Chapter VI
Sustaining and Expanding the Horticultural Revolution

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Sustaining and expanding Horticultural Revolution

Introduction

Maharashtra is one of the leading states in the country in Horticulture Development. The diverse agro-climatic conditions of the state are very congenial for cultivation of various horticultural crops. The area under fruit crops which was 2.42 lakh ha. in 1990 has gone up to 12.89 lakh ha. in 2002. Similarly, the area under various vegetables, spice crops and floriculture has also increased substantially. This is mainly due to the Govt. policies like establishment of separate Department of Horticulture in 1981 and linking horticulture development with Employment Guarantee Scheme in 1990. Creation of various infrastructure facilities like establishment of horticulture nurseries, irrigation facilities also helped for horticulture development.

With the expansion of area under horticulture, production of fruits has increased substantially. However the marketing of fruits could not be organized simultaneously. At present markets are dominated by middlemen and they decide the prices of fruits. Unless the farmers form cooperative and open their sale outlets in urban areas, the exploitation from middlemen would not be reduced. The farmers in some areas have organized themselves and formed fruit producers cooperatives.

The merchants do not have knowledge of handling of produce. Transportation is more oriented towards quantitative basis rather than qualitative basis. Timely availability of the transport is a matter of concern. e.g. Jalgaon district is well known for banana cultivation. Wagon loads of bananas are transported to North India every day from Jalgaon. However, since the railway wagons are not specially designed for transport of fruits, great losses are incurred during April to June which are months of severe heat.

Due to lack of cold chain, considerable losses are incurred in fruits and vegetables. Cold chains have been established in some limited areas of grapes. This has helped to increase shelf life, storage, transport and export of grapes.

Due to lack of processing facilities, great losses occur in fruits and vegetables. It is therefore necessary to give thrust on processing of fruits and vegetables both
in informal and organized sectors. The processed products have great demand both in domestic and export markets. The exports of processed products of fruits and vegetables have increased which shows that there is increasing demand for these products.

**Areas of Development**

Usually horticulture is mainly referred to fruit crops. Horticulture includes following areas.

1. Fruits  
2. Vegetables  
3. Floriculture  
4. Spices & condiments  
5. Medicinal and Aromatic plants  
6. Mushroom

**For development in above areas, following activities play an important role.**

1. Nursery activity  
2. Green House cultivation  
3. Agro-processing  
4. Post Harvest Management  
5. Research  
6. Use of IT  
7. Marketing  
8. Export  
9. Preparation for WTO.

**Development of Fruit Crops**

The area under fruit crops in Maharashtra State is 12.89 lakh ha. of which 6.13 lakh ha. area is productive and the productivity comes to 13.95 MT/ha. Today Maharashtra stands first in terms of area, production and productivity in the country. It is proposed to bring additional 2 lakh ha. under fruit crops during the next 25 years, thus covering total area of 50 lakh ha. Therefore the existing E.G.S. linked Horticulture Development Programme needs to be continued. The major fruit crops cultivated in the state are Mango, Cashew, Pomegranate, Citrus, Sapota, Banana, Grapes and Guava. The productivity in case of Cashew, Citrus, Grapes, Guava and Banana is higher than the national average. However the overall productivity of fruit crops in the state is 13.95 Mt/ha. The productivity will have to be increased upto 15 Mt/ha. by the end of 10th plan and 20 Mt/ha after 25 years.

The higher productivity can be achieved through measures like production and distribution of improved seeds and planting material, rejuvenation of senile orchards, judicious use of natural resources like land, water and light, integrated nutrient management, integrated pest management, disease surveillance, plant health clinics, mechanization of farm operations etc. Assistance for these activities will have to be extended to the public as well as private sector.

**Employment Guarantee Scheme Linked Horticulture Development Programme**

Considering the very congenial climatic conditions and soil types, an ambitious scheme namely Employment Guarantee Scheme linked Horticulture Development Programme has been launched in 1990-91 with following objectives.

- To utilize 29 lakh hectare cultivable waste area.
- To convert the land from low value crops to high value crops.
- To generate employment opportunities in rural areas.
- To control soil erosion.
- Pollution control.
- To improve socio economic conditions of the farmers.
Salient Features of the Employment Guarantee Scheme

- 25 fruit crops covered under the scheme.
- Each beneficiary can avail the facility up to 4 hectares. However, up to 10 hectares in Konkan region.
- 100% subsidy on wages and inputs to small and marginal farmers and those belongs to SC, ST, VJ, NT and Nav Buddhist categories. However, other beneficiaries can avail 100% assistance on wages and 75% assistance on inputs.
- Subsidy amount ranges from Rs.17,281/- to Rs.49,189/- per hectare as per the crop.
- Subsidy is given in cash for wages and in kinds for planting material, fertilizer, plant protection chemicals for three years.
- Subsidy amount is directly deposited by Demand Draft in beneficiaries' bank account.

