

\[ = \frac{553}{8} - (11.75 \times 5.81) \]

\[ = 69.13 - 68.27 \]

\[ = 0.86 \]

\[ x = 11.75 \]

\[ y = 5.81 \]

\[ \text{Cov}_{xy} = 0.86 \]

\[ r = 0.93 \]

Explained variation = 86.49

Unexplained variation = 13.51

Cal val – t = 6.1

Table value – Df = 2.447

**Irrigation**

Water is the most fundamental physical factor which plays a vital role in the increase and sustaining of the plants, besides a certain duration and quantity of sunlight of temperature and a minimum soil mineral nutrient. It is experimental that the plenty of temperature and the availability of soil humidity and nutrients in it hold the key role in the development of plants or the agricultural productivity.
may be given once in 10 days. Avoid water stagnation near the plant. Sweet orange require more water because sap circulation never entirely ceases and transpiration takes place throughout the year.

Water deficiency moisture stress at critical periods such as fruit development check the growth reduces fruits size and quality thus moisture stress during the period of growth, flowering and fruit development should always be avoided. The frequency of irrigation is influences by soil, climate, variety and age of plants. In northern India and western Maharashtra, water is applied at every 6-8 days interval from March to June and at every 10-12 days interval during November-February. Sweet orange being susceptible to water in the orchard and around the tree trunk should be avoided. In young plants up to the age of 8 years, the irrigation should be given through basis system of system of irrigation may be adopted avoiding water content with tree trunks. In western Maharashtra, drip irrigation system of gaining popularity ring system of irrigation is adopted for this, double ring system or bed irrigation is best in reducing the water contact with the tree trunk, thus avoiding fungal infection. A grown- up sweet orange tree need about 25-20 irrigation in a year, amounting about 1,325 mm of water. Its plants have the highest demand of water during fruit development. It is advisable to irrigate the orchard after the fruits have attained pea size.

**Definition of Irrigation**

Plants are living beings and do require water and air for their survival, as do human beings require. Their Requirement of water varies with their types. Different types of plants require different
quantities of water, and at different times, till they grow up completely. Water is normally supplied to these plants by nature through direct rain or through the flood waters of rivers which inundate large areas during floods. The flood water may saturate the land before the flood is subsided. The water absorbed by the land during floods, supplements the water requirement of the crop during dry season. These natural processes, whereby, the water is supplied to the crops for their growth, are dependent upon ‘Nature’ or ‘God’ whatever we may call it. Sometimes, there may be very heavy rains creating serious floods and damaging the crops, and sometimes, there may not be any rains at all, creating scarcity of water for the crops.

Thus famine and scarcity conditions are created. In his bid to control the nature, man discovered various methods by which the water can be stored during the periods of excess rainfall, and to use that extra water during the periods of ‘no rainfall’ or ‘less rainfall’. The art or the science by which it is accomplished, is generally, termed, as irrigation. Irrigation may, therefore, be defined as the science of artificial application of water to the land, in accordance with the ‘crop requirements’ throughout the ‘crop period’ for full-fledged nourishment of the crops. (Garg S.K. 1995).

**Necessity of Irrigation**

India is a tropical country with a vast diversity of climate, topography and vegetation. Rainfall varies considerably in its place of occurrence, as well as in its amount. Crops cannot, therefore, be raised successfully, over the entire land, without ensuring artificial irrigation of fields. More than seventy percent of our population directly depends
on a agriculture, and the remaining depends indirectly on agriculture. Out of a total geographical area of about 328 million hectares about 180 million hectares is the cultivable area. In order to save this area from the complete wishes of nature, and to ensure full growth of crops, it is necessary that adequate artificial irrigation facilities are ensured. In order to achieve this, the Indian government is trying hard and spending enormously to provide irrigation facilities for the entire cultivable land. The so far developed irrigation facilities in India have been shown under ‘Introduction’ in the previous pages.

