



Impact Study of the National Horticulture Mission (NHM) Scheme in Tamil Nadu



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Preface

India has made rapid strides in food grain production as well as in the production of fruits and vegetables after Independence. The importance of horticulture was realized in recent plans as the diversification to horticultural crops has expanded the options available for improving the livelihood security of farming community. The increasing demand for horticultural crops such as fruits, vegetables, spices, flowers, aromatic and medicinal plants has also necessitated the policy makers to find ways to augment the production of horticulture. Government of India has implemented various schemes for the development of horticulture. National Horticulture Mission was one such programme launched by the Government of India on July 8, 2004 with a view to doubling horticultural production to the extent of 300 million tonnes, to provide holistic growth of the horticulture sector and to promote development and disseminate technologies.

The present study was allotted to AERC, Chennai. Salem, Dharmapuri and Krishnagiri districts were selected for the in depth study. The results of the study, we hope would be useful to policy makers for clear evaluation and better implementation of the scheme so as to achieve the desired objectives. We take this opportunity to thank the Commissioner of Horticulture, Government of Tamil Nadu and the district officials of the Department for all the assistance and support extended by them to carry out the study successfully.

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CHAPTER I

Introduction

1.1 Rationale of the Study

Agriculture continues to be crucial for the growth of the Indian economy. This was proved in 2009 when the rural economy supported the industry and service sectors in India thereby insulating them from the global economic downturn. It acquires greater importance in our policy of inclusive growth. Though its contribution to GDP has come down to 17 per cent, it still employs about 56 per cent of the population. With less than 3 per cent of world's arable area and less than 4 per cent water available for irrigation, it produces enough food for 17 per cent of the world's population.

However, in the year 2006, the country was heading towards a possible food shortage. The year 2007 witnessed a global food crisis exacerbated by a financial crisis. There were times when there was no food available in the global market even if one had enough money. This was a wake-up call for the Indian policymakers. They decided to increase government's investment in agriculture substantially from the previous levels.

Agriculture and allied activities have been given adequate thrust and horticulture is one of the areas as it makes a substantial contribution to the share of agriculture in GDP. Horticulture in India includes fruits, vegetables, spices, medicinal and aromatic plants, flowers, mushroom and a variety of plantation crops such as coconut, areca nut, cashew and cocoa which have been contributing significantly to the share of GDP agriculture.

In order to have a planned development of horticultural crops, the National Horticultural Mission (NHM) was launched on July 8, 2004. The scheme has been implemented in 18 States with effect from 2005-06. Since the programme entered in the fourth year it was proposed to carry out crop based impact evaluation study in different States in order to analyse the impact of the flagship programme vis-à-vis objectives of the NHM scheme especially for the major focused crops in terms of area expansion, increase in production and productivity.

The objectives of the National Horticulture Mission are as follows:

- Doubling horticultural production; that is to achieve a production of 300 million tonnes by 2011-12.
- Establishing convergence and synergy among various on-going and planned programmes in the field of horticultural development.
- Promoting development and dissemination of technologies by blending traditional wisdom and frontier knowledge.

The National Horticulture Mission (NHM) focuses on horticultural research, development, post harvest management, processing and marketing.

The programme under horticultural development aims at increasing the production and productivity of all horticultural crops through adoption of improved technologies in crop production. Under this programme, special emphasis is given for regionally differentiated crops, which are most suitable for the state/region. This programme is implemented by the horticultural departments of the State governments, which also include cooperative organizations, self-help groups, NGOs and commodity organizations for achieving the targeted production and productivity of identified crops. Risk management in the form of crop insurance has also been included.

Post-harvest management would include creating suitable infrastructure for efficient post-harvest management and marketing of horticultural produce (handling, transport, storage and marketing) besides taking up market promotional activities such as dissemination of market information to the farmers, processors, traders, and consumers. Special thrust has been provided to promote export of horticultural produce through establishment of AEZs, for which there is a potential global market.

The Mission also focuses on promoting processing of horticultural produce and value addition by providing incentives for setting up horticultural processing industries and food parks in potential areas and to encourage linkages between the markets for the horticultural produce and processing industry. This activity is supported by the Ministry of Food Processing Industry (MFPI) and implemented through agencies under the administrative control of MFPI and other organizations and the concerned departments of the State governments. These programmes would be credit-linked through NABARD/IDBI/State Financial Corporations. The estimated requirements of funds for the Mission during the X Plan was Rs.65,000 million. Research was given Rs 4,700

million, horticultural development Rs 3,200 million, post-harvest management and marketing Rs. 18,600 million, processing and value addition Rs 8,700 million and the National Horticulture Mission headquarters Rs 1,000 million. The funds were allocated for the years of the X Plan 2004-07.

Guiding Principles under NHM: The Mission has adopted an end-to-end approach covering production, post harvest management, processing and marketing to:

- Assure appropriate returns to growers/producers;
- Promote Research and Development (R and D) of technologies for production, post-harvest management and processing in potential belts/ clusters;
- Enhance acreage, coverage and productivity in potential belts/clusters.
- Adopt a coordinated approach and promote partnership, convergence and synergy among R&D, processing and marketing agencies in public as well as private sectors, at all levels;
- Promote, where appropriate, National Dairy Development Board model of cooperatives to ensure support and adequate returns to farmers; and
- Facilitate capacity- building and human resource development

The State and sub-State level structures have been evolved, keeping in view the need for getting adequate returns for the produce of the farmers and eliminating middleman to the extent possible

1.2 Background of Horticultural Crops in Tamil Nadu

The State of Tamil Nadu can be divided into seven agro-climatic zones, namely, the Western, Southern, North Eastern, North Western, Delta, High Rainfall, and Hilly and Tribal Zones. Tamil Nadu has a rich diversity of horticultural crops, namely tropical, subtropical and temperate crops due to the presence of seven agro-ecological regions each having a unique microclimate suitable for select crops. Moreover, there are areas with temperate climate (above 2,000 m), subtropical climate (1,000 m – 2,000 m), humid tropical climate (500 m – 1,000 m) and tropical climate (up to 500m), thereby making it possible for the production of various horticultural crops. Nearness to the equator and the presence of long stretch of Western Ghats, discontinuous Eastern Ghats and presence of

hills and hillocks in the plains help moderation of climate to ensure the required temperature for growing different kinds of horticultural crops.

In Tamil Nadu, agriculture contributes 12 per cent of the GSDP, while the share of horticulture to the GSDP is estimated at 3.5 per cent. The net sown area is 36 per cent of the total geographical area (national average is 46 per cent). The gross cropped area is 532,000 ha with a cropping intensity of 1.19. Irrigation covers 46 per cent of the cropped area and the remaining 54 per cent is rain-fed.

Production Strengths of Tamil Nadu in Horticulture

Tamil Nadu accounts for nearly 6 per cent of the area under fruits and 4 per cent of the area under vegetables in the country. In terms of production, the State's share is nearly 10 per cent in fruits and 6 per cent in vegetables. Tamil Nadu is also a leading State in the production of flowers. The total area under horticultural crops was 7.99 lakh ha and the total production was 176.78 lakh tonnes during TE 2010-11.

1.2 Main Objectives of the Study

The study aims to understand the impact of the NHM scheme in Tamil Nadu.

The main objectives of the study are:

- To assess the impact in terms of increase in area, production and productivity of identified horticultural crops covered under NHM, keeping 2004-2005 as the base year in the State in general and for the identified crops/districts in particular.
- To assess the extent to which the scheme has helped in creating employment opportunities and enhancement of income of the farmers
- To suggest measures for improving the implementation strategy of NHM in Tamil Nadu

1.4 Data and Methodology

The study area under evaluation consists of three districts of the State of Tamil Nadu, namely, Dharmapuri, Krishnagiri and Salem, all of them in the northwestern part of the State. Hence, the database for evaluation of the National Horticulture Mission in Tamil Nadu is from the three districts, although State level performance has been assessed using the secondary data available from the Department of Horticulture.

The sources of data were both primary and secondary. As regards the primary data, a survey of 150 farmers from the three selected districts, by using the household schedule for studying the impact of the National Horticulture Mission in Tamil Nadu, was made and the data so collected were analyzed and interpreted.

The secondary sources were primarily the library and documentary sources and the State agencies were helpful in providing some aggregate data for the districts, which were appropriately assessed and analyzed for use in the report. Totally 13 villages in the 3 districts were covered for the study. A main thrust was given to banana and mango for Dharmapuri district, mango and banana for Salem district and flowers for Krishnagiri district. The details are furnished in Table 1.1.

