Organic Cultivation of Mango in Tamil Nadu

Model Bankable Scheme for Organic Cultivation of Mango in Tamil Nadu

1. Introduction :

Mango (*Mangifera indica* L.) belonging to Family Anacardiaceae is the most important commercially grown fruit crop of the country. It is called the king of fruits. India has the richest collection of mango cultivars. Cultivation of mango is believed to have originated in South East Asia. Mango is being cultivated in southern Asia for nearly six thousand years.

2. International scenario:

The total global area under mango is 43.69 lakh ha and the global production is to the tune of 312.51 lakh tonne. India ranks first among world's mango producing countries accounting for about 46% of the global area and 40 % of the global production. Other major mango producing countries with their percentage share in the global production include China (11.8%), Thailand (5.8%), Mexico (5.4%), Pakistan (5.1%), Indonesia (4.5%), Brazil (4.3%), Philippines (3.2%), Nigeria (2.6%) and Egypt (1.2%). Worldwide production is mostly concentrated in Asia, accounting for 75% of the global production. The world trade in mango consists of an export of 9.29 lakh tonne valued at 6189.17 lakh US$ and imports to the tune of 7.93 lakh tonne estimated at 7592.35 lakh US$.

Among internationally traded tropical fruits, mango ranks only second to pineapple in quantity and value. Major markets for fresh and dried mangoes are Malaysia, Japan, Singapore, Hong Kong and the Netherlands and canned mangoes are Netherlands, Australia, United Kingdom, Germany, France and USA. Southeast Asian buyers consume mangoes all year round. Their supplies come mainly from India, Pakistan, Indonesia, Thailand, Malaysia, Philippines, Australia and most recently from South Africa. The varieties in demand at the international market include Kent, Tomy Atkin, Alphonso and Kesar. Each exporting country has its own varieties, which differ in shape, colour and flavour. Prices are very low for Indonesian and Thailand fruit and are on the higher side for Indian fruit. In the United States of America, the prices vary with the

season. Higher prices prevail during February and March, when mango availability is lowest. The major chunk of international trade in fresh mangoes takes place within short distances. Mexico, Haiti and Brazil account for the majority of North America's imports.

India and Pakistan are the predominant suppliers to the West Asian market. Southeast Asian countries get most of their supplies from the Philippines and Thailand. European Union buyers source mangoes from South America and Asia. Although Asia accounts for 75 percent of the world production, its dominance does not translate into international trade. Asian producers find it easier to expand sales to the European Union. Europe's acceptance of different varieties is greater, because of a large demand from Asian immigrant groups. Phytosanitary restrictions are less stringent. Transportation costs are not as big a factor in exporting mangoes to the European Union as in exporting to the United States market. India and Pakistan are able to compete with non-Asian suppliers to the European Union, where as proximity gives Mexico and Haiti a clear advantage in supplying it to the United States market.

Fifty-four percent of European Union imports enter during the periods May to July and November to December, with peak imports in June. French imports reach peak in April and May, whereas United Kingdom imports are concentrated during the May to July. German imports are spread more evenly throughout the year. Of the top suppliers, Brazil provides chiefly during the period November to December, the United States during June to October, South Africa during January to April and Venezuela during April to July. Pakistan supplies the majority of its exports to the European Union during June and July; Indian exports take place mainly during the month of May.

3. National scenario :

India's share is around 40% of world production of mangoes i.e. 12.5 million tonne as against world's production of 31 million tonne (2006). The state wise area, production and productivity of mango is given in Table 1.