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Tahsils</th>
<th>Project</th>
<th>Present Irrigation. in Hectare</th>
<th>Projected Irrigation In Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bhokardan</td>
<td>Jui</td>
<td>197</td>
<td>2163</td>
</tr>
<tr>
<td>2</td>
<td>Badnapur</td>
<td>U. Dudhana</td>
<td>710</td>
<td>3401</td>
</tr>
<tr>
<td>3</td>
<td>Ambad</td>
<td>Galhati</td>
<td>534</td>
<td>2200</td>
</tr>
<tr>
<td>4</td>
<td>Jafrabad</td>
<td>Jivrekha</td>
<td>143</td>
<td>1064</td>
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<td>5</td>
<td>Jalna</td>
<td>Girija</td>
<td>353</td>
<td>1360</td>
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<td>6</td>
<td>Bhokardan</td>
<td>Dhamna</td>
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<td>1376</td>
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<tr>
<td>7</td>
<td>Jalna</td>
<td>Kalyan</td>
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<td>1920</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>2341</td>
<td>13484</td>
</tr>
</tbody>
</table>

**Source:** Socio-Economic Abstract, Jalna District(2005).

However an area of 51710 hectare in Jalna district is being irrigated by Jaykwadi project which is one of the major irrigation project situated in Paithan tahsil, Aurangabad district. There are seven medium irrigation project and forty six minor irrigation project in Jalna district. Here is shortage of water during summer season. Ghansawangi tahsil has maximum irrigated area whereas Mantha tahsil with the
lowest irrigated area. The following medium irrigation project exists in Jalna district. Girija and Kalyan both are the minor project in Jalna tahsil total irrigates 597 hectar areas. While 197 hectar area irrigated by Jui and 160 hectar area irrigated by Dhamana project in Bhokardan tahsil.

**Fig.No.4.3**

Medium and Minor Irrigation Project in Jalna District.

**Source:** Irrigation Department Jalna.(2010)
The Upper Dudhana is a minor project in Badnapur tahsil it irrigates 710 hectare area. Galhati project irrigates 534 hectare area in Ambad tahsil and Jivrekhra irrigation project covers 143 hectare area in Jafrabad tahsil.

**Advantages of Irrigation**

Every irrigation project is calculated, keeping in view of its economics, the disbursement likely to be incurred and the benefit likely to occur. There is a capital investment on the project and the future conservation charges. The project estimate is generally sanctioned when the benefit gives at least about 6 Percent interest on the capital outlay. Sometimes, unproductive projects are also sanctioned in view of their general public benefits. (Garg S.K. 1995). There is hardly any point in emphasizing the importance and advantages of irrigation during the times of acute food shortages and growing population of our country. Even then, some of the advantages of irrigation are summarized below.

1. Irrigation helps to increasing crop yields, and hence, to attain self-sufficiency in food.
2. Optimum, utilization of water is made possible by irrigation. By optimum utilization, we generally mean, obtaining maximum crop yield with any amount of water. In other words, yield will be smaller for any quantity lesser than or in excess of optimum quantity.
3. Revenue returns are sometimes, quite high and help in around development of the country and prosperity of the entire nation and community.
Drip Irrigation

Drip irrigation leads to effective, efficient and economic use of irrigation water and is recommended specially in low rainfall regions of Maharashtra, Madhya Pradesh and Rajasthan which are some of the major producing areas. The compensations of using this technology are.

Advantages of drip irrigation

2. Continuous cultural operations are possible.
3. High efficiency in water application and use.
4. High fertilizer use efficiency.
5. Improvement in plant growth, yield and quality.
6. Irrigation is controlled as per requirement of evapotranspiration needs.
7. Land leveling work is minimized.
10. Water is applied directly to the root region of the crop.
11. Weed infestation is reduced.