Achievements under the Schemes

- Area covered during 1990-91 to 2001-2002 is 10.14 lakh ha. thus total area under fruit crops in the state has gone up to 12.89 lakh ha. On an average approximately one lakh ha. area per annum is been covered under the scheme.
- More than 2.76 lakh ha.(29%) area is waste/fallow land of the total planted area under the scheme.
- 7% and 11% SC & ST farmers respectively have been benefitted by this scheme until now.
- Mandays generated are 2299 lakhs.
- 35,525 villages are covered under the scheme.
- Since 1990-91 Rs.803.50 crores have been distributed as subsidy.

Mango -

Mango is one of the most important fruit crops in the State having an area of 4.03 lakh hectares under cultivation with an productive area of 1.64 lac hectares and 55.90 lakh M.T. production. Though the productivity of mango in the state is much low as compared to national average, the state has 1.58 lakh hectares area in Konkan division under the export quality cultivar "alphonso". So also trial export consignment of "Kesar" mango was sent from Marathwada region. The share of the state in total export of mangoes from the country is 60-65%. Besides export, there is a good demand for Alphonso, Keshar, Dashahari, etc. varieties in other parts of the country also. Considering the demand for processed products like pickles, juice, etc., there is a scope for establishment of processing units in the State.

A decreasing trend is being noticed in the yield of mango. This is mainly due to monoculture, which reduces the chances of availability of pollens of different varieties and thereby reducing fruit set. Secondly, excessive use of Cultar (Paclobutrazol) is also responsible for over exploitation of the fruit bearing capacity of the orchards. Rejuvenation of old orchards for higher production is essential.

The Konkan has potential for increasing area under Alphonso mangoes. The areas adjacent to Arabian Sea or creeks are suitable for cultivation of Alphonso
variety. This variety has potential for domestic markets and export. Western Maharashtra, Marathwada and Vidarbha are suitable for ‘Keshar’ variety. Other varieties suitable for cultivation in the state are Ratna, Sindhu, Langra, Totapuri, Begumpalli, Dashari and Konkan ruchi.

Grapes -

Maharashtra stands first in area and production of grapes in the country. At present 29,756 hectares area with 7.8 lakh M.T. production is in the State. Normally, 20000-25000 M.T. fresh grapes worth Rs.75.00 crores are exported from the state, which comes to 90% of the total export of grapes from the country. Every year, about 1.20 lakh M.T. fresh grapes are used for making 30,000 M.T. resins. However this industry needs to be supported with imported technology. The major cultivars grown in the state are thompson seedless and its derivatives sharad seedless, sonaka, tas-e-ganesh. Also flame seedless and some other cultivars are also cultivated in the state.

Grape wine industry is coming up on a large scale because of huge demand in domestic and international markets. The area under wine purpose varieties should go up quickly to sustain the demand pressure from the wineries. The state has National Research Centre on Grapes in Pune district. The Mahagrapes, Association of grape exporters and Grape Growers Association are actively involved in the development of grape industry and promotion of export. They import Gibberellic acid and dipping oil in bulk quantity and provide it to the member farmers at moderate rates.

Cashew -

Maharashtra is number one in the country in respect of area. At present 1.53 lakh hectare area is under cashew crop as against 7.57 lakh hectares in the country. Majority of the plantation is under promising cultivars i.e. Vengurla series 1 to 7. The average productivity per hectare at national level is only 0.8 M.T. however in Maharashtra it is 1.5 M.T. which is highest in the country. The total production in the state is 1.25 lakh M.T. However, only 10 to 15 percent raw cashew is processed in the state and therefore there is a need to establish cashew processing units in the state. In order to encourage cashew processing units in rural areas, assistance was given to 45 units during 2000-2001 @ 10,000/- per units and during 2001-2002 the 50% subsidy upto Rs.25,000/- is given to 358 units.

Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli has evolved series of varieties from Vengurla, which are higher yielding and of good quality. The farmers have setup small processing units, which have generated gainful employment for women besides value addition. The cashew has good domestic market as well as export potential. There are about 5 lakh ha. of wasteland’s in Konkan and western ghats which is suitable for cashew plantation. If cashew are introduced on large scale, it would bring about economic development of Konkan and Western ghats.