Table 1. Statewise Area, Production and Productivity of of mango in India

Name of the state	Are(000'ha)	Production(000' t)	Productivity(t /ha)
Andhra Pradesh	399.3	3194.3	8.00
Uttar Pradesh	251.5	2673.3	10.60
Karnataka	124.5	1236.8	9.90
Bihar	140.2	1222.7	8.70
Gujarat	96	772.1	8.00

Maharashtra	444.5	638.6	1.40
Tamil Nadu	125.1	537.8	4.30
West Bengal	70.1	513.3	7.30
Kerala	88	511.1	5.80
Orissa	125.3	428.8	3.40
Others	156.2	809.1	5.20
Total	**2020.7**	**12537.9**	

Source : NHB - 2005-06 Although a lion's share of the Indian mangoes go to the Gulf countries, efforts have been made to exploit European, American and Asian markets. Alphonso variety is exported to Middle East, UK and Netherlands. The different products of mango which are exported include mango chutney, pickles, jam, squash, pulp, juice, nectar and slices. These are being exported to U.K., U.S.A., Kuwait and Russia. Besides these, the fresh mangoes are being exported to Bangladesh, Bahrain, France, Kuwait, Malaysia, Nepal, Singapore and U.K. Varieties such as Alphonso, Dashehari, Kesar, Banganapalli and several other varieties that are currently in demand in the international markets are produced and exported from India.

4. State Scenario:

In Tamil Nadu, Mango is cultivated in about 125104 ha with production of about 537780 t with average productivity of 4.30 t /ha. Major mango growing districts are Dharmapuri, Krishnagiri, Vellore, Dindigul, Thiruvallur and Theni.

5. Organic farming:

Organic farming is a crop production method which encourages sustainable agriculture by enhancing the biological cycles in nature. It is targeted at producing healthy, nutritive, pollution free food maximising the use of on farm resources and minimising the use of off-farm resources. It seeks to avoid the use of chemical nutrients and pesticides. There is no published data available for area under Organic mango. Organic mango is being practiced by individual entrepreneurs and NGOs in isolated pockets of Theni, Kancheepuram, the Nilgiris and Dindigul districts. The guidelines for organic farming is enclosed in

Annexure I

6. Organic production :

6.1 Site Selection

6.1.1 Climate

Mango is a tropical fruit, but can be grown upto 1100 m above MSL. The ideal temperature range for successful mango cultivation is between 24 0 to 27 0 C . It can be grown best in regions with a rainfall of 25 cm and 250 cm. High humidity, rain or frost during flowering is detrimental to mango cultivation. Higher temperature during fruit development and maturity

gives better quality fruits. Regions with bright sunny days and moderate humidity during flowering are ideal for mango growing

6.1.2 Soil

Mango can grow well in all types of soil from alluvial to lateritic, except the black cotton soils, which are considered as poor. The only prerequisite is a deep (2 to 2.5 m) and well drained soil. In Tamil Nadu, red loamy soil with good drainage is preferred soil for mango cultivation. Mango prefers slightly acidic soil. It does not grow well beyond a soil pH of 7.5. Soils with an appreciable amount of gravel or Kankar in the profile too can grow good mangoes provided they are not alkaline. Saline and alkaline soils are not conducive for profitable mango cultivation.

6.1.3 Other factors

Selecting a location isolated from potential sources of pest, disease, or weed is desirable; but is not often possible. Sites that are away from conventional production areas, allows relative isolation to reduce the risk of contamination from adjacent land use. If the area is prone to wind breaks, wind breaks are required to protect the crops from wind effect and damage. Selecting better soils is likely to be helpful and require lesser inputs than poor soils. Loamy soils are likely to require relatively less nutrient inputs and lower water demands than sandy soil types.

Loamy soils can accommodate organic matter, which in turn is responsible for the development of good soil biological activity and humus formation suitable for organic production. Chemical or heavy metal residue in soil must not exceed limits set by organic standards Choosing a small initial block for organic conversion can reduce the commercial risk, as it is unlikely to have significant impact on profit. By starting with a small trial area dedicated to organic methods, growers can gain experience, knowledge and confidence about what works and where problems may occur.