Domestic Water Supply

Irrigation helps in augmenting the town water supply, where water is available with a great difficulty. It also provides water for swimming, bathing, cattle drinking, etc.
Types of irrigation

Irrigation may broadly be classified into

1. Surface irrigation: and
2. Sub-surface irrigation

Surface irrigation can be further classified into:

a) Flow irrigation: and
b) Lift irrigation

When the water is available at a higher level and it is supplied to lower level, by the mere action of gravity, then it is called Flow Irrigation. But, if the water is lifted up by some mechanical or manual means, such as pumps, etc. and then supplied for irrigation, then it is called lift irrigation.

Flow irrigation can be further sub-divided into

i) Perennial Irrigation
ii) Flood Irrigation

Perennial Irrigation

In perennial system of irrigation, constant and continuous water supply is ensured to the crops in accordance with the crop requirements, throughout the ‘crop period’. In this system of irrigation, water is supplied through storage canal head works and canal distribution system. When the water is directed into the canal by constructing a weir or a barrage across the river, it is called, Direct Irrigation. Ganga Canal System is an example of this type of irrigation. But, if a dam is constructed across a river to store water during
monsoons, so as to supply water in the off-taking channels during period of low flow, then it is termed as Storage Irrigation. Ram-Ganga Dam Project in U.P. is an example of this type of irrigation system. This perennial system of irrigation is most important and is mostly practiced in India.

**Flood Irrigation**

In this method of irrigation, soil is kept submerged and thoroughly flooded with water, so as to cause through saturation of the land. The moisture soaked by the soil, when occasionally supplemented by natural rainfall or minor watering’s, brings the crop of maturity.

**Sub-surface Irrigation**

It is termed as sub-surface irrigation, because in this type of irrigation, water does not wet the soil surface. The underground water nourishes the plant roots by capillarity. It may be divided into the following two types.

a) Natural sub-irrigation

b) Artificial sub-irrigation

**Natural sub-irrigation**

Leakage water from channels etc., goes underground, and during passage through the sub-soil. It may irrigate crops, sown on lower lands, by capillarity. Sometimes, leakage causes the water table to rise up, which helps in irrigation of crops by capillarity. When underground irrigation is achieved simply by natural processes, without any additional extra efforts, it is called natural sub-irrigation.
**Artificial sub-irrigation**

When a system of open jointed drains is artificially laid below the soil, so as to supply water to the crops by capillarity, then it is known as artificial sub-irrigation. It is a very costly process and hence, not adopted in India. It may be recommended only in some special cases with favorable soil conditions and for cash crops of very high return. Sometimes, irrigation water may be intentionally collected in some ditches near the fields the percolation water may then come up to the roots through capillarity.

**Disadvantages of Irrigation**

1) Irrigation may contribute in various ways to the problem of pollution. One of these is the seepage into the ground water of the nitrates that has been applied to the soil as fertilizer. Sometimes, up to 50 Percent of nitrates applied to the soil, sinks into the underground reservoir. The underground water may thus get polluted, and if consumed by people through wells, etc. it is likely to cause diseases such as anemia. Will it ultimately affect the fishing, as the tides carry the polluted water out into the ocean, is still a matter of research.

2) Irrigation may result in colder and damper climate, causing outbreak of diseases like malaria.

3) Over-irrigation may lead to water-logging and may reduce crop yields.

4) Irrigation is complex and expensive in itself. Sometimes, cheaper water is to be provided at the cost of the government and revenue returns are low.
Post-Harvest Practices

To get attractive and uniform yellow colour, fruits to be dipped 1000 PPM (1g/ltr) ether solution. For improving the shelf life fruits have to be dipped in 2-0 Percent calcium chloride solution for 15 minutes (with can keep fruits for 30-35 days without deterioration in quality).

Propagation

Seeds exhibit 45-90 Percent polyembryony. The seedlings are comparatively more free from and other virus diseases which are not transmitted through seed. Yet the yields are not good compared to budded plants on account of the beneficial responses of the root stock viz., earliness, high yield and adaptability to the environment and soil, good quality, resistance to diseases and pests.

Rootstocks

The stock and scion must be compatible and should be capable of producing long lived, productive. The influence of the most important and widely used root stocks and their characteristics should be known to the grower for choosing the right kind of stock for the locality. The most commonly used stocks for sweet orange as well as mandarins in Indian are Jamberi.