Cashew has also been accepted successfully in hilly and tribal parts of Vidarbha and there is good scope for increasing area under cashew in this region.
Pomegranate -
Maharashtra stands first in the country in respect of area and production of pomegranate. At present 0.78 lakh hectares area is under pomegranate crop with the productive area of 0.48 lakh ha. The total production is 4.76 lakh M.T.

The varieties like Ganesh and Mrudula are suitable for table purpose. The pomegranate have very good potential for export. However, processing techniques need to be evolved. Considering the growing importance of this crop, the National Research Centre for Pomegranate should be established immediately.

Oranges -
Oranges are mainly grown in Vidarbha region of the State. The total area under Oranges is 1.48 lakh hectares with 0.93 lakh hectares as a productive area. The total production is about 8.34 lakh M.T.

The Orange orchards in Vidarbha are facing the problem of decline on large scale. Therefore varities resistant to phytophthora and also varieties suitable for exports and processing needs to be developed.

Extension efforts for better bahar management, prevention of fruit drop of Mandarin Orange are essential. Organized markets for domestic marketing of Mandarin Orange to provide better remuneration to the farmers, needs to be established.

Sweet Orange -
Sweet Orange is a major fruit crop in Marathwada region of the State. 0.77 lakh hectares area is under this crop and 0.34 lakh hectares is under production. The total production is about 5.18 lakh M.T. Since 1998-99, control market is started at Jalna for sweet orange growers in their production area.

Lime and Lemon-
The present area under kagdi lime is more than 30000 hactares with about one lakh M. T. Production. This crop as well as Lemon have very good export and processing potential. However new varieties suitable for export and processing needs to be developed.

Banana -
Maharashtra stands second in respect of area and first in respect of productivity of banana in the country. The productivity is more than 60 M.T. per hectare. At present 72,000 ha. area is under banana crop. Maharashtra is pioneer in cultivation of Dwarf Cavendish variety useful for table purpose. Even though the productivity is highest in the country efforts needs to be made to evolve pest and disease resistant varieties.

Maharashtra State is pioneer in cultivation of dwarf cavendish varieties useful for table purposes. Even though the productivity is highest in the country, suitable varieties for export and processing needs to be evolved. Similarly establishment of processing industries in the area of production is essential for value addition.
Coconut
The present area under coconut is more than 30000 ha. with annual production of 1936 lakh nuts. This crop possesses good potential with increasing irrigation facilities and as a base crop for coconut based farming system. Emphasis needs to be given for high yielding and pest resistant varieties.

Papaya
Papaya is another potential fruit crop of the state. Apart from great potential as a table fruit, it is suitable for papain etraction and other value added products. Suitable varieties for higher papain yield and resistant to pest and diseases needs to be developed.

Other fruit Crops
Considering the soil and climatic conditions, the area under fruit crops like Sapota, Guava, Custard apple, Tamarind, Amla, Strawberry, Pine apple, Fig, Ber etc. is increasing. Some of these crops have very good export and / or processing potential, however, suitable varieties need to be evolved.

Under exploited fruit crops
Fruit crops like karonda, jamun, kokum, jack fruit, charoli, wood apple, beal, bhokar etc. have good potential especially for export and processing. These crops have good medicinal properties. Most of these crops are very hardy and can grow under adverse climatic conditions. Identification and evolution of suitable varieties and standardization of package of practices is necessary. The efforts to introduce new fruits like Litchi, Pomeloes etc. need to be supported and scientifically tested by the SAUs.

The important recommendations are
• E.G.S. linked horticulture development programme must be continued and approximately an area of 200000 ha should be brought under cultivation of various fruit crops every year. The quality of planting material needs to be ensured for genuineness of variety, disease free material, vigour and vitality of planting material. For this purpose testing facilities must be developed. Facilities like Eliza test & other tests, certification mechanism for planting material needs to be established.
• Use of micro nutrients, plant growth regulators, micro irrigation, micro propagation, training and pruning techniques etc. needs to be standardized.
• There is need to introduce new varieties, conserve them in germplasm, thereafter mass clonal multiplication. Varieties such as Tommy Atkins, Kent, Ratol, Sindri and varieties suitable for processing in mango, figs with high TSS, better alternative to mandarin oranges must be introduced in Maharashtra. After introduction, efforts must be concentrated on their acclimatization, demonstrations, standardizing cultivation practices, pre and post harvest management, mechanization to reduce cost of cultivation, IPM, INM etc. is essential promote commercial horticulture. Use of salt tolerant rootstocks such as salt crick, dogridge in grapes, khirni in sapota, aonla is essential to bring problematic soils under cultivation
• Cropping pattern, crop geometry need to be studied. Maharashtra horticulture is predominantly dry land horticulture. However there are no crop models as they are available for agricultural crops. Hence agri-horticulture crop based models need to be defined on the basis of - IPM, -
Dry land intercropping concept to minimize risk & optimizing returns based on traditional models Ex. Marigold in cotton, Jawar with cucurbitaceous crop like "waluk-Gudmakailu"

- Monsoon harvesting techniques and judicious use of available water must be given top priority.
- Training and pruning techniques for fruit crops must be standardized including the conditions under high density plantation.