Table 1.1 Distributions of Sample Farmers by Location, Crops and Castes

| Districts | Taluk | Study of Crops | Village | Community wise distribution of sample farmers | | | | |
|--------------------|------------------|----------------|------------------------|---|----------|------------|----------|---------------------------|
| | | | | SC | ST | OBC | General | Total |
| Dharmapuri | Palacode | Banana & Mango | Sasthra Mutloo | 11 (22) | 1 (2) | 37 (74) | 1 (2) | 50 (100) |
| | | | Kari mangalam | | | | | |
| | | | Matlampatti | | | | | |
| | | | Byhalli | | | | | |
| Salem | Valapadi | Mango | Veppilaipatti | 5 (10) | 1 (2) | 22 (44) | 2 (4) | 30 (60) |
| | | | Valapadi | | | | | |
| | Panamarathupatti | Banana & Mango | Kurainatham | 5 (10) | - | 15 (30) | - | 20 (40) |
| | | | Erasinampatti | | | | | |
| | | Mango | Kammalapatti | | | | | |
| Krishnagiri | Hosur | Flowers | Chinna Bela Gondapalli | 11 (22) | 1 (2) | 36 (72) | 2 (4) | 50 (100) |
| | | | Bagalur | | | | | |
| | | | D. Dasarepalli | | | | | |
| | | | S.Muduganapalli | | | | | |
| Grand Total | | | 13 | 32 | 3 | 110 | 5 | 150 |

1.5 An Overview

Two new flagship programmes called the National Agriculture Development Programme- commonly known as *Rashtriya Krishi Vikas Yojana* – with a proposed outlay of US \$ 5.5 billion, a programme called National Food Security Mission with a proposed investment of about US \$ 1.0 billion over a five year period were launched in 2007-08.

Tamil Nadu, being a water starving State could not compete with states with perennial water sources; however, with concerted efforts a lot has been done in the horticultural crops since cropping pattern can be suitably adjusted according to the availability of water.

1.5.1 Banana:

The major banana producing States of India are Tamil Nadu, Maharashtra, Karnataka, Gujarat, Andhra Pradesh, Assam and Madhya Pradesh, State wise area, production and productivity of banana is presented in Table 1.2

Table 1.2 State wise Area, Production and Productivity of Banana in India: 2006-07

| Name of the State | Area (000 Ha) | Production (000 t) | Average Productivity (t/ha) |
|-----------------------|---------------|--------------------|-----------------------------|
| Assam | 43.30 | 598.90 | 13.83 |
| Andhra Pradesh | 72.40 | 2173.30 | 30.02 |
| Bihar | 29.00 | 1125.10 | 38.80 |
| Gujarat | 53.40 | 2912.60 | 54.54 |
| Kerala | 59.10 | 463.77 | 7.85 |
| Karnataka | 58.13 | 1441.07 | 24.79 |
| Maharashtra | 73.40 | 4621.90 | 62.97 |
| Madhya Pradesh | 14.90 | 773.00 | 51.88 |
| Orissa | 22.20 | 284.80 | 12.83 |
| Tamil Nadu | 102.22 | 5019.45 | 49.10 |
| West Bengal | 31.70 | 802.10 | 25.30 |
| Others | 40.40 | 641.80 | 15.89 |
| Total | 600.15 | 20857.79 | 34.75 |

Source: National Horticulture Board Database

Banana is a fast growing and high biomass-yielding plant. India is the largest producer of banana next to mango. They are cultivated primarily for their fruit, and to a lesser extent to make fibre and as ornamental plants. The fruits averages 125 grams, of which approximately 75 per cent is water and 25 per cent dry matter. Each individual fruit (known as a banana or “finger”) has a protective outer layer (a peel or skin) with a fleshly, edible inner portion.

About 90 per cent of banana produced is consumed domestically as fresh fruit. Merely 5 per cent is consumed in processed form providing a good potential for future processing. About 2.5 per cent is only processed purely as banana products and the rest as an ingredient in other foods. About 17 varieties of products could be made from banana. The primary candy, which constitutes around 31 per cent , rest as banana pure 9 per cent, banana pulp 3 per cent, banana beer 3 per cent, banana wafers 3 per cent, banana powder 6 per cent and the remaining others. There is a good market demand for all banana products.

1.5.2 Mango:

It belongs to family Ana cardiacease and is the important commercially grown fruit crop of the country. It is called the king of fruits. India has the richest collection of mango varieties. Cultivation of mango is believed to have originated in South East Asia. Mango is being cultivated in southern Asia for nearly six thousand years.

Varieties: There are differencnt varieties of mango such as Neelum, Bangalora, Alponso, Rumani, Banganapalli, Kalepad, Peter, PKM 1, PKM 2, Sendura, Jahangir.Mulgoa,Himayuddin, Paiyur 1, Amrapali, Salem, Arka Anmol, Arka Aruna,Arka Neelkiran,. Banganapalli. Bangalora, Neelum, Rumani,Mulgoa, Alphonso, Senthura, Kalepad, Imam , Pasand are the popular varieties

The total global area under mango is 43. 69 lakh ha and the global production is to the tune of 312.51 lakh tonnes. India ranks first among world’s mango producing countries accounting for about 46 per cent of the global area and 40 per cent of the global production. Other major mango producing countries with their percentage share in the global production include China (11.8), Thailand(5.8 per cent), Mexico (5.4 per cent),

Pakistan (5.1 per cent), Indonesia (4.5 per cent), Brazil (4.3 per cent), Philippines (3.2 per cent), Nigeria (2.6 per cent), Egypt (1.2 per cent). Worldwide production is mostly concentrated in Asia, accounting for 75 per cent of the global production.

The world trade in mango consists of an export of 9.29 lakh tonnes valued at 6189.17 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, Netherlands and for 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 Indonesia 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 for 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 per cent 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 supplies to the European Union, whereas proximity gives Mexico and Haiti a clear advantage in supplying it to the United States market.

Fifty four per cent of European Union imports are in June. French imports are reach peak in April and May, whereas, United Kingdom imports are concentrated during

May to July. German imports are spread more evenly throughout the year. Of the top supplies, 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 May.

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, United Kingdom 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 United Kingdom, U.S.A, Kuwait and Russia. Besides these the fresh mangoes are being exported to Bangladesh, Bahrain, France, Kuwait, Malaysia, Nepal, Singapore and United Kingdom. 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.

1.5.3 Flowers:

Tamil Nadu stands first at the national level in terms of production and productivity (in flowers). The main flowers grown in Tamil Nadu are jasmine, mullai, chrysanthemum, marigold and rose. Flower crops are much in demand locally as well as regionally and internationally. Flower crops are the focus of the crops in Krishnagiri district. In flower crops such as jasmine, rose, chrysanthemum and marigold, there is further scope for additional expansion of 500 ha. Protected cultivation of rose (80ha, 1200 mt, 15mt/ha), gerbera (12 ha, 216 mt, 18 mt/ha) and coronation (8 ha, 64 mt, 8 mt/ha) must be possible in the district.

Varieties

Rose

Plenty of light, humid and moderate temperature ranging from 150°C to 200°C is considered as an ideal condition for production of roses in the tropical and sub-tropical climate of India. When roses are grown at a temperature below 150°C, the interval

between flushes becomes long. A higher temperature above 30°C, roses can be grown provided high humidity is maintained and evaporation rate is brought down.

Rose crop requires to be grown in a soil with good drainage properties rich in organic matter as high as 30 per cent in the top 30cm of the growing beds is provided. The pH of the soil should be around 6 to 6.5, i.e., slightly acidic soil is considered more suitable for rose cultivation.

Rose plants under protected green house condition require approximately 1 ltr of water per plant per day. Except for the very old units, most of the other units are adopting drip irrigation system from the reputed companies to deliver the above quantity of water. A drainage line is also provided below the bed for disposal of excess water.

Gladiolus

Gladiolus is one of the most important bulbous flowering crops grown commercially for cut-flower trade in India. Fertilizer trials have revealed that best results can be obtained with 400 g N, 100g P and 200 g K/ha in cv Snow Princess at the PAU, Ludhiana; 500 g N, 200 g P and 300 g K/ha in cv Vinks Glory at the BCKV, West Bengal; 400 g N, 300 g P and 200 K/has in cv Friendship at the IIHR, Bangalore, and 500 g N, 200 P and 200 g K/ha in cv Tropic Sea at the BCKV, Kalimpong.

Chrysanthemum

Chrysanthemum is recognized as a potent flower crop in India. It is used as a cut-flower for interior decoration and as a loose flowers for making garlands, wreaths and for religious offerings. Technology for year-round blooming in chrysanthemum has been standardized at the NBRI, Lucknow.

Jasmine

Jasmine finds a very important place both in the perfume industry and flower market. Research work on standardization of agro-technology in jasmine was carried out in different parts of India; notable among these are the IIHR, Bangalore and the TNAU, Coimbatore.

Tuberose

Tuberose is grown commercially in India for cut-flower and loose flower trade. Planting during April-March is suitable for single variety. Pre-planting treatment of tuberose single bulbs with GA3 significantly increased the rachis length. Trials conducted at the Indian Botanical Garden, Howrah, West Bengal, revealed that planting of 3.0 to 3.5 cm diameter bulbs at a depth of 4 cm, spaced at a distance of 25 cm each way and fertilized with 20 g N, 40 g / m² each of P2O5 and K2O, resulted in maximum number of flower spike production, with more number of florets on long rachis.