The following rootstocks have been tried to study their influence.

1. Rangpur lime

   It is used as stock for Mosambi in Bombay region. It is a vigorous grower, resistant to many of the virus diseases chiefly Tristeza virus. It gives high yields with fruits of much better and hence recommended as stock for sweet orange.
2. **Sathgudi seedling**

   Suitable for moderately heavy soils. It gives smooth joint. The trees are long lived being tolerant to decline. Yields are moderate. Fruits are of fine quality and good keeping quality.

3. **Jamberi**

   With more number of seeds, high percentage of germination and polyembryony is a vigorous stock for Sathgudi. The tree top is oval. Fruits are large, rind is rough and thick and juice is insipid. Morality is very high mortality and hence disordered.

4. **Gajanimma**

   It has all the good nursery characters of Jamberi and has a prolific but is susceptible to gummosis and collar rot resulting in high mortality and hence disordered.

5. **Trifoliate Orange**

   It is the hardiest root stock and does well in forestry areas. Resistant to many virus diseases. The plant gets dwarfed on this root stock and is frost resistant.

6. **Wood apple**

   Dwarf Sathgudi very much. Reduces preparing period, longevity and yield but increases the sweetness of fruit.

7. **Sweet lime**

   It is a satisfactory stock for Nagpur Santhra with better quality and tighter skin.

**Raising of stock seedlings**

   Seeds freshly extracted from mature fruits picked from healthy, vigorous and good yielding trees are shown on raised beds during July-August. The slimy substance on the seeds is removed by mixing them
with wood ash and drying them under shade. The seeds take 20-30 days to germinate and in another month, a pair of leaves emerge. After 3 or 4 months the plants reach 60 cm in height. The seedlings are transplanted late the nursery beds under shade and spaced 20 cm apart and the seedlings will be ready in a year.

**Selecting but wood**

Buds should be collected from a tree or trees of the desired variety. Bud sticks are commonly selected from the next to last growth flush and from the current growth flush after it has matured and hardened. Older growth flushes can be used if the bark still is green. Round twigs about the size of a pencil are preferred. The buds located in the axils of the leaves should be well developed, but still dormant. After the but wood is cut from the tree, the undesirable wood and growth flush should be removed and the remaining but wood should be trimmed to lengths of 20-25 cm. The leaves should be cut off leaving a stub of the petiole 3-4 mm long to protect the buds. Trimmed but sticks should be labeled and used immediately or placed in plastic bags in a cool place. Include a moist paper towel to maintain turgidity and freshness. The label should include the variety, date of collection and source. Bud sticks are usually tied in bundles for ease of handling.

**Budding**

The seedlings are ready for budding in about a year budding along with a chip of wood gives good results. In mandarin the removal of wood seems to decrease the percentage of success. Generally it has done winter in July or in September in South India and October and December in North India. T-Budding or Shield budding is easy to perform. The root stock is generally budded at a height of about 9”.

180
1. Sweet orange

It is propagated by Shield or T-budding. The root stocks mainly used are Jamberi and Rangapur lime. Andhra Pradesh mainly Rangapur lime is used as a rootstock.

2. Acid lime

It is commonly propagated by seed all over the country because the seeds exhibit a high percentage of polyembryony. The nucellar seedlings are identical with the parent in growth and production. These seedlings are hardy compared to the budded plants. The seedlings take a little longer time than budded plants to start bearing but soon over take them in yield. If budded, gajanimma is a prolific stock but there is scope for the spread and transmission of diseases and the buddings are short-lived.

3. Mandarins

Mandarins are largely propagated by seed all over the country except Nagpur Santhra which is the only budded variety grown one commercial scale around Nagapur in Maharashtra producing the finest mandarins of the world.