6.2 Land preparation

The land is prepared by usual ploughing, harrowing and levelling. A gentle slope is provided to facilitate proper irrigation and prompt drainage to avoid the harmful effects of water stagnation. After marking of the points for the plants, pits of 90X90X90 cm are dug during summer months. This operation is done by utilizing a planting board so that precise location of the plants in the middle of the pit remains undisturbed. While digging of pits, it is essential to keep the topsoil and subsoil separately in two heaps near each pit for two to four weeks.

This helps in exposing the harmful soil organisms to weathering agencies, providing better aeration to the root zone and in making provision for nutritional requirements for healthy

development of the soil. The pit is filled with 20 kg of FYM, 5 kg of vermicompost and Biofertlizers (Azospirillum and Phosphobacteria). Green manuring is also done with the onset of SW monsoon in July/August with Daincha and Sunhemp. Growing of leguminous green manuring crops helps in Nitrogen fixing besides providing excellent green cover to entire field, which in turn prevents moisture loss.

6.3 Spacing

Spacing varies from 7 m to 10 m either way.

6.4 Planting material

Mango is propagated by inarching and veneer grafting, but of late, epicotyl and softwood grafting replacing these two methods. As regards, selection of root stock, research trails show that polyembroyonic cultivar Vellaikolambam significantly reduces the canopy size by half with out reducing production. Planting material is procured from nurseries, which propagate the planting material either by organic or chemical means. However, it is preferable to procure planting material from organic sources.

6.5 Varieties

The varieties recommended for mango for agro climatic conditions of Tamil Nadu are as follows:

- Neelum, Bangalora, Alphonso, Rumani, Banganapalli, Kalepady, Peter, PKM 1, PKM 2, Sendura, Jahangir, Mulgoa, Paiyur 1, Mallika, Amrapali, Salem Bangalora, Arka Anmol, Arka Aruna and Arka Puneeth, Arka Neelkiran.
- Varieties for processing: Alphonso, Banganapalli, Totapuri
- Varieties for export : Alphonso, Banganapalli, Sendura
- Alphonso has become a popular variety among organic growers, in view of its better varietal characteristics and better market.

6.6 Planting

It is done with the advent of monsoon. The planting season could be July to December, depending upon the monsoon and availability of irrigation facilities.

6.7 Water Management

The water requirements mainly depend on the age, soil type and climate. However, young plants upto 2 years should be watered regularly. The newly planted grafts need about 25-30 l of water every day. Irrigating the grown up trees after fruit set at 10-days interval increases their yield. Mango growers commonly practice drip irrigation so as to control over watering and also to

irrigate a larger area with better management practices.

6.8 Cultural practices

6.8.1 Weeding

It is preferable to select a site, which is free from serious weed problems. Mulching with straw during the first few years of establishment may be useful in controlling weeds. In older mango orchards, weed management is less problematic due to shading and leaf litter.

6.8.2 Pruning

Pruning mango tree is important for tree size control and to improve the fruit colour. Essentially, tree pruning and canopy management is same for organic or conventional production. Pruning is done to open up the structure to allow good airflow and adequate internal light. It also minimises disease risk and assists in good fruit colouration. Internal pruning to remove dead wood can be very important to help reduce the incidence of disease like stem end rot.

Rootstock sprouts and low-lying branches have to be removed. Overlapping, intercrossing, diseased, dried, weak branches are removed to get good sunlight and aeration. For internal branches, pruning may be done during August- September, once in three years. Flowering should not be allowed upto three years. Among the crowded terminal shoots, weak shoots are trimmed to retain two healthy shoots during August- September annually.

6.9 Manuring

The underlying principle of organic crop production is that "healthy crops grow from healthy soil". Well balanced, biologically enhanced soil forms the basis of organic production. Hence synthetic fertilizers and chemical pesticides and herbicides are not permitted and can be detrimental to biologically active healthy soil. Contrary to the popular perception that organic systems use no fertilizers at all, a wide range of nutrient inputs is permitted, making it possible to correct any soil imbalance and provide specific supplements as required. The main difference from conventional system is that inputs are used keeping in view the biological approach to manage the soil fertility. The application of supplementary inputs is applied wherever necessary, to correct imbalances or deficiency of nutrients.