Orchids

Orchids produce remarkably attractive flowers with long lasting quality. *Aerides multiflorum*, a monopodial epiphyte, performed best in a substrate of hard-wood charcoal. *Dendrobium moschatum*, a sympodial epiphytic orchid, showed marked improvement in growth and flowering of the plants with the treatment of tree fern fibre.

Marigold

Marigold is an important floriculture crop. Investigations on the effect of nutrients and growth retardants on African marigold at the UAS, Bangalore, showed that application of N, P, and K at 250:200:100 kg/ha and spraying of cycocel twice at 2,000 ppm in the second and fourth week after transplanting, resulted in higher flower yield and quality flowers. The maximum flower yield (22.19 tones /ha) of African marigold was recorded in the closes spacing (30 cm X 30 cm). Higher level of N (100 kg/ha) recorded a significantly higher flower yield (20-47 tones /ha) as compared to control at the GAU, Anand

CHAPTER II

Area, Production and Productivity of Horticultural Crops in Tamil Nadu

2.1 Status of Horticultural Crops in the State of Tamil Nadu

The Government of Tamil Nadu has recognized the emergence of horticulture as growth engine of agriculture sector in recent years and set up a Mission for horticulture development to give an impetus to cultivation, processing for value addition and marketing of vegetables, fruits, flowers and medicinal plants in the State.

The objectives of the mission are improving production through balanced nutrient management, providing suitable mechanism for the supply of quality planting material and giving impetus to need based research, providing adequate infrastructure for post harvest management and marketing and encouraging active involvement of farmer's association in adoption of modern technologies.

Under Tamil Nadu "Horticulture Development Mission", there are three mini-missions namely:

1. Technology Generation and Research
2. Transfer of Technology and Development and
3. Post-harvest Management and Marketing Linkages

Mini Mission I: Technology Generation and Research will be implemented by Tamil Nadu Agriculture University.

Mini Mission II: Under Mini Mission II Transfer of Technology and Development, there are five Development Missions namely (1) Fruit Development Mission (2) Vegetable Development Mission (3) Cashew Development Mission (4) Floriculture Development Mission and (5) Medicinal Plant Development Mission, which are implemented by the Department of Horticulture.

Mini Mission III: Post harvest Management and Market linkages are implemented by the Department of Agriculture Marketing and Agri- Business. The working of the Tamil Nadu Horticulture Mission is closely monitored by the State Government

It was aimed at achieving 8 per cent annual growth rate during X Five Year Plan in the horticulture sector in Tamil Nadu. It was also aimed to double the horticulture production by the year 2011-12 in consonance with the National Horticulture Mission.

Tamil Nadu stands first at the national level in terms of production and productivity in flowers. The Government has announced commercial floriculture policy for the benefit of floriculture. Hosur and the Nilgiris have been announced as the Agri-Export Zones for flowers, which have been included in the National Horticulture Map.

Tamil Nadu Horticulture Development Agency (TANHODA)

Tamil Nadu Horticulture Development Agency has been registered as a Society under Tamil Nadu Societies Registration Act, 1975. The Governing Council of the Society consists of the Chairman, Managing Director and six official members. TANHODA has been conceived as a “**Special Purpose Vehicle**” for the purpose of implementing schemes like National Horticulture Mission, Micro Irrigation and National Bamboo Mission.

Centrally Sponsored Schemes

1. National Horticulture Mission

The scheme is implemented in 20 districts, namely, Coimbatore, Erode, Salem, Dharmapuri, Krishnagiri, Cuddalore, Madurai, Theni, Dindigul, Trichy, Tirunelveli, Sivagangai, Ramanathapuram, Nilgiris, Perambalur, Vellore, Pudukottai, Villupuram, Kanyakumari and Thanjavur. The scheme covers crops of mango, aonla, banana, cashew, cocoa, chillies, turmeric, aromatic plants and flowers, which are promoted through a cluster approach.

The scheme has been implemented through the District Mission Committees headed by the District Collectors and the Deputy Director of Horticulture of the districts are the Member Secretaries of the Committees.

Plantation Infrastructure and Development

In order to ensure adequate quantity of planting materials, 20 model and 20 small nurseries in public sector and 20 model and 40 small nurseries in private sector were set

up in 2005-06. In addition, rehabilitation of 4 tissue culture units was undertaken both in the public and private sectors.

Establishment of New Gardens

It was proposed to undertake area expansion in horticultural crops in Tamil Nadu. The State ranks first in the production of flowers and tapioca, second in the production of mango and third in the production of sapota. Mango and banana are the leading fruit crops in Tamil Nadu accounting for over 84 per cent of the area under fruit and over 87 per cent of the total fruits production. Off-season production of mango and round the year production of grapes is unique to Tamil Nadu.

The main fruits growing in Tamil Nadu are banana, mango, sapota, grapes, guava and aonla.

Fruits and the main production areas (districts) are shown below:

Banana: Thiruchirapalli, Thoothukudi, Tirunelveli, Pudukottai, Thanjavur

Mango: Krishnagiri, Vellore, Dindigul, Theni, Dharmapuri, Madurai

Sapota: Tirunelveli, Erode, Karur

Grapes: Theni, Coimbatore

Guava: Madurai, Dindugul, Vellore, Virudhunagar

Aonla: Tirunelveli, Sivagangai, Thoothukudi, Coimbatore, Dindigul, Erode.

2.1.1 Banana Varieties:

Dessert: Robusta, Dwarf, Cavendish, Grand Daine, Rasthali, Vayal Vazhai, Poovan, Nendren, Red Banana, Karpooravalli, Co: 1 Matti, Snnachenkadai, Udayam and Neypoovan are popular varieties in banana. Cavendish groups are generally preferred in export market.

Culinary: Monthan, Vayal Vazhai, Ash Monthan and Chkkia are cultivated for culinary purpose. Nendren is a dual purpose variety used for dessert and culinary.

Hill Areas: The popular varieties of banana suitable for hilly are Virupakshi. Sirumalai and Namarai, Red Banana, Manoranjithan (Santhana Vazhai) and Ladan are also cultivated in hills.

2.1.2 Mango

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

Individually, mangoes are the most significant of the horticultural crops. Among the varieties grown here are Bangalore (30,000 ha), Alphonso (4,000 ha), Sendhura (2,000 ha) and Banganapallee (1,000 ha). Other varieties of mangoes occupy an additional 2,965 ha. There is scope for increasing the area under mangoes in the next 10 years to the tune of 20,000 ha in the order of varieties Bangalore (12,000 ha), Alphonso (5,000 ha), Sendhura, Banganapalle and other varieties (1,000 ha each). Among the departmental suggestions for improving production of mangoes are:

- Introduction of hybrid varieties of mangoes
- Adoption of high density of planting the crops
- Planting of export oriented and nutrient varieties and
- Planting of high juicy varieties
- And among the suggestions for improving productivity are:
- Adoption of high density planting crops
- Adoption of regular pruning of the crops
- Application of chemical fertilizers through fustigation methods
- Spraying of growth regulators to reduce fruit drops and
- Application of keltor chemicals to increase yield

The main vegetables grown in Tamil Nadu are tapioca, tomato, onion, brinjal and drumstick. These account for over 85 per cent of the total area as well as the production of vegetables. Vegetables and the main production areas (districts) are as follows.

| | | |
|------------------|---|---|
| Tapioca | : | Namakkal,Salem,Dharmapuri |
| Drumstick | : | Thoothukudi, Dindigul,Karur |
| Tomato | : | Coimbatore, Dharmapuri, Salem, Krishnagiri |
| Onion | : | Perambalur, Thiruchirapalli, Namakkal, Dindidul |
| Brinjal | : | Vellore, Kanchipuram, Theni, Coimabotre |
| Cabbage | : | Nilgiris, Krishnagiri, Dindigul |

- Potato** : Nilgiris, Dindigul
Bhendi : Kancheepuram, Vellore, Dindigul

The main spices grown in Tamil Nadu are chillies, coriander, tamarind, turmeric and curry leaves.

The spices and their main area of production districts are:

- Curry Leaves** : Coimbatore, Salem, Thoothukudi
Turmeric : Erode, Coimbatore, Salem
Coriander : Cuddalore, Perambalur, Virudhunagar
Chillies : Ramanathapuram, Thoothukudi
Tamarind : Dindigul, Theni, Coimbatore, Madurai

The main flowers grown in Tamil Nadu are rose, jasmine, mullai marigold, and chrysanthemum

The flowers and their main areas of production (districts) are:

- Jasmine** : Madurai, Thirunelveli, Erode, Dindigul
Mullai : Vellore, Coimbatore, Cuddalore
Marigold : Thiruchirapalli, Theni, Dindigul, Karur
Rose : Krishnagiri, Dindigul, Dharmapuri
Chrysanthemum: Krishnagiri, Dharmapuri, Salem

Brief Profile of the selected districts:

Dharmapuri District

Dharmapuri district is bounded on the east by Thiruvannamalai district, on the west by Karnataka State, on the north by Krishnagiri district and on the south by Salem district. It has a total geographical area of about 4,498 km²

In the district, there is one municipality, 8 panchayat unions and 236 town panchayats. There are 470 revenue villages in two revenue divisions, namely Dharmapuri and Hosur. There are 5 taluks (Palacode, Harur, Pennagaram, Dharmapuri and Pappireddipatti) and 8 development blocks (Palacode, Karimangalam, Harur, Pennagaram, Nallampalli, Dharmapuri, Morappur and Pappireddipatti).