Intercultural

Before maturing, the basins are dug and the weeds are removed. The tree basins should be kept free of weeds. Superficial cultivation of citrus orchards is practiced to keep them free of weeds. Deep cultivation should be avoided. Root stock sprouts water suckers and dead wood have to be periodically removed and cut ends are pasted with Bordeaux paste. Occasionally the water suckers are to be observed and they should be removed.
**Intercrops**

Crops like soybean, gram, groundnut, cow peas, French bean, peas etc., may be grown in citrus orchards. Intercropping is advisable during the initial three- four years after planting. Mostly this method is applied by the farmers in the study region, Soybeans, cotton;this crop is taken by the farmers.

4. **Bahar Treatment**

If left to nature the trees may bloom and fruit irregularly throughout the years. In order to overcome this problem and to force a full crop in any of the three seasons, as required by the grower and the traders, bahar treatment is practiced in citrus orchards. In Maharashtra, the citrus trees generally bloom three times a year, i.e., in January-February (Ambe-bahar), June (Mrig-bahar) October (Hastha-bahar). Trees are treated for Ambe-bahar (January-February), in November or December. In this method, from November onwards the amount of water is gradually reduced in successive irrigations and completely stopped in December. About the middle of December, the land is ploughed. When the trees start showing wilting symptoms (3-4) weeks, the soil around the tree to a distance of 120 cm is dug a depth of 10 cm and the recommended manure is added to the soil and the trees are irrigated. The first irrigation that follows is sparing while the subsequent ones are more plentiful. Flowers appear about a month after the first irrigation. Maharashtra, the roots are also exposed for about 10 days as part of bahar treatment. This method is occasionally practiced in a few places in Andhra Pradesh consequently, plant gives new vegetative growth, produce flowering and fruiting. However, this
treatment is considered to be harmful in the long run and not encouraged as a routine practice.

- **Cropping**

  Budded Sweet orange trees give a commercial crop in about 5 years. Mandarins may take one or two years more. Seedling trees take about 8 years to come to bearing. The life of budded tree is about 35 years and of seedling about 60 years.

- **Fruit Drop**

  Fruits drop in citrus occurs more or less in three distinct stages viz. post setting drop, pea size drop and pre-harvest drop. Among which the last one is most important and causes huge loss to the farmers. Based on the causal factors, the fruit drop can be classified broadly as

  1. **Physiological Drop** - Although the initial fruits drop period in citrus is primarily from physiological reasons the term is strongly associated to October fruit drop and describes the abscission of they approach 0.5-2.0 cm in diameter. This is mainly due to competition among fruits for carbohydrates, water, hormone and other metabolites. The problem is highly aggravated by water stress and humidity.

  2. **Entomological Fruit Drop** - Citrus bud mite and sweet orange bug are some important pests which causes heavy drop of flower and fruits in sweet oranges. Besides fruit fly and fruit sucking moth are mainly causing fruit drop in the later crucial stage of fruit ripening. Pre-harvest fruit drop is mainly caused by fruit fly infestation. Its activity is first noticed during last week of October which continues till the final harvest.
3. **Pathological Fruit Drop**-fruits drop also occurs due to pathogenic fungi viz. Botry odiploidia the obromaem, Collet otrichumgle osporoides and alternariacitri which mainly occur predominantly on the mature fruits near ripening. High inoculums of these fungi in the orchards builds up due to dead twigs on the bearing trees. Water spot also causes fruit drop in which the rind absorbs of large amounts of water in localized areas during period of prolonged rains or dampness.