The amount of supplementary nutrients needed typically diminishes over a period of time to maintenance levels, as a system of biological cycling develops. The biological practices include mulching, green manuring, application of biofertilisers and application of compost. Mulching is a method of covering the soil with a thin layer of biomass. Mulching materials used include bark, nut shells, weeds, grass, wood chips, silage, paddy/wheat straw, rice husk, coir dust, banana, sugarcane leaf trashes etc,. The fallen leaves of the same plant can also be used as mulch material. These materials can be applied based on its availability in the region. Mulching reduces evaporation and transpiration losses, keeps down the weed growth, reduces temperature fluctuations and also increase water use efficiency.

Green manuring is a practice of ploughing in situ or turning into soil undecomposed green plant material for the purpose of improving physical structure as well as fertility of the soil. It increases the availability of plant nutrients that contribute to the yield of the crop. The microbial activities enhance as the fresh organic material acts as the nutrient source for diverse soil flora and fauna. The structure of heavy, light, and sandy soil is considerably improved and unproductive lands can be converted into fertile ones with green manuring. Green manure crops are quick growing legumes and grasses that are ploughed into the field, mulched on the top soil and used as composting material. Amongst the green manure crops, sun hemp (*Crotolaria juncea*) and dhaincha (*Sesbania aculata*) are outstanding in biomass production. It is essential that there should be sufficient moisture in the soil when the green manure crops are ploughed into soil to facilitate microbial activity.

After green manuring, it is in practice to grow groundnut as an intercrop. This not only provides extra income to the growers, but also fixes nitrogen. If a farmer cannot afford to loose a season for cultivation of green manure crops, tender green twigs collected from shrubs and trees grown on bunds, waste lands and nearby forest are ploughed into the soil. The common shrubs and trees used are glyricidia, karanj, subabool etc. Biofertlizers are preparations containing efficient strain of nitrogen fixing, phosphate solubilizing or cellullitic microorganism used for inoculating the seed or soil with the objective to accelerate microbial processes to enhance the quantity of nutrients in the available form to the plant. They are widely used in organic farming. Some of the biofertilizers used are Rhizobium, Azospirillum, Azatobactor, Phosphate solubilizing bacteria – Phosphobacteria(PSB), Blue Green Algae (BGA).

In mango, farmers are applying PSB and Azospirillum during the pit preparation and also as soil application during the crop growth period. Commercial products of biofertilizers are available in the market. Composting is an excellent method for improving the fertility and productivity of small holdings of small and marginal farmers. It converts all kinds of wastes into nutrient rich humus. Composting is a good option for the farmers to make better use of wastes and refuse present on the farm to improve the fertility of their land with no additional input cost.

There are different methods of composting: Aerobic composting, Vermicomposting and Biodynamic composting. While the first two processes are very common among farmers, the later process i.e. Biodynamic Composting uses special herbal preparation in homeopathic doses. These preparations enhance the composting process and in turn enrich the compost. The time of composting may vary from 3 to 4 months. Farmers themselves can do composting. All these preparations are also commercially available. The Central Institute for Subtropical Horticulture, Lucknow, based on their experiments with Biodynamic farming in fruit and vegetable crops have recommended the following practices :

- Application of Organic manures (10-20 kg/tree) through NADEP, Vermi, Biodynamic Compost (BD) or Microbe Mediated Compost in descending moon period

- Growing of legume for green manuring or as inter/cover crops as per requirement as per moon constellation

- Mulching after application of 100 g Cow Pat Pit (CPP), Spray of cow horn manure (BD 500) and release of earthworms in presence of proper moisture as per calendar

- Need based foliar spraying of biodyanmic liquid manures/vermin wash/ (CPP) in ascending phase.