Land Use, Soils and Climate

The soils of the district are black to mixed loam and red sandy loam. The climate is both hot and dry. The average rainfall of the district is 895.6 mm and the maximum temperatures range from 25° to 40° C whereas the minimum temperatures range from 15° C to 25° C. While the summer season is during March-June, the rainy season is during July-November. The winter season stretches from December to February, when the temperatures are rather mild.

Salem District

The city of Salem is the district headquarters of Salem. The district is well connected by rail and road networks. Salem district is known for its mangoes, steel and Mettur dam, which is a major source of irrigation and drinking water for the state of Tamil Nadu.

With an area of over 5,205 sq km, Salem district is bordered by the districts of Dharmapuri in the north, Erode in the west, Namakkal in the south, Perambalur in the south and southeast and Villuppuram in the east. It has a population of about 2.9 million.

Climate, Soil, Other Factors and Mangoes

Salem district experience low rainfall and the climate are semiarid. It receives an annual rainfall of 925 mm. The temperature often exceeds 20° C. Of the annual rainfall, 47.6 per cent (447 mm) is received during the North East Monsoon 33.7 per cent (316 mm) during South West Monsoon 17.4 per cent (164 mm) during summer and 1.3 per cent (12 mm) during winter. The major sources of irrigation are through wells (93 per cent). Of the total geographical area, the net sown area occupies 52.3 per cent (272, 069 ha) and the remaining area is under forest (24.1 per cent), barren and uncultivable land (8 per cent) and land put to non-agricultural uses accounts for 9.4 per cent.

Krishnagiri District

Krishnagiri district falls under the Northwestern zone of the seven agro-ecological zones of the State of Tamil Nadu. Administratively, the district is divided into two revenue divisions: Krishnagiri and Hosur. There are 5 revenue taluks, namely

Krishnagiri, Hosur, Pochampalli, Uthangarai and Denkanikottai. The ten Panchayat unions of the district are Kelamagalam, Thally, Hosur, Shoolagiri, Veppanapalli, Krishnagiri, Kaveripattinam, Bargur, Mathur and Uthangarai. Besides, there are 2 Municipalities, 7 town panchayats, 337 village panchayats and 637 revenue villages.

Land Use, Soils and Climate

Krishnagiri district is most suitable for cultivation of horticultural crops such as the plantation crops, fruits, vegetables, spices, flowers and medicinal plants. They are grown throughout the year, by way of its moderate climate (a rainfall of over 830 mm), high altitude (from 300 m to 1,400 m) and fertility of the soil.

Red loamy and black mixed loam soils are prevalent in the district. As for soil fertility, nitrogen is low at 98 per cent and medium at 2 per cent. Phosphorous, on the other hand, is low at 20 per cent, medium at 50 per cent and high at 30 per cent. Potassium is low at 15 per cent, medium at 55 per cent and high at 30 per cent. The climate has a maximum temperature of 37° C in summer, usually in May, and a minimum of 17° C in the winter, usually in January. From an average rainfall of 830.5 mm over the year, the highest of 339.7 mm is received from the northeast monsoon; 311.6 mm is received from the summer months, 160.2 mm from southwest monsoon and 19 mm from the winter months. Thus, the rainfall is distributed throughout the year even as northeast monsoon (September-December) gets the highest, more than a third of the rainfall.

The district wise details of geographical, cultivable and horticultural crop area in Tamil Nadu are given in Table 2.1

2.1 District wise Geographical, Cultivable and Horticultural Crop Area in Tamil Nadu

(area in hectares)

| S.No. | District | Geographical area | | Cultivable area | | % Cultivable area to geographical area | | Area under Horticultural Crops | | % Horticultural area to cultivable area | |
|-------|------------------|-------------------|---------|-----------------|------------|--|------------|--------------------------------|------------|---|------------|
| | | 2008-09 | 2004-05 | TE 2008-09 | TE 2004-05 | TE 2008-09 | TE 2004-05 | TE 2008-09 | TE 2004-05 | TE 2008-09 | TE 2004-05 |
| 1 | Chennai | 17098 | 17098 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | Kancheepuram | 443210 | 443210 | 125176 | 121362 | 28.24 | 27.38 | 5318 | 7588 | 4.25 | 6.25 |
| 3 | Thiruvallur | 342243 | 342243 | 110284 | 99585 | 32.22 | 29.1 | 13526 | 14445 | 12.26 | 14.517 |
| 4 | Cuddalore | 367781 | 367781 | 214214 | 215348 | 58.24 | 58.55 | 42039 | 48430 | 19.62 | 22.49 |
| 5 | Villupuram | 722203 | 722203 | 336079 | 320395 | 46.54 | 44.36 | 25573 | 29977 | 7.61 | 9.36 |
| 6 | Vellore | 592018 | 592018 | 190058 | 172918 | 32.1 | 29.21 | 26430 | 25783 | 13.91 | 14.91 |
| 7 | Thiruvannamalai | 631205 | 631205 | 220594 | 235903 | 34.95 | 37.37 | 8269 | 9581 | 3.75 | 4.06 |
| 8 | Salem | 520530 | 520530 | 210562 | 202889 | 40.45 | 38.98 | 56114 | 47541 | 26.65 | 23.43 |
| 9 | Namakkal | 336335 | 336335 | 160293 | 167151 | 47.66 | 49.7 | 41209 | 29802 | 25.71 | 17.83 |
| 10 | Dharmapuri | 449777 | 449777 | 153302 | 169908 | 34.08 | 37.78 | 45790 | 40684 | 29.87 | 23.94 |
| 11 | Krishnagiri | 514326 | 514326 | 173814 | 179679 | 33.79 | 34.93 | 44842 | 46361 | 25.80 | 25.80 |
| 12 | Coimbatore | 472322 | 747079 | 182306 | 324410 | 38.6 | 43.42 | 52641 | 46730 | 28.88 | 14.40 |
| 13 | Thiruppur* | 519559 | - | 196042 | - | 37.73 | - | 18708 | - | 9.54 | - |
| 14 | Erode | 571389 | 816191 | 206587 | 300065 | 36.16 | 36.76 | 34700 | 28341 | 16.80 | 9.44 |
| 15 | Thiruchirappalli | 440383 | 440383 | 174689 | 171002 | 39.67 | 38.83 | 28476 | 28954 | 16.31 | 16.93 |
| 16 | Karur | 289557 | 289557 | 97066 | 100432 | 33.52 | 34.68 | 12039 | 9344 | 12.40 | 9.30 |

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| | | | | | | | | | | | |
|--------------------|----------------|-----------------|-----------------|----------------|----------------|-------------|--------------|---------------|---------------|--------------|--------------|
| 17 | Perambalur | 175739 | 369137 | 97906 | 212765 | 55.71 | 57.64 | 12006 | 54006 | 12.26 | 25.38 |
| 18 | Ariyalur* | 193398 | - | 110190 | - | 56.98 | - | 35493 | - | 32.21 | - |
| 19 | Pudukottai | 466329 | 466329 | 153392 | 158724 | 32.89 | 34.04 | 13814 | 16684 | 9.01 | 10.51 |
| 20 | Thanjavur | 339657 | 339657 | 197548 | 189295 | 58.16 | 55.73 | 8560 | 10012 | 4.33 | 5.28 |
| 21 | Thiruvavarur | 209709 | 209709 | 154554 | 146472 | 73.7 | 69.85 | 1314 | 1112 | 0.85 | 0.76 |
| 22 | Nagapattinam | 271583 | 271583 | 164015 | 143118 | 60.39 | 52.7 | 6744 | 3273 | 4.11 | 2.29 |
| 23 | Madurai | 374173 | 374173 | 139146 | 138560 | 37.19 | 37.03 | 16453 | 16225 | 11.82 | 11.71 |
| 24 | Theni | 324230 | 324230 | 115403 | 112053 | 35.59 | 34.56 | 40591 | 34733 | 35.17 | 30.99 |
| 25 | Dindigul | 626664 | 626664 | 229681 | 255945 | 36.65 | 40.84 | 62262 | 63313 | 27.11 | 24.74 |
| 26 | Ramanathapuram | 408957 | 408957 | 188568 | 191823 | 46.11 | 46.91 | 28826 | 26071 | 15.29 | 13.59 |
| 27 | Virudhunagar | 424323 | 424323 | 133328 | 141278 | 31.42 | 33.29 | 14738 | 14188 | 11.05 | 10.04 |
| 28 | Sivagangai | 418900 | 418900 | 112770 | 122173 | 26.92 | 29.17 | 13341 | 13359 | 11.83 | 10.93 |
| 29 | Thirunelveli | 670638 | 682308 | 163017 | 166419 | 24.31 | 24.39 | 35190 | 27814 | 21.59 | 16.71 |
| 30 | Thoothukudi | 470724 | 459054 | 176293 | 179289 | 37.45 | 39.06 | 37088 | 40550 | 21.04 | 22.62 |
| 31 | The Nilgiris | 254485 | 254485 | 77522 | 79514 | 30.46 | 31.25 | 33941 | 77783 | 43.78 | 47.82 |
| 32 | Kanyakumari | 167200 | 167200 | 78497 | 78536 | 46.95 | 46.97 | 21796 | 40255 | 27.77 | 51.26 |
| State Total | | 13026645 | 13026645 | 5042896 | 5097011 | 38.7 | 39.13 | 937831 | 852939 | 18.60 | 16.73 |