- **Control of Fruit Drop**
  1. Maintain balance nutrients in the plants to develop sufficient foliage to support the developing fruits.
  2. Prune the plants after harvesting to minimize pest and disease incidence.
  3. Proper drainage should be made to avoid water stagnation.
  4. Irrigation should be applied at critical stages viz., flowering, fruits set and fruits development.
  5. Dropped fruits should not be left as they act as carrier for the diseases.
  6. Spray GA3 10 ppm+urea 1 Percent at the time of flowering.
  7. Spray 2, 4-D 15 ppm- Benomy /carbenedazim 1000 ppm – urea 1Percent one month after fruits set when the fruits size 8-10 mm fruits size.
  8. Spray GA3 10 ppm + potassium nitrate 1Percent two month after fruit set 18-20 mm fruit size.
  9. Spray ZnSo4 (0.4 Percent) + MgSo4 (0.2 Percent) + CuSo4 (0.3 Percent) at fortnight interval will decrease the fruits drop and increase the fruit yield.
Harvesting

Generally, citrus trees start bearing fruits 3-5 years from planting although economic yields start from the fifth year and the trees may take 8 to 10 years to achieve full productivity and can be harvested 5-6 months from flowering depending on the variety and the environment.

Maturity Indices

Unlike some other fruits do not ripen further once they have been removed from the tree, so it is important that they are picked at the right stage of maturity. Maturity is measured depending on different characteristics such as color, juice content, level of soluble solid and solids to acid ratio. Normally, citrus fruits are harvested by hand.

The Cultivation of Inter-crop

Sweet orange is a one of the good kinds or helpful of crop for new farmer, because farmer can take inter-crops plant in the sweet orange farm. But farmer should plant sweet orange according to some measurement like plant sweet orange distance in 6×6m, in the period of three years farmer can take inter crops in the farm of sweet orange. It will increase economical stage farmer, but in the starting period of sweet orange crops farmer should not take higher growing crops because it will effect on main crops. During the period of taking inter-crops farmer should heed towards the soil fertility. So that he should take short period crop such as red-gram, black-gram, green-gram, pea, cowpea, and groundnut or like cod crops, or chilly, tomato, cabbage, potato etc. and for growing that crops farmer should give it water, manure or fertilizer. And taking inter-crops farmer should live 30cm
place from the trunk of sweet-orange. And farmer can take inter-crops during five years.

5. Important Factors while Taking Inter-crops

1) We should not neglect sweet-orange due to inter crops.
2) It should not be higher growing crops.
3) It should be taken only 3 to 4 years. If we take more than 4 years it will be harmful for sweet orange.
4) In the fourth year farmer should take crops like creeper crops.
5) For inter-crops farmer should give it water, manure or fertilizer on particular time.
6) Give water in different time for inter-crop and sweet-orange. Don’t give water on one time for two crops, because if we give more water to inter-crops it is harmful for sweet-orange so that prefer different time for giving water.
7) He ought to know the disease on inter-crops because if the mistake happened it will damage crops of sweet orange, so he should know it very well.

Choosing Inter-crops

If we think about above mention all thing and we thought to take inter-crops, and we know if we get less benefit from inter-crops no problems but the main thing is how we should be taken, what will be the effect on sweet orange plant, and if we decided to take inter-crops than we should go through following points.

1. While choosing inter-crops we have to choose dual-seeds, because the roots of dual-seeds have knots and it absorbs Alkaloid, and soil become pure. So that for dual-seeds farmer should sow crops like
groundnut, black-gram, green-gram, soybean etc. but if we choose single-seed crop it harm soil.

2. When taking inter-crops in to the sweet-orange farm that crops should not effect on sweet-orange plant. On the plant of sweet-orange we found some disease such as larva, or maggot eats leaves of that sweet-orange plant, Cilla, Mawa, Khod-kida, or skin eater maggot, so such type of crops we should not take.

3. For planting inter-crops it should not high grower because of shadow of high height plant can’t give or stop carbon to the sweet-orange plant. The cause of shadow there are more chances of diseases on sweet-orange plant. E.g. sugar-cane, castor, jowar, sweet-corn etc. Such that we should not be taken.

4. Though crops need more nutrients, these types of inter-crops should not be taken. E.g. sugar-cane, cotton sweet-corn these crops want more nutrients, so it will make bad effect on sweet-orange.

5. Should not give more water to the sweet-orange plant, comparatively more diseases are follows on the sweet-orange plant, if we give more water than humidity get increases so that fungal and bacterial thongs get increase. Near the plant’s root or trunk if there is more water than it will kill the plants.