### Development of Vegetables

Maharashtra contributes 6% of production of vegetables in the country. The area under vegetable crops is about 4.04 lakh ha. The total production is 50.96 lakh M.T. per year and the productivity is 12.00 M.T. per hect. Maharashtra is the largest producer of onion in the country covering an area about 1,18,262 ha. with average annual production of about 14 lakh M.T. It accounts for 20% of total area and 25% of the total output of onion in India, Maharashtra is exporting about 2,50,000 to 3,00,000 M.T. Onions every year. State will give more emphasis on post harvest handling of the vegetable crops in future.

The State Government has also laid emphasis on providing assistance for construction of improved onion storage structures to help the onion growers in the state. Since 1999-2000, under the schemes 1165 Onion storage structures are constructed with a storage capacity of 32,790 M.T. During 2002-2003 it is planned to construct another 980 Onion storage structures.

The important recommendations are

- Vegetable farming needs to be developed on commercial scale.
- An integrated approach is necessary for production and availability of fresh vegetables for a longer period.
- Climatic variability, high-tech production systems; use of green houses etc. needs to be fully utilized for enhancing year round availability of vegetables.
- Suitable varieties for export and processing need to be evolved.
- Technology & infrastructure for Post Harvest Management is necessary.
- Marketing network through producers or consumers co-operatives need to be developed to avoid the impact of middlemen.
- Indigenous and popular vegetable genotypes like kartoli needs to be identified and commercially exploited.
- Production of clean vegetables through use of IPM, Organic cultivation etc. and minimizing use of pesticides needs to be promoted.
- Though tuber crops such as potato, sweet potato, calocasia, and amorphophalus are commercially exploited in the state, the unexploited tuber crops like tapioca, yam etc. have great potential and hence need to be promoted.
Development of Floriculture

Maharashtra stands sixth in respect of area under floriculture in the country with approximately 7000 ha. under cultivation. The major flower crops grown are roses, chrysanthemum, aster, tuberoses, jasmine, gaillardia, marigold etc. These flowers are mainly grown in Pune, Nasik, Ahmednagar and Sangli Districts. Recently many private companies and progressive farmers in the State have started export oriented cultivation of flower crops. The crops grown are roses, carnations, gerbera, gladiolus, lillium, etc. These companies have contributed much more in floriculture development through green houses and tissue culture technology. There are 14 big corporate green houses and 902 small green houses are erected on farmers field.

Under the Government of India's scheme "Commercial Floriculture", Horticulture Department of Maharashtra State has established a Model floriculture center at Rajgurunagar, District Pune. One hi-tech floriculture unit with an investment of Rs. 3.00 crores is established in College of Agriculture, Pune to demonstrate hi-tech technology to the farmers. The state Government has taken lead to establish auction market on the lines of Dutch auction centre (AlSameer) at Goregaon, Mumbai. Besides this, the Maharashtra State Agricultural Produce Marketing Board has established one hi-tech floriculture centre at Talegaon, Pune. An organization "Western Maharashtra Floriculturists Association" is working in the state.

The important recommendations are

- Considering the past experience of commercial floriculture units, it is necessary to indigenise green house technology for commercial production,
- Research support for identification of native and novelty flowers and cut foliage plants from indigenous flora for commercialization, post harvest technology, variety improvement, standardization of agro-techniques for exotic and domestic flowers under open and green house cultivation needs priority attention.
- Product diversification and value addition like extraction of pigments, essential oils, production of dry flowers, flower crafts should be encouraged.
- For strengthening domestic market, flower shows should be organized regularly.
- Strengthening of model floriculture center, Rajgurunager, Dist-Pune and establishment of new model floriculture centers is essential in Vidarbha, Marathwada and Konkan region.

Development of Spices

Maharashtra is one of the important spices growing states. The area under spices crops is about 1.62 lakh ha. and production is 13.46 lakh MT. The major crops are chillies, ginger, turmeric, black pepper, cardamom, etc. These is cultivation of seed spices like coriender, fenugreek, etc. to some extent. The konkan belt of the state i.e. coastal belt is most congenial for spices cultivation. Western Maharashtra region is famous for turmeric cultivation. There is auction market for turmeric at Sangli. Some of the farmers / NGOs have started growing spices crops organically. The estimated area under organic cultivation is to the tune of 4500 ha.
• Considering the market potential, development of minor seed spices like Jeera, Cumin, Coriander etc. need to be focussed.