Note: * Thiruppur and Ariyalur were newly created districts
Source: Season and Crop Report Tamil Nadu 2004-05 and 2008-09

It could be observed from Table 2.1 that the total cultivable area in Tamil Nadu decreased by 10.6 per cent from 5097011 ha during the triennium ending 2004-2005 to 5042896 ha during TE 2008-2009. But on the contrary the percentage of horticultural area to cultivable area in Tamil Nadu significantly increased from 16.14 per cent during the triennium ending 2004-2005 to 18.79 per cent during TE 2008-09. This is indicative of the fact that the measures taken under National Horticulture Mission Scheme made favourable impact on the area under horticultural crops.

In absolute terms, the area under horticultural crops increased from 858396 ha during TE 2004-05 to 947483 ha during TE 2008-09. While analyzing the horticultural area district wise, Table 2.1 reveals that Theni district with an area of 63373 ha under horticultural crops stood first among all the districts in Tamil Nadu during TE 2008-09 and the lowest of 1335 ha was found in Thiruvarur district which is basically in a delta region. Whereas during 2004-09 the Niligiris district occupied the first place among all the districts in terms of area under horticultural crops (77877 ha) and the same Thiruvarur district as in TE 2004-05 had the lowest area (1112 ha). It could be seen from Table 2.1 that over 44 per cent of the total cultivable area was under horticultural crops in the Niligiris district which was found to be the highest percentage during TE 2008-09, whereas this position went to Kanyakumari district (51.27%) during 2004-05. In Thiruvarur district less than 1 per cent of the total cultivable area was under horticultural crops during the triennium ending 2004-05 and 2008-09, which was the lowest percentage compared to all other districts in Tamil Nadu.

2.2 Impact of NHM on Growth of Horticultural Crops in Tamil Nadu:

Details regarding area and production of horticultural crops in Tamil Nadu are presented in Table 2.2

Table 2.2 Area and Production of Horticulture Crops in Tamil Nadu (TE 1980-81 to TE 2008-09)

Area: lakh hectare

Production: lakh tonnes

| S. No. | Year | Fruits | | Vegetables | | Spices | | Flowers | | Medicinals | | All Horticulture Crop | |
|--------|------------|--------|--------|------------|--------|--------|--------|---------|--------|------------|--------|-----------------------|--------|
| | | Area | Produ. | Area | Produ. | Area | Produ. | Area | Produ. | Area | Produ. | Area | Produ. |
| 1 | TE 1980-81 | - | - | - | - | - | - | - | - | - | - | 4.6 | 44.78 |
| 2 | TE 1981-82 | - | - | - | - | - | - | - | - | - | - | 5.48 | 40.84 |
| 3 | TE 1982-83 | - | - | - | - | - | - | - | - | - | - | 5.68 | 43.22 |
| 4 | TE 1983-84 | - | - | - | - | - | - | - | - | - | - | 5.63 | 46.31 |
| 5 | TE 1984-85 | - | - | - | - | - | - | - | - | - | - | 5.95 | 54.70 |
| 6 | TE 1985-86 | - | - | - | - | - | - | - | - | - | - | 5.97 | 53.11 |
| 7 | TE 1986-87 | - | - | - | - | - | - | - | - | - | - | 5.84 | 53.84 |
| 8 | TE 1987-88 | - | - | - | - | - | - | - | - | - | - | 9.15 | 58.59 |
| 9 | TE 1988-89 | - | - | - | - | - | - | - | - | - | - | 5.99 | 63.03 |
| 10 | TE 1989-90 | - | - | - | - | - | - | - | - | - | - | 6.15 | 73.00 |
| 11 | TE 1990-91 | - | - | - | - | - | - | - | - | - | - | 6.04 | 70.87 |
| 12 | TE 1991-92 | 1.45 | 30.59 | 1.61 | 40.97 | 1.36 | 1.57 | 0.11 | 0.54 | 0.00 | 0.00 | 4.53 | 73.67 |
| 13 | TE 1992-93 | 1.63 | 29.67 | 1.51 | 35.93 | 1.75 | 2.08 | 0.12 | 0.58 | 0.00 | 0.00 | 5.01 | 68.26 |
| 14 | TE 1993-94 | 1.80 | 36.21 | 1.71 | 45.16 | 1.78 | 2.72 | 0.12 | 0.62 | 0.00 | 0.00 | 5.41 | 84.71 |

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|----|--------------|------|-------|------|-------|------|-------|------|------|-------|------|-------|--------|
| 15 | TE 1994-95 | 1.86 | 48.19 | 1.75 | 43.98 | 1.65 | 2.73 | 0.14 | 0.71 | 0.00 | 0.00 | 5.4 | 95.61 |
| 16 | TE 1995-96 | 1.95 | 49.13 | 1.58 | 39.57 | 1.43 | 1.91 | 0.15 | 0.82 | 0.00 | 0.00 | 5.11 | 91.43 |
| 17 | TE 1996-97 | 1.95 | 38.56 | 1.69 | 40.02 | 1.60 | 2.24 | 0.16 | 0.95 | 0.00 | 0.00 | 5.4 | 81.77 |
| 18 | TE 1997-98 | 2.11 | 50.33 | 1.93 | 50.76 | 1.57 | 2.49 | 0.17 | 0.17 | 0.00 | 0.00 | 5.78 | 103.75 |
| 19 | TE 1998-99 | 2.21 | 45.09 | 1.86 | 42.58 | 1.71 | 2.65 | 0.17 | 1.3 | 0.00 | 0.00 | 5.95 | 91.62 |
| 20 | TE 1999-2000 | 2.2 | 37.58 | 2.05 | 49.88 | 1.78 | 3.19 | 0.18 | 1.37 | 0.00 | 0.00 | 6.21 | 92.02 |
| 21 | TE 2000-01 | 2.23 | 40.06 | 2.20 | 59.39 | 1.68 | 6.62 | 0.19 | 1.45 | 0.00 | 0.00 | 6.3 | 107.52 |
| 22 | TE 2001-02 | 2.29 | 43.74 | 2.18 | 57.53 | 1.61 | 6.37 | 0.19 | 1.47 | 0.00 | 0.00 | 6.27 | 109.11 |
| 23 | TE 2002-03 | 2.23 | 40.14 | 1.62 | 35.98 | 1.46 | 6.24 | 0.18 | 1.35 | 0.001 | 0.02 | 5.491 | 83.73 |
| 24 | TE 2003-04 | 2.21 | 36.09 | 1.91 | 46.73 | 1.54 | 6.93 | 0.20 | 1.62 | 0.04 | 0.07 | 5.9 | 91.44 |
| 25 | TE 2004-05 | 2.36 | 44.98 | 2.15 | 63.08 | 1.43 | 8.05 | 0.23 | 1.87 | 0.05 | 0.09 | 6.22 | 118.07 |
| 26 | TE 2005-06 | 2.58 | 57.97 | 2.34 | 65.47 | 1.30 | 7.84 | 0.25 | 2.02 | 0.05 | 0.09 | 6.52 | 133.39 |
| 27 | TE 2006-07 | 2.69 | 69.4 | 2.42 | 73.51 | 1.42 | 8.02 | 0.25 | 1.97 | 0.07 | 0.10 | 6.85 | 153 |
| 28 | TE 2007-08 | 2.80 | 67.78 | 2.44 | 76.61 | 1.40 | 7.39 | 0.25 | 2.09 | 0.08 | 0.18 | 6.97 | 154.05 |
| 29 | TE 2008-09 | 2.95 | 68.03 | 2.52 | 71.86 | 1.54 | 8.63 | 0.29 | 2.56 | 0.10 | 0.48 | 7.4 | 151.56 |
| 30 | TE 2009-10 | 3.07 | 73.05 | 2.63 | 77.62 | 1.6 | 9.32 | 0.30 | 2.77 | 0.1 | 0.51 | 7.7 | 163.27 |
| 31 | TE 2010-11 | 3.19 | 79.35 | 2.73 | 83.82 | 1.66 | 10.07 | 0.31 | 2.99 | 0.10 | 0.55 | 7.99 | 176.78 |

Table 2.2 reveals that the total area under all horticultural crops in Tamil Nadu remarkably increased by 73.7 per cent from 4.6 lakh ha during triennium ending 1980-81 to 7.99 lakh ha during TE 2010-11. In tune with the increase in area, the production of horticultural crops also tremendously increased by 294 per cent from 44.78 lakh tonnes to 176.78 lakh tonnes over a period of 3 decades (TE 1980-81 to TE 2010-11). Analyzing the growth of area and production of horticultural crops for the reference period of the study i.e. from 2004-05 to 2008-09, the table vividly shows, that there was a steady increase in area and production as the area increased by 19 per cent from 6.22 lakh ha to 7.4 lakh ha and production by 28.4 per cent from 118.07 lakh tonnes to 151.56 lakh tonnes. The same trend reflected in case of fruits and flowers as well during the period under study.