6.10 Plant protection

6.10.1 Pests

The important pests are hopper, mealy bug, stem bores, fruit fly. Pest management practices for each pest is described below:

6.10.1.1 Fruit Fly

Adult and larvae maggots cause fruit damage. Egg laying females puncture the fruits leaving scars and holes on the fruit surface. Larval feeding causes premature fruit drop and destroys the pulp of the fruit. The fruit eventually rots making it unsuitable for harvesting and human consumption. Fruit fly attack is controlled by harvesting the crop early when fruits are mature green. This is the stage of maturity when crops are not susceptible to fruit fly attack. Removal of fruits with dimples and oozing clear sap, collection and destruction of fallen and damaged ripe fruits and practicing field sanitation helps in controlling fruit fly attack.

6.10.1.2 Mango Mealy bugs

The mealy bug affected plant leaves are distorted (rolled or folded), stunted and yellow. Heavy infestation causes drooping of leaves and flowers and reduces fruit setting and attacked fruits drop prematurely. Mealy bugs excrete large quantities of honeydews, which promote sooty mold that causes blackened malformed leaves, stems, and fruits. Infested fruits are unmarketable. Spraying steady stream of water on the host plant to knock off mealy bugs, hand picking of the bugs from the affected plants to reduce populations and pruning the affected plant parts to remove mealy bugs, applying chilli and soap sprays are the suggested control measures. Removal and destruction of heavily infested plant will help in cutting down the infested sites and reducing its future population.

6.10.1.3 Mango leafhopper

Both the nymphs and adults feed on the plant sap of the flowers, leaves, tender shoots and newly formed fruits. They then suck out the liquid contents leaving behind the dead empty cells, which are small white spots. The affected flower heads turn brown and dry up. Leafhoppers produce large amounts of sugary liquid waste called honeydew, on which sooty mould develops. The appearance of sooty mold on plants is an indication of leaf hopper infestation. Spraying garlic oil and neem oil are recommended as control measures.

6.10.1.4 Mango shoot caterpillar

The larvae feed on the growth flushes of nursery stock, young trees, and top-worked trees. Occasionally, the fruit stalks and young fruits are damaged. The sudden death of a part of a branch, cracked branch and falling off a branch are indications of the attack. It is controlled by

applying ginger, garlic and chilly extract and neem leaf extract. Pruning the affected plant parts and burning or burying them helps in controlling their population. Central Institute for Subtropical Horticulture (**CISH**) Lucknow, recommends the following practices for controlling pests in mango:

- Spraying of Biodynamic pesticide prepared from cow urine, neem, karanj (*Pongamia glabara*), castor, *Thevtia nerrifolia*, Vitex spp.

- Spraying Nettle leaf extract sprays to control hard pests like mango hoppers, mealy bugs, etc. Nettle spray is prepared by soaking 250 g of nettle leaf powder in 4-5 l of water for 24 hrs. Filter the extract and mix in 20 l of cow urine. Dilute to 200 l in water and spay on foliage to control pests.

6.10.2 Disease management:

The important diseases of mango are Powdery mildew, Anthracnose, Stem-end rot, and Sooty mould. Suggested measures are as follows:

6.10.2.1 Powdery mildew

It is a fungal disease caused by *Oidium mangiferae* and can destroy the crop. Its incidence is favoured by high humidity accompanied by cloudy weather and low night temperatures during the period between panicle development and fruit set. It is characterized by the appearance of greyish white powdery bloom on the flower buds and fruits. Need based spraying of Horsetail / Casuarina extract helps in controlling the disease.

6.10.2.2 Anthracnose

It is a fungal disease and occurs especially in humid and high rainfall areas. The characteristic symptom is the appearance of black necrotic areas on the affected parts. The affected young shoots finally show die back symptoms. As the fungus survives on dead or dried twigs, these should be pruned and burnt at the earliest. Good canopy management and tree nutrition / soil management, close monitoring and application of copper hydroxide & potassium bicarbonate sprays help in controlling the disease.