Medicinal & Aromatic Plants.
Though medicinal and aromatic plants have great potential for cultivation, presently majority of the material is sourced from the forest area. Therefore, it is not economical for individual farmer to cultivate them without buy-back arrangement.

The important recommendations are
• Germplasm collection, characterization and evaluation through multilocational trial should be taken up on priority basis. Additionally emphasis should also be given on development and commercialisation of new varieties standardizing package of practices.
• Database with regards to area, production, uses, traditional knowledge, export, import etc on medicinal & aromatic plants needs to be developed.
• The efforts of different agencies involved on the development of these plants needs to be integrated.
• Network of analytical labs. should be established.
• The herbal gardens and nurseries established in all 4 SAU’s should be strengthened.
• Contract farming of medicinal plants should be promoted to safeguard against price fluctuation.
• State Medicinal & Aromatic plant Institute should be established.

Mushroom.
Mushrooms are rich source of nutrients. This industry also provides employment to landless labors. Even though the production has been increased substantially, still there is wide gap in utilization, Mushroom, being highly perishable, its marketing needs to be done with care. Therefore an integrated approach is necessary for development of mushroom cultivation

The employment guarantee scheme linked with horticulture needs to be continued. Every year, the target of 50,000 is proposed.

Similarly the area under vegetable, spice, floriculture and medicinal and aromatic plants is proposed as under.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area (lakh ha)</th>
<th>Production (Mt/ha)</th>
<th>Productivity</th>
</tr>
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<tbody>
<tr>
<td>Fruits</td>
<td>2002 6.13</td>
<td>85.53</td>
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<tr>
<td></td>
<td>2025 15.00</td>
<td>270.00</td>
<td>18.00</td>
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<tr>
<td>Vegetables</td>
<td>2002 4.04</td>
<td>50.96</td>
<td>12.00</td>
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<tr>
<td></td>
<td>2025 6.00</td>
<td>96.00</td>
<td>16.00</td>
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<tr>
<td>Floriculture</td>
<td>2002 0.07</td>
<td>0.28</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td>2025 0.18</td>
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<tr>
<td></td>
<td>2025 3.00</td>
<td>30.00</td>
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General Recommendations

- High-tech horticulture like high density planting, use of micro-irrigation, fertigation, INM, IPM needs to be promoted for improving quality and productivity.
- Horticulture being a technology driven sector, it is necessary to upgrade the knowledge & skill of the farmers, field functionaries & entrepreneurs from time to time.
- Precision farming, which involves judicious use of inputs like water, fertilizer, plant protection chemicals & time needs to be promoted.
- Efforts should be made to reduce cost of production by improving productivity and quality.
- Emphasis should be given on proper irrigation and drainage of areas under fruit crops.
- Wastelands and drylands should be brought under suitable fruit crops.
- Emphasis should be given on leaf and tissue analysis for use of micronutrients.
- Proper research support is needed for identification and promotion of cultivation of local fruit crops having commercial importance, management of problematic diseases like Malformation, Alternate bearing, Spongy tissue of Mango, Decline in Citrus, Wilt in Pomegranate, Sapota seed borer, Sigatoka in Banana etc.
- To catch up global market and reduce the cost of cultivation, organic cultivation should be promoted.
- Organic cultivation of horticultural crop should be promoted for better quality & minimum pesticide residues.
- Production of bio-control agents, vermicompost, bio-fertilizers, FYM compost should be encouraged for use in organic farming.
- Assistance for infrastructure development. such as setting up of cold chain, pack house, facilities, marketing network, procurement of plant protection and farm implements and quality planting material will have to be extended to the farmers.
- Marketing and export problems should be solved timely along with exploration of new markets.
- Flower growers co-operatives for input supply and marketing should be encouraged.
- HRD for staff and farmers is essential.
- Technology dissemination through demonstrations, training of farmers, publicity through different media, use of IT should be encouraged.
- Database on area, production, productivity, uses, import, export etc. should be developed and updated timely.
Infrastructure/strengths for Horticulture Development

Planting material

The State has 136 Govt. nurseries with an area of 2730 ha. and about 2.12 lakh mother plants of various promising cultivars. All the 4 SAUs are also having 24 nurseries on their farms. Besides this, the State has about 1674 registered private nurseries. The State is now self sufficient in planting material except grafts of Amla and seedlings of spice crops. Mahabeej the largest public sector enterprise is well equipped for producing quality planting material of vegetable crops besides large scale production of seeds of cereal, oil seeds, pulses and so many other crops. It is well equipped with tissue culture laboratory and is producing clonal planting material especially of banana and many other crops including flower crops. The State Agricultural Universities are having tissue culture laboratory of which the laboratory at Marathwada Agricultural University is a centre of excellence for tissue culture with a project cost of 4.00 crores. The state is having 21 tissue culture laboratories in private sector with the capacity of 913 lakh plantlets. The private nurseries in the field of floriculture are well established especially in cities such as Pune, Nagpur.