The growth rate in area and yield of horticultural crops in Tamil Nadu for the period 1980-81 to 2008-09 is depicted in Table 2.3

Table 2.3 Growth Rate in Area and Yield of Horticulture Crops in Tamil Nadu

| S. No. | Period | (Percentage) | | | | | | | | | | | |
|--------|----------------------|---------------|-----------------|---------------|----------------|-----------------|---------------|----------------|---------------|---------------|----------------|-----------------------|---------------|
| | | Fruits\$ | | Vegetables\$ | | Spices\$ | | Flowers\$ | | Medicinal\$# | | All Horticulture Crop | |
| | | Area | Yield | Area | Yield | Area | Yield | Area | Yield | Area | Yield | Area | Yield |
| 1 | 1980-81 to 1990-91* | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 2.48 (1.94) | 3.0 1.80 |
| 2 | 1990-91 to 2000-01* | 4.5 (9.09) | -1.4 -(0.87) | 3.5 (5.2) | 0.03 (0.05) | 1.1 (1.08) | 8.4 (3.1) | 6.1 (14.19) | 2.6 (0.38) | NA | NA | 1.9 (2.43) | 1.8 (1.57) |
| 3 | 2000-01 to 2008-09* | 3.8 (6.76) | 5.2 (4.08) | 3.1 (2.08) | 3.2 (3.02) | -1.7 (-1.87) | 4.3 (3.36) | 5.7 (7.18) | 1.1 (2.35) | 5.5 (2.56) | -3.6 (-0.2) | 2.5 (3.11) | 4.8 (4.21) |
| 4 | 2000-01 to 2004-05** | 1.13 | 3.09 | -0.46 | 3.63 | -3.22 | 4.48 | 3.82 | 0.08 | 7.82 | 0.56 | -0.26 | 4.06 |
| 5 | 2004-05 to 2005-06** | 4.46 | 8.23 | 4.23 | -2.37 | -4.76 | 3.44 | 4.17 | -0.13 | 0.00 | 0.00 | 2.36 | 3.74 |
| 6 | 2004-05 to 2006-07** | 4.36 | 10.09 | 3.94 | 1.16 | -0.23 | 0.11 | 2.78 | -1.04 | 11.21 | -7.70 | 3.21 | 5.42 |
| 7 | 2004-05 to 2007-08** | 4.27 | 5.98 | 3.16 | 1.69 | -0.53 | -1.61 | 2.08 | 0.70 | 11.75 | 5.58 | 2.28 | 3.80 |
| 8 | 2004-05 to 2008-09** | 4.46 | 3.81 | 3.18 | -0.57 | 1.48 | -0.09 | 4.64 | 1.65 | 13.86 | 14.61 | 3.47 | 1.52 |

.Notes:

1. *The growth rate for the decennial period are based on semi log time trend and the figures in the parentheses are respective 't' values.
2. ** Growth rates are based on annual averages. Annual Average Growth Rate = ((Ln(value year end)-Ln(value year begin))/number of years X 100.
3. \$ The growth rate of area and yield for Fruits, Vegetables, Spices, Flowers, Medicines have not been calculated from 1980-81 to 1990-91 due to unavailability of data
4. # The growth rate for medicinal crop area and yield has not been calculated from 1990-91 to 2000-01 due to non-availability of data

It is understood from Table 2.3 that the growth rate of area and yield of all horticultural crops in Tamil Nadu during the period 1980-81 to 1990-91 worked out to 2.48 per cent and 3.0 per cent respectively, whereas there was a fall in the growth rate of area (1.9 %) and yield (1.8 %) during the period 1990-91-2000-01. Again a significant growth rate of 2.5 per cent in area and 4.8 per cent in yield could be observed from 2000-01 to 2008-09. The table shows the growth rate of area and yield of all horticultural crops during the reference period of study from 2004-05 to 2008-09 and it worked out to 3.47 per cent and 1.52 per cent respectively. The table reveals that the growth rate of yield declined to 1.52 per cent during 2004-05 from 3.80 per cent during the period 2004-05 to 2007-08 although the growth rate of area increased to 3.47 per cent from 2.28 per cent.

2.3 District wise Growth of Horticulture Crops and Impact of NHM

District wise data regarding area and production of horticultural crops for the period TE 2004-05 and TE 2008-09 are furnished in Table 2.4 and 2.5. Table 2.6 provides information on average annual growth rate in area and yield of horticultural crops at district level in Tamil Nadu from TE 2004-05 to TE 2008-09

Table 2.4 Area and Production of Horticultural Crops at district level in Tamil Nadu (TE 2004-2005)

(Area in hectare and production in m.tonnes)

| S. No. | District | Fruits | | Vegetables | | Spices | | Flowers | | Medicinals | | All Horticulture Crop | |
|--------|------------------|--------|--------|------------|---------|--------|--------|---------|--------|------------|--------|-----------------------|---------|
| | | Area | Produ. | Area | Produ. | Area | Produ. | Area | Produ. | Area | Produ. | Area | Produ. |
| 1 | Chennai | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | Kancheepuram | 3193 | 30146 | 3319 | 80723 | 306 | 4452 | 311 | 2293 | - | - | 7129 | 117614 |
| 3 | Thiruvallur | 10407 | 119809 | 1857 | 47692 | 620 | 1643 | 1327 | 10115 | 17 | 17 | 14228 | 179276 |
| 4 | Cuddalore | 5644 | 116898 | 8251 | 301903 | 3826 | 4781 | 591 | 4433 | - | - | 18312 | 428015 |
| 5 | Villupuram | 3126 | 57212 | 18770 | 493839 | 2750 | 32826 | 478 | 3374 | 0.00 | 0.00 | 25124 | 587251 |
| 6 | Vellore | 16391 | 191226 | 4246 | 55958 | 1948 | 9953 | 3100 | 24134 | 16 | 16 | 25701 | 281287 |
| 7 | Thiruvannamalai | 3359 | 117493 | 3671 | 116425 | 1224 | 6610 | 1334 | 11246 | 38 | 760 | 9626 | 252534 |
| 8 | Salem | 4690 | 83230 | 27250 | 826441 | 5173 | 122338 | 1343 | 11240 | 7 | 15 | 38463 | 1043264 |
| 9 | Namakkal | 3592 | 75908 | 21881 | 867077 | 3042 | 10474 | 88 | 603 | - | - | 28603 | 954062 |
| 10 | Dharmapuri | 7369 | 52882 | 26673 | 1174821 | 4954 | 13057 | 1222 | 9274 | 1 | 20 | 40219 | 1250054 |
| 11 | Krishnagiri | 36075 | 196213 | 5511 | 132055 | 2645 | 10379 | 1867 | 14738 | 7 | 35 | 46105 | 353420 |
| 12 | Coimbatore | 11429 | 361434 | 11048 | 162232 | 7988 | 283692 | 969 | 7935 | 214 | 2375 | 31648 | 817668 |
| 13 | Thiruppur* | - | - | - | - | - | - | - | - | - | - | - | - |
| 14 | Erode | 8360 | 271514 | 8879 | 251970 | 9238 | 67274 | 1491 | 12986 | 15 | 75 | 27983 | 603819 |
| 15 | Thiruchirappalli | 12452 | 431502 | 10212 | 327128 | 4455 | 8959 | 882 | 8121 | 34 | 680 | 28035 | 776390 |
| 16 | Karur | 4248 | 120451 | 3488 | 131544 | 1045 | 2397 | 221 | 1710 | - | - | 9002 | 256102 |