6.10.2.3 Anthracnose Stem end rot

Removing dead wood, good canopy management and tree nutrition / soil management helps in controlling the disease. It is reported that application of calcium to the soil in the form of gypsum at low rates, 2-4 kg per tree prior to flowering reduces the severity of internal fruit disorder significantly. Farmers are also applying some commercially available bio-pesticides such as *Pseudomonas fluorescens*, *Verticillium lecanii*, *Beauveria bassiana* as foliar sprays, besides neem oil spray in controlling the disease. CISH findings on disease management :

- Two sprays of Cow Horn Silica (BD-501) at flowering and fruit development stage

- Biodynamic tree paste/cow dung paste for control of gummosis and die back
- Spraying of Horse tail (*Equisetum arvensis*)/Casuarina leaves extract for control of fungal diseases in ascending moon period.

It is reported that in Uttar Pradesh, application of cow dung paste has almost replaced the spray of Copper Oxychloride for the control of die back in rejuvenated old mango orchards. It is also effective in controlling anthracnose and control of stem borer.

6.11 Harvesting

Mango fruits need 120 to 140 days after fruit set to mature. The fruits should be harvested at the correct stage to obtain the characteristic taste and flavour of the variety. Harvesting is traditionally done when a few semi-ripe fruits fall from the tree. However, it is not a scientific method. The accurate method of finding maturity is by sinking the fruits in water and when fruits fully sink in water, they are considered to have attained full maturity.

Fruits sinking in water have specific gravity of less than 1.02. The fruits will give best taste and flavour when the shoulders outgrow the stem-end and colour is olive green or when the colour become light. Harvesting of fruits should be done before 10 AM or after 04 PM to keep fruits fresh, turgid for longer shelf life. Harvest only matured fruits as frequently as possible in about 4-6 rounds. Injury to the fruits during harvesting brings down their quality and makes them prone to fungal attack.

Harvest fruits with sharp secature keeping 3-5 cm pedicel. It is important that all fruits should have pedicels intact to avoid oozing of latex on fruit surface spoiling appearance, development of black spots and paving way for entry of pathogens. Harvested fruits should be kept in shade and not in open sun and transported to the pack house for post-harvest operations.

6.12 Post Harvest treatment

Dip the fruits in 520C hot water immediately after harvest for 5 minutes followed by 8% plant wax to reduce anthracnose disease in mango during storage. In general fruit requiring only short term storage before retail sale are unlikely to suffer from fungal break down and post harvest fungicides may not be necessary. For longer storage of mangoes a fungicide treatment is usually required. However, effective organic treatment for post-harvest fungal breakdown is yet to be established. The important pre and post-harvest practices are:

- Produce from a healthy tree in a well managed orchard with good hygiene
- Grow with adequate calcium and other elements
- Do not subject to excessive N during fruit development and ripening

- Pick at the correct stage of ripeness
- Do not subject to bruising or damage
- Maintain at ideal temperature
- Clean,pack and transport.

Generally grading of fruits is done by farmers manually according to size of the fruits. Grade will vary with variety. The prevailing grading standards for Alphonso are given as an example;

- A + Grade - > 300 gm
- A Grade - 250 –299 gm
- B Grade - 200-249 gm
- C Grade - 150-199 gm
- D Grade - < 150 gm

6.13 Yield

The grafted plants, which are relatively short-lived and less vigorous, bear fruits of highly uniform size and good quality and bearing starts in the fourth year of planting. Initial yield is reported to be 30 kg per tree and attaining the peak yields of 100 kg/tree in the 10th year after planting.