Strengthening of nurseries for quality planting material

Quality planting material is a prerequisite for any agricultural activity. As horticultural crops are perennial in nature, this becomes very crucial aspect. The quality of planting material needs to be ensured for geniuses of variety, disease free material, vigor and vitality of planting material.

For production of planting material for horticulture following points should be keep in the mind

Availability of planting material.

- Rootstock development in mango is prime important
- Special nursery programme for large scale multiplication should be established for mortification
- Variety specific to particular area to be identified which have export potential and its planting material should be made available to farmers.
- The varieties, which are suitable for processing should be identified and those varieties planting material should be made available to farmers.
- More efforts should be concentrated on quality vegetable seed production programme on public farms.
- Special efforts should be taken on production of high yielding quality planting material of fruit crops, vegetables, floriculture, ornamental plants, medicinal plants and aromatic plants. Spices etc. with special reference to disease and pest resistance on Govt. farms or under Govt. supervision.
Quality control of planting material

The monitoring of quality of planting material needs the following facilities in future in the State.

- The laboratories should be established for testing of genetic purity, Eliza test and other important Tests.
- Tissue culture laboratories should be established for production of quality planting material i.e. micro- propagation techniques.
- Development of facilities for production of disease / virus free planting material

Research Activities
The state has privilege of having 4 State Agricultural Universities along with 5 Colleges of Horticulture and 2 colleges of Forestry. So also there are 3 National Research Centres existing in the State for Grapes, Citrus and Onion and Garlic. The present research focused which is on varietal improvement, production and utilization needs to be strengthened, related to WTO scenario. The agricultural universities have evolved promising varieties like Vengurla series of cashew, Ratna, Sindhu in mango etc.

The strong crop based farmers organizations such as Mahagrapes, Grape Growers Association, Mahabanana etc. themselves are conducting need based research. Even the farmers are innovative who have evolved promising selections of grape. The technologies like micro propagation, micro irrigation, fertigation, organic farming, IPM, INM, polyhouses cultivation are becoming popular.

Research needs in Horticulture
Mango
- Comprehensive research about “Cultar” & use of alternatives to reduce expenditure
- Keeping in view the export potential of mango, the problem of quality management and spongy tissue in Alphonso needs to be solved
- Mapping & control for fruit fly infestation needs to be undertaken
- Recommendations about crop geometry and pruning techniques for high density mango plantation needs to be finalized.

Grapes
- Wine purpose varieties of Grape, suitable for growing in the state need to be evaluated and released at the earliest.
- Products other than raisins and wine should be developed to stabilise the Grape market.

Citrus
- Study of exotic varieties of Mandarin Orange to find out suitable seedless and firm skinned varieties need to be taken up.
- Seedless & firm skinned varieties & study of exotic varieties
- Varieties suitable for processing
Sapota
- Remedy for control of seed borer of sapota

Banana
- Export oriented varieties with spotless, straight fingers, big sized fruits & resistance to anthracnose & Sigatoka disease,

Papaya
- Virus resistant varieties

Custard apple
- Seedless / small seeded varieties with max. pulp contents & better keeping quality with high TSS

Cashew
- Rejuvenation of old plantations
- Control measures for tea mosqueto

Pomegranate
- study of wilt disease,
- development of suitable varieties for processing

Fig
- Variety with high TSS contents
- Technique for drying

Litchi
- feasibility study of litchi cultivation under Maharashtra conditions & identification of suitable variety & standardization of cultivation practices

Vegetables
- Development of public sector hybrids
- Standardization of parameters & techniques for export oriented vegetables

Onion
- Varieties with high TSS contents suitable for processing
- Development of alternative varieties for rangada season
- Research for alternative remunerative crop for rangada (onion) season

Spices
- Considering the high production potential and better export demand, suitable varieties in the country should be developed and promoted.