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| | | | | | | | | | | | | | |
|--------------------|----------------|---------------|----------------|---------------|----------------|---------------|---------------|--------------|---------------|-------------|-------------|---------------|-----------------|
| 17 | Perambalur | 1850 | 21748 | 11582 | 329929 | 5508 | 8665 | 85 | 720 | 6 | 105 | 19031 | 361167 |
| 18 | Ariyalur* | - | - | - | - | - | - | - | - | - | - | - | - |
| 19 | Pudukottai | 5093 | 194357 | 188 | 3341 | 432 | 895 | 293 | 2509 | - | - | 6006 | 201102 |
| 20 | Thanjavur | 5697 | 128950 | 882 | 16813 | 276 | 816 | 187 | 1511 | 5 | 25 | 7047 | 148115 |
| 21 | Thiruvarur | 639 | 16942 | 230 | 5318 | 184 | 604 | 18 | 124 | - | - | 1071 | 22988 |
| 22 | Nagapattinam | 1896 | 29533 | 290 | 9089 | 313 | 1077 | 187 | 1416 | - | - | 2686 | 41115 |
| 23 | Madurai | 9608 | 159029 | 2268 | 35080 | 2641 | 8124 | 1348 | 10943 | 1222 | 1222 | 17087 | 214398 |
| 24 | Theni | 14053 | 278305 | 5369 | 130060 | 4622 | 23855 | 340 | 2348 | 33 | 165 | 24417 | 434733 |
| 25 | Dindigul | 26647 | 276949 | 15662 | 257997 | 7591 | 21861 | 2652 | 21785 | - | - | 52552 | 578592 |
| 26 | Ramanathapuram | 467 | 9254 | 192 | 3002 | 25033 | 14485 | 101 | 771 | 1 | 1 | 25794 | 27513 |
| 27 | Virudhunagar | 3872 | 52367 | 2010 | 18690 | 7503 | 14331 | 673 | 5348 | 1747 | 1747 | 15805 | 92483 |
| 28 | Sivagangai | 3003 | 56270 | 193 | 3198 | 5334 | 9160 | 10 | 78 | - | - | 8540 | 68706 |
| 29 | Thirunelveli | 13276 | 320926 | 3220 | 46596 | 3442 | 8361 | 1486 | 12410 | 272 | 272 | 21696 | 388565 |
| 30 | Thoothukudi | 10408 | 514583 | 4323 | 102233 | 24423 | 96134 | 442 | 3669 | 1713 | 1713 | 41309 | 718332 |
| 31 | The Nilgiris | 800 | 25407 | 6154 | 158994 | 4193 | 12064 | 19 | 185 | 94 | 485 | 11260 | 197135 |
| 32 | Kanyakumari | 7935 | 188039 | 7709 | 218075 | 2413 | 5747 | 168 | 1339 | 13 | 215 | 18238 | 413415 |
| State Total | | 235579 | 4498577 | 215328 | 6308223 | 143122 | 805014 | 23233 | 187358 | 5455 | 9943 | 622717 | 11809115 |

Table 2.4 shows that the total area and production of all horticultural crops including fruits, vegetables, flowers in Tamil Nadu during the triennium ending 2004-05 worked out to 622717 ha and 11809115 m.tonnes respectively. District wise analysis of area and production indicates that Dindigul district topped the list in terms of area (52552 ha) and Dharmapuri district with a total production of 1250054 m.tonnes ranked first in terms of production among all the districts in Tamil Nadu during triennium ending 2004-05. Thiruvarur district had the lowest area (1071 ha) under horticultural crops and also had the lowest production (22988 m.tonnes) during the triennium ending 2004-05 compared to other districts in Tamil Nadu.

The area under fruits worked out to 36075 ha in Krishnagiri district which was the highest area among all the districts and in case of production of fruits, Thothukudi district had a record level of 514583 m tonnes of fruits production.

The total area under vegetables worked out to 215328 ha and the total production worked out to 6308223m.tonnes during triennium ending 2004-05. The data reveals that in terms of area under vegetables Salem district ranked first with 27250 ha among all other districts in Tamil Nadu and the last place went to Pudukottai district (188 ha.). The production of vegetables in Dharmapuri district during TE 2004-05 worked out to 1174821 m.tonnes which put the district at the top of all the districts in Tamil Nadu and Ramanathapuram district had the lowest production of vegetables (3002 m.tonnes).

Turning to flowers, in terms of area and production, Vellore district occupied the first place, the area and production being 3100 ha and 24134 m.tonnes respectively followed by Dindigul district. Sivagangai district had the lowest area under flowers (10 ha) as well as the least production (78 m.tonnes) compared to other districts in Tamil Nadu.

Table 2.5: Area and Production of Horticultural Crops at District level in Tamil Nadu (TE 2008-2009)

(Area in hectare and production in tonnes)

| S. No. | District | Fruits | | Vegetables | | Spices | | Flowers | | Medicinals | | All Horticulture Crop | |
|--------|------------------|--------|--------|------------|---------|--------|--------|---------|--------|------------|--------|-----------------------|---------|
| | | Area | Produ. | Area | Produ. | Area | Produ. | Area | Produ. | Area | Produ. | Area | Produ. |
| 1 | Chennai | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | Kancheepuram | 3755 | 26859 | 3291 | 61751 | 378 | 8365 | 222 | 1706 | 21 | 109 | 7667 | 98790 |
| 3 | Thiruvallur | 12018 | 92346 | 1197 | 19449 | 523 | 604 | 1391 | 11117 | 38 | 38 | 15167 | 123554 |
| 4 | Cuddalore | 6264 | 183815 | 4510 | 177050 | 1064 | 3507 | 727 | 5604 | 29 | 241 | 12594 | 370217 |
| 5 | Villupuram | 3793 | 77435 | 13781 | 387079 | 2614 | 10825 | 369 | 2769 | 93 | 984 | 20650 | 479092 |
| 6 | Vellore | 20838 | 278227 | 4198 | 91446 | 2131 | 7574 | 2158 | 19621 | 34 | 126 | 29359 | 396994 |
| 7 | Thiruvannamalai | 3980 | 239736 | 5758 | 113118 | 751 | 5425 | 2573 | 26111 | 1164 | 17673 | 14226 | 402063 |
| 8 | Salem | 14979 | 285849 | 37811 | 1057486 | 9942 | 125210 | 2773 | 28229 | 90 | 958 | 65595 | 1497732 |
| 9 | Namakkal | 6457 | 178857 | 32103 | 1282992 | 3914 | 21454 | 155 | 1304 | 27 | 83 | 42656 | 1484690 |
| 10 | Dharmapuri | 11377 | 135579 | 30586 | 882652 | 9054 | 25432 | 2138 | 21544 | 464 | 9086 | 53619 | 1074293 |
| 11 | Krishnagiri | 34977 | 359904 | 8426 | 205206 | 2861 | 11576 | 2205 | 17700 | 35 | 127 | 48504 | 594513 |
| 12 | Coimbatore | 14166 | 544110 | 9006 | 205718 | 5263 | 268416 | 912 | 9516 | 203 | 1721 | 29550 | 1029481 |
| 13 | Thiruppur* | 6750 | 229817 | 8763 | 281677 | 3496 | 30066 | 45 | 362 | 1058 | 1058 | 20112 | 542980 |
| 14 | Erode | 13137 | 687157 | 14964 | 549015 | 9675 | 68141 | 1676 | 13902 | 1078 | 1795 | 40530 | 1320010 |
| 15 | Thiruchirappalli | 12344 | 332952 | 11202 | 369143 | 4328 | 9877 | 960 | 8058 | 62 | 629 | 28896 | 720659 |

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| | | | | | | | | | | | | | |
|--------------------|----------------|---------------|----------------|---------------|----------------|---------------|---------------|--------------|---------------|-------------|--------------|---------------|-----------------|
| 16 | Karur | 6434 | 249278 | 4154 | 168653 | 1280 | 4286 | 572 | 4831 | 399 | 1589 | 12839 | 428637 |
| 17 | Perambalur | 789 | 23598 | 9886 | 156894 | 1514 | 6780 | 39 | 324 | 33 | 257 | 12261 | 187853 |
| 18 | Ariyalur* | 956 | 21231 | 983 | 41759 | 2572 | 2065 | 54 | 380 | 728 | 728 | 5293 | 66163 |
| 19 | Pudukottai | 4800 | 175021 | 1208 | 30290 | 954 | 1111 | 378 | 1497 | 0 | 0 | 7340 | 207919 |
| 20 | Thanjavur | 5424 | 197000 | 1205 | 30445 | 244 | 813 | 264 | 2171 | 41 | 202 | 7178 | 230631 |
| 21 | Thiruvarur | 679 | 20251 | 380 | 10483 | 149 | 324 | 56 | 426 | 21 | 21 | 1285 | 31505 |
| 22 | Nagapattinam | 3477 | 40487 | 605 | 9979 | 696 | 2400 | 316 | 2444 | 305 | 305 | 5399 | 55615 |
| 23 | Madurai | 10901 | 192365 | 2417 | 59027 | 5117 | 10328 | 1629 | 12756 | 458 | 743 | 20522 | 275219 |
| 24 | Theni | 17630 | 537543 | 7249 | 173990 | 5272 | 18986 | 444 | 3743 | 64 | 266 | 30659 | 734528 |
| 25 | Dindigul | 29378 | 372297 | 14966 | 274071 | 6448 | 24886 | 3487 | 34023 | 1111 | 2476 | 55390 | 707753 |
| 26 | Ramanathapuram | 652 | 19978 | 245 | 3243 | 28457 | 10265 | 83 | 643 | 10 | 10 | 29447 | 34139 |
| 27 | Virudhunagar | 5306 | 76063 | 2176 | 24630 | 8652 | 15572 | 609 | 4906 | 602 | 905 | 17345 | 122076 |
| 28 | Sivagangai | 3317 | 5081 | 173 | 2262 | 5303 | 5898 | 18 | 142 | 3 | 3 | 8814 | 58386 |
| 29 | Thirunelveli | 19852 | 364752 | 4370 | 72522 | 3883 | 10131 | 1760 | 13776 | 429 | 429 | 30294 | 461610 |
| 30 | Thoothukudi | 11582 | 502307 | 3884 | 101226 | 21436 | 76453 | 576 | 5132 | 657 | 657 | 38135 | 685775 |
| 31 | The Nilgiris | 1158 | 43345 | 5213 | 158041 | 3597 | 9612 | 104 | 1172 | 394 | 4442 | 10466 | 216612 |
| 32 | Kanyakumari | 8590 | 290058 | 7914 | 188612 | 2205 | 8911 | 229 | 1710 | 1 | 1 | 18939 | 489292 |
| State Total | | 295760 | 6828298 | 252624 | 7189909 | 153773 | 805293 | 28922 | 257619 | 9652 | 47662 | 740731 | 15128781 |