6. Though inter-crops have more than 1 or 2 years production period it should not be plant as an inter-crops. The period of inter-crops more for adult and it sends its root very deep in soil. So it badly affect soil as well as sweet-orange plant, so inter-crops should have time period for 5 to 6 months only.
7. While we choosing inter-crops should pay attention towards the climate and applicable soil. Sometimes we plant some crops as experiment, it should not happen.

8. We should not spend more on chosen inter-crops, it should leave on natural procedure, because if it is loss than should not be affected on farmer

6. **True Inter-crops**

In to the sweet-orange farm we can take inter-crops such like red-gram, black-gram, green-gram, pea, cowpea, groundnut, chilly, tomato, cabbage, potato etc. and other like cod crops we can take as inter crops. If we take dual-seeds in a season it will help to the soil to increase quality, and take that kind of crops according to seasons. Economically farmers get support of choosing good inter-crops, and it will control erosion of soil, in short there are a number of benefits of inter-crops.

- **The Benefits of Inter-crops Cultivation**

1) Duel-seeds inter-crop helps to increasing or making stability of ‘Alkaloid’.

2) Benefits of an empty place.

3) Economically farmer gain support of choosing good inter-crops.

4) Less expenditure on fertilization, and good use of manure.

5) It will control soil erosion.

6) There is no production of sweet-orange in 1 to 4 years, so taking inter-crops helps to farmer.
4.6 The Changes in Sweet orange Seeds and its Growth Seed Formation and Maturity

Seed develops along with the fruit and reaches, full size and maturity when the fruit ripens. Hence seed should be extracted only from ripe fruit. Seeds gathered from immature fruit may not germinate to under favorable conditions and may lose viability more quickly than fully matured seeds.

Seed Storing

Seeds should be normally stored in relatively dry condition at low temperature. Some seeds should be sown immediately after extraction. Citrus other must be kept for sometimes depending upon the kind of plant. Seeds of most plant retain their viability longer when stored at a relatively low then at a high temperature. Hence store the seeds in dry, cool place. If exported to damp atmosphere, even after through drying seeds absorb moisture and rapidly deteriorate. Some seeds like close of apple, stone fruit loose viability if dried after harvest. They require to be kept moist and exposed cold or freezing temperature, known as stratification to after ripen dormant and to modify seed coverings.

Dormancy

It is term used to describe a seed that will not germinate because of any condition associated either with the seed itself or with existing environment factors such as temperature and moisture. Some seeds may even germinate within the fruit.
Best Period

Some seeds will not germinate immediately after harvest even if conditions are favorable. This failure to germinate is due to Physiological condition. This is said to be the seeds are in the rest period or they require rest period after ripening period. Viability means the presence of life in the seed. Longevity refers to the length of time that seeds will retain their viability. Some seeds are short lived. (Citrus).

Pre-germination Seed Treatment

1. Chemical: - The purpose is to modify hard or important or impermeable seed covering generally soaking seed in concentrated sulphuric acid is an effective method. The time of treatment may vary from 10 minutes to 6 hour according to species. After treatment seeds are thoroughly washed in clean water to make them free of acid and then re sown immediately. i.e. the seeds of ber, cotton Asparagus are treated with 50 Percent concentrated H2 so4. The seeds are soaked in acid for 3 to 5 minutes.

2. Mechanical: - Seed of a few species with impermeable seed coat. i.e. hard seed coat can be rendered permeable to water and gases their germination is greatly improved by mechanical scarification in taking care that seeds should be injured heavily. This can be achieved by.
Summary:

In the present chapter shows following crucial findings, Nuceller, Sathgudi, Ambersweet orange such a sweet orange types mostly used by the farmers in the study region. Information regarding plantation system mortally given by the sweet orange research station Badnapur. Medium irrigation project of Jalna district irrigated 2341 hectare area. The highest 710 hectare area irrigated by upper Dudhana project, it is situated in Badnapur tahsil.
References


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