Other
- Evaluation & development of suitable varieties & their protocols for inhouse cultivation
- Survey & Identification of indigenous flora for export market
- Package of practices & processing for medicinal & aromatic plants
- Efforts to develop & promote nutracriticals
• Development of different crop models for medicinal & aromatic crops
• Varietal germplasm & screening of varieties for export quality/processing purpose
• Use of Genetically Modified Crops (GMC)
• Genetic Resource conservation & characterization
• Techniques for production of grafted vegetable saplings (water melon on bottle gourd, brinjal, tomatoes) using robot specially G 892
• Standardization of pruning techniques with special reference to High Density Plantation & Crop geometry
• Mechanization in horticulture
• Standardization of grading & packing requirements for indigenous & foreign markets with reference to size, colour & quality parameters
• Recommendations for micro-irrigation/fertigation in horticultural with reference to crop wise season wise requirements

Education and training
Agricultural education facilities in Maharashtra are ample. The 4 state agricultural universities have all disciplines of agriculture and agriculture education facilities from diploma to post graduation is available in the state. The Yashawantrao Chavan Open University, Nasik has developed course curriculum in local language i.e. marathi, with a part time education pattern that too with more practicals normally conducted on weekends. Besides this there are private colleges wherein even the facility of biotechnology is available. The Maharashtra State Agricultural Education and Research Council conducted massive training courses of six months duration on minimum qualification basis to increase the human resource in the field of horticulture.

The state has optimum training facilities. There are 7 training institutes in the state having autonomous status. Vasantrao Naik Agricultural Management Training Institute, Nagpur is an apex body. Out of the seven training institutes, the department has now two training institutes exclusive for horticulture and one institute for agri-business at Daund, Dist. Pune.

Besides this the state has institutes such as Water and Land Management Institute, Aurangabad. With the depleting ground water table, judicious use of water and its conservation has become very important activity. Also NCL Pune and BARC Mumbai institutes are helping agriculture to lead towards hi-tech.

The state is pioneer in establishing Agri-polyclinics to demonstrate field trials and educate farmers on various aspects. Such facility is also available on Government nurseries and Seed farms at taluka (block) level. Besides this the state has 3 tribal training centres in tribal belts of the state. The fruit processing centre at Aurangabad demonstrates house hold and cottage level processing techniques especially to the women.

The above education facilities should be effectively used for imparting training, dissimination of information etc. to meet the future challenges.
Demonstrations

Demonstration is the best method of extension. Under various schemes demonstrations are conducted. Model floriculture centre at Rajgurunagar, Dist. Pune, hi-tech floriculture centre at college of agriculture, Pune, Centre of excellence for tissue culture at Marathwada Agricultural University, Parbhani are some of the major demonstrations in the state. The huge plantation of various fruit crops all over the Maharashtra done under Employment Guarantee Scheme linked Horticulture Development Programme, itself is a demonstration.

The hi-tech floriculture project at College of Agriculture, Pune worth Rs. 3.00 crore is being implemented to demonstrate h-tech agriculture to the farmers. One Model Floriculture Unit is established at Rajgurunagar, Dist. Pune wherein one low cost green house is established with the assistance from Food and Agriculture Organization. The Maharashtra State Agricultural Produce Marketing Board has established Floriculture Park at Talegaon to demonstrate hi-tech horticulture to the farmers. Considerable work has been done in the field of vegetables, floriculture, spices etc. The Konkan Krishi Vidyapeeth has evolved multistoried crop model for intercropping of spices in coconut orchards popularly known as "Lakhi baug".

The Maharashtra State Agricultural Produce Marketing Board is promoting horticulture export zones which will demonstrate and promote crop production for export.

Laboratories and other related facilities

The state has many soil testing laboratories to test soil and water quality, which is basic need for site selection and for regulating fertilizer doses. The state has a pesticide residue testing laboratory of international standard which has accreditation of APEDA.

The state is establishing 4 leaf and tissue testing laboratories to know nutritional status of the plants so as to regulate fertilizer doses.

The state agricultural universities has been given assistance to establish 7 disease forecasting centres so as to co-relate whether parameters and to evolve some conclusions to predict chances of incidence of disease well in advance.

Field extension

The department has undergone structural reform under "one window system". Now there are over 15500 field level staff available for extension. They arrange demonstrations, field days, krishi melavas etc. The agriculture department and agricultural universities have system of conducting workshops/Zonal agricultural Research Conferences. Even the growers association such as Mahagrapes, Grape Growers Association etc. conduct seminars, training programmes for the farmers. Under various schemes farmers are given proper training.
Linkages with Research and Development Institutes

Maharashtra State has well established linkages with research and development institutes. Various schemes are designed after thorough discussions with the university scientists, eminent personalities from industries, private sector etc. The ambitious scheme Employment Guarantee Scheme linked Horticulture Development Programme was designed after discussion with state agricultural universities. The workplan schemes are designed in the same manner. The universities are given funds for establishing infrastructural facilities and research work, especially need based research work.