Table 2.5 depicts details regarding area and production of horticultural crops at district level in Tamil Nadu during triennium ending 2008-09. It could be observed from Table 2.5 that the total area and production of all horticultural crops including fruits, vegetables, spices, flowers and medicinal crops in Tamil Nadu stood at 740731 ha and 15128781 m tonnes respectively during TE 2008-09. Out of this area, a major chunk of 65595 ha (8.8%) was under all horticultural crops in Salem district and out of the total production in Tamil Nadu, this district had a record production of 1497732 m.tonnes (9.9%). As evident from Table 2.5 that lowest area under all horticultural crop was in Thiruvavur district and the lowest production (31505m.tonnes) was also found in this district during TE 2008-09.

It is understood from Table 2.5 that the total area under fruits was 295760 ha and the total production of fruits worked out to 68,28,298 m.tonnes in Tamil Nadu during TE 2008-09. District wise analysis shows that highest area under fruits was found in Krishnagiri district in 34977 ha(11.83%) whereas the highest production of fruits of 687157 m.tonnes (10%) could be found in Erode district during the triennium ending 2008-09. As could be seen from Table 2.5 that Ramanathapuram district had the lowest area (652 ha) under fruits whereas the lowest production of fruits went to Sivagangai district during the triennium ending 2008-09. In case of flowers the total area was 2.8922 ha and the production was 257619 m.tonnes during TE2008-09 in Tamil Nadu. District wise analysis shows that Dindigul district with an area of 3487 ha(12%) occupied the first place in terms of area and in terms of production the pride of place went to Salem district for 28229 m.tonnes(11%).

**Table 2.6: Average Annual Growth Rate in Area and Yield of Horticulture Crops at district level in Tamil Nadu
from TE 2004-05 to TE 2008-09**

| S.No. | District | Annual growth rates (per cent)* | | | | | | | | | | | |
|-------|------------------|----------------------------------|-------|------------|-------|--------|--------|---------|-------|-----------|--------|-----------------------|-------|
| | | Fruits | | Vegetables | | Spices | | Flowers | | Medicinal | | All Horticulture Crop | |
| | | Area | Yield | Area | Yield | Area | Yield | Area | Yield | Area | Yield | Area | Yield |
| 1 | Chennai | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2 | Kancheepuram | 3.24 | -5.55 | -0.17 | -5.19 | 4.23 | 8.39 | -6.74 | 0.83 | 0 | 0 | 1.46 | -4.94 |
| 3 | Thiruvallur | 2.88 | -8.08 | -8.78 | -9.16 | -3.40 | -16.61 | 0.94 | 0.95 | 16.08 | 0 | 1.28 | -8.72 |
| 4 | Cuddalore | 2.08 | 6.96 | -12.08 | 1.41 | -5.60 | 9.39 | 4.14 | 0.55 | 0 | 0 | -7.49 | 4.59 |
| 5 | Villupuram | 3.87 | 2.18 | -6.18 | 1.31 | -1.01 | -21.17 | -5.18 | 1.22 | 0 | 0 | -3.92 | -0.15 |
| 6 | Vellore | 4.80 | 2.69 | -0.23 | 10.05 | 1.79 | -7.26 | -7.24 | 3.10 | 15.08 | 26.19 | 2.66 | 4.23 |
| 7 | Thiruvannamalai | 3.39 | 10.87 | 9.00 | -9.58 | -9.76 | 5.82 | 13.14 | 3.71 | 8.44 | -5.51 | 7.81 | 1.48 |
| 8 | Salem | 23.22 | 1.45 | 6.55 | -1.62 | 13.06 | -12.60 | 14.50 | 3.92 | 15.08 | 12.06 | 10.68 | -3.44 |
| 9 | Namakkal | 11.73 | 5.41 | 7.67 | 0.17 | 5.04 | 9.29 | 11.32 | 4.10 | 0 | 0 | 7.99 | 0.85 |
| 10 | Dharmapuri | 8.69 | 10.14 | 2.74 | -8.46 | 12.06 | 1.27 | 11.19 | 5.67 | 12.34 | -0.42 | 5.75 | -8.78 |
| 11 | Krishnagiri | -0.62 | 12.75 | 8.49 | 0.32 | 1.57 | 0.61 | 3.33 | 0.33 | 32.18 | -6.41 | 1.01 | 9.39 |
| 12 | Coimbatore | 4.29 | 3.89 | -4.09 | 8.84 | -8.34 | 7.24 | -1.21 | 4.85 | -1.05 | -5.39 | -1.37 | 5.98 |
| 13 | Thiruppur* | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 14 | Erode | 9.04 | 9.53 | 10.43 | 5.13 | 0.92 | -0.67 | 2.34 | -0.98 | 15.49 | -21.99 | 7.41 | 8.23 |
| 15 | Thiruchirappalli | -0.17 | -5.01 | 1.85 | 0.57 | -0.58 | 2.53 | 1.69 | -1.85 | 12.01 | -13.57 | 0.60 | -2.09 |

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| | | | | | | | | | | | | | |
|--------------------|----------------|-------------|-------------|-------------|--------------|-------------|--------------|-------------|-------------|--------------|--------------|-------------|-------------|
| 16 | Karur | 8.30 | 6.24 | 3.49 | 1.47 | 4.05 | 7.56 | 19.02 | 1.75 | 0 | 0 | 7.10 | 3.19 |
| 17 | Perambalur | -17.0 | 8.67 | -3.16 | -11.69 | -25.83 | 20.92 | -15.56 | -0.39 | 24.16 | -16.19 | -8.79 | -4.28 |
| 18 | Ariyalur* | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 19 | Pudukottai | -1.18 | -0.91 | 17.20 | 6.89 | 15.85 | -11.52 | 5.09 | -15.42 | 0 | 0 | 4.01 | -3.34 |
| 20 | Thanjavur | -0.98 | 9.46 | 6.24 | 5.63 | -2.46 | 2.39 | 6.89 | 0.35 | 42.08 | -0.29 | 0.37 | 8.48 |
| 21 | Thiruvavarur | 1.21 | 2.35 | 10.04 | 3.53 | -4.22 | -8.24 | 2.69 | 1.98 | 0 | 0 | 3.64 | 2.66 |
| 22 | Nagapattinam | 12.13 | -5.82 | 14.71 | -12.83 | 15.98 | 0.04 | 8.49 | 0.42 | 0 | 0 | 13.96 | -7.92 |
| 23 | Madurai | 2.52 | 1.28 | 1.27 | 9.13 | 13.23 | -8.43 | 3.78 | -0.72 | -19.63 | 9.68 | 3.66 | 1.33 |
| 24 | Theni | 4.53 | 8.63 | 6.00 | -0.18 | 2.63 | -7.20 | 5.34 | 3.99 | 13.25 | -3.69 | 4.55 | 5.94 |
| 25 | Dindigul | 1.95 | 3.97 | -0.91 | 2.12 | -3.26 | 5.86 | 5.47 | 3.44 | 0 | 0 | 1.05 | 2.98 |
| 26 | Ramanathapuram | 6.67 | 8.72 | 4.88 | -3.33 | 2.56 | -9.45 | -3.92 | 0.29 | 46.05 | 0 | 2.65 | 1.67 |
| 27 | Virudhunagar | 6.30 | 1.164 | 1.59 | 3.93 | 2.85 | -1.19 | -1.99 | 0.27 | -21.31 | 8.