7. Linkages :

7.1 Govt. Programmes for Organic farming

7.1.1 Department of Agriculture

Department of Agriculture, Govt. of Tamil Nadu is implementing a project for promotion of organic farming with 100% assistance from Govt. of India with an outlay of Rs.56.77 lakh for conduct of trainings, seminars, workshops and setting up of Model Organic Farms in the State Seed Farms and establishment of vermiculture hatcheries. Various components of the project are as follows:

- Training of certification and Inspection agencies
- Training on Production and Quality control of Organic inputs
- Training of field functionaries/Extension officers
- Field Demonstration on Organic inputs
- Setting up of Model Organic Farms (numbering 5)
- Organization of State and Regional workshops
- Setting up of vermiculture hatcheries in the State Seed Farms (numbering 20)
- **7.1.2 Department of Horticulture and Plantation Crops**

7.1.2.1 National Horticulture Mission

National Horticulture Mission (NHM) is being implemented in Tamil Nadu from 2005-

06 with focus on eight crops viz. Mango, Aonla, Banana, Flowers, Chillies, Turmeric, Aromatic Plants and Cashew. The programme is being taken up in 14 districts viz Coimbatore, Cuddalore, Dharmapuri, Dindigul, Erode, Krishnagiri, Madurai, Ramanathapuram, Salem, Sivaganga, Theni, Tiruchirapalli, Tirunelveli and the Nilgiris. Tamil Nadu Horticultural Development Agency (TANHODA) is the implementing agency in the state, which steers the programme in association with other stakeholders. NHM has a component of Organic farming which provides subsidy to farmers for adopting organic farming practices. The incentives provided under NHM are as follows:

Sl.No.	Programme	Estimated Cost	Proposed Assistance
1	Adoption of Organic farming	Rs 20000/ha	50% of cost subject to a maximum of Rs 10000/ ha per beneficiary
2	Vermi Compost units	Rs 60000/unit	50% of cost subject to a maximum of Rs 30000 /unit
3	Certification	Project based	Rs 5 lakh in cluster of 50 ha

Under NHM, during the year 2005-06 and 2006-07, an area of 1400 ha and 4200 ha respectively were brought under Organic farming. NHM targets to bring another 9500 ha of area under Organic farming in 2007-08 and contemplates to establish another 200 vermi compost units and organic certification in 2 clusters each with an extent of 50 ha to secure input supply and certification to the organic farming system.

8. Financial aspects

8.1 Sale Price

Well-established organic mango producers are realizing a premium and the farm gate price realised is Rs 30 per kg, while small producers have obtained an average sale price ranging from Rs 12-15 per kg. A modest sale price of Rs.12 per kg has been considered in the present model.

8.2 Economic life

The economic life of mango is considered as thirty years.

8.3 Unit Cost

The item wise unit cost for 1.0 ha model of organic mango is given in **Annexure II**. As per the technical and financial parameters, the unit cost per hectare works out to Rs.

152300 /- spread over five years(1 year : Rs. 32100 + 2year : Rs. 24200 + 3year :Rs. 27100 + 4 year : Rs.31100 + 5 year :Rs.37800

8.4 Margin money

The percentage of margin / down payment to cost of development prescribed is 5, 10 and 15% for small, medium and large farmers respectively. The rest of the cost of development will be provided as bank loan. Margin considered in the present model is 10%.

8.5 Bank loan

Bank loan of 85 - 95 % shall be available from the financing institution. Bank loan considered in the model is 90%.

8.6 Rate of interest

The rate of interest to be charged to the ultimate borrower would be guided by RBI guidelines issued from time to time. However, the ultimate lending rate has been considered as 12 % for working out the bankability of the model scheme.

8.7 Security

Banks are guided by RBI guidelines issued from time to time in this regard.

8.8 Economics

The detailed techno economic parameters and economics are presented in **Annexure III and Annexure IV**

8.9 Financial Analysis

The detailed financial analysis given in **Annexure V**. Based on the detailed financial analysis, the financial indicators are given below :

- NPW : Rs.191891.66
- BCR : 1.95 : 1
- IRR : 35.53 %

8.9 Repayment Period

The bank loan along with interest is repayable in ten years including four years grace period. The detailed repayment schedule is given in **Annexure VI**

9. Conclusion:

Organic cultivation of mango is technically feasible, financially viable and bankable.