The state has 3 National Research Centres. There advice is taken from time to time to tackle many issues. Many a times natural calamities occur in the state such as outbreak of sigatoka disease on banana, off season rains spoiling crop etc. when these institutes come to great help in strategic planning/disaster management.

The state is having National Chemical Laboratory of international standard. There expertise was taken on consultancy basis for establishing tissue culture laboratory at Marathwada Agricultural University, Parbhani.

The National Informatics Centre, Pune has guided the department in overall computerization of the department, in developing various softwares for the department and for developing website of the department.

There is urgent need to establish strong linkage with the national and international institutes considering the growing importance of horticulture. The Non Government Organizations such as Hind Swaraj Trust, Ralegansiddhi, Dist. Ahmadnagar, Vidya Vikas Pratishtan, Baramati are actively involved in the development of agriculture sector in the state. "Adarsh Gaon" is an unique concept being implemented in the state. Jain irrigation is one of the major industry in the country, with its headquarter located at Jalgaon. A national symposium on micro irrigation was arranged by the company. Similarly a mega event called "Kisan" is organized at Pune in every alternate year by Deccan Exhibitors. Strong network of cooperative organizations is an asset of the state.

State Schemes

1. Plant protection scheme on Horticulture crops
2. The fruit and vegetable cultivation in kitchen gardening for tribal families in Melghat area

Centrally Sponsored Schemes

1. Integrated Development of Cashew
2. Integrated Development of Fruits
3. Integrated Development of Vegetables
4. Integrated Development of Spices
5. Integrated Development of Floriculture
6. Integrated Development of Medicinal and Aromatic Plants
7. Integrated Development of Mushroom
**Centrally Sponsored scheme for Establishment of Agri business support system.**

1) Assistance for preparation of feasibility report
2) Assistance for establishment of common facility center for value addition to fruit and vegetable crops. (Agro Processing Units)
3) Assistance for Establishment of Marketing Information Centers
4) Assistance for Opening of the Retail Outlet (Market support for fruit & vegetable)
5) Incentives on experimental consignments for exports
6) Assistance for Participation in International Exhibition by Entrepreneurs
7) Assistance for value addition of Basmati Rice
8) Assistance for Establishment of Residue Testing Laboratory
9) Assistance for Establishment of food Park / Pack House

**Board/Agency schemes**
- Coconut Development Board sponsored schemes for Integrated coconut farming in coconut growing area for improving productivity improvement
- National Horticulture Board sponsored schemes
- Spices board sponsored schemes
- Coffee Board sponsored schemes
- Schemes of Department of Food and Processing
- APEDA schemes

**Thrust areas for development**
- Promoting organic cultivation of horticultural crops
- Contract farming in medicinal & aromatic crops, vegetables, spices, fruits etc.
- Promotion of IPM, INM technology in horticultural crops
- Strengthening PHT facilities (on farm, cold chain)
- Promoting horticulture mechanization
- Precision agriculture
- Micro irrigation
- Value addition units (processing, extraction)
- Promoting export (AEZ, residue testing labs, awareness about Codex etc.)
- Use of IT technology (software, GIS, satellite data & predictions about diseases, pests, cropped area and yields)
- Strengthening export cell (international market data, campaigning for promotion of Indian produce at International market)

**Production related**
- Area expansion & quality improvement
- Improvement & modernization of nurseries for quality planting material
- Speedy development and multiplication of market led varieties
- Promoting varieties suitable for processing, value addition & exports
- Developing package of practices for export production
• synergization of quality standards for domestic as well as international markets
• Standardization of
  - IPM & INM modules
  - package of practices for organic farming
  - package of practices for high density plantation,
  - pruning & training techniques
  - off season production
  - micro irrigation & fertigation
  - mechanization
  - production of hi-value crops in green house

Processing related
• Use & application of maturity indices
• Improvement in harvesting techniques
• On farm & off farm storage management
• Extension efforts for improvement of harvesting, handling, grading & packing techniques
• Measures to reduce post harvest losses
• Promoting farm/village level primary processing in different crops

Marketing related
• market intelligence
• development of interstate / intrastate markets
• There is need to introduce new technology from wherever it is available in the field of Cold storage, Processing, PHM, etc. Such attempts were successfully made by organizations like Mahagrapes, who consulted "Humifresh" for controlled atmosphere storage. Countries like Mexico, Brazil, Phillipines, Thailand etc. have done excellent work in this regard

Policy issues
• Risk coverage through crop insurance for major horticultural crops including protected cultivation & propagation units
Enactment of legislation for contract farming ensuring the interest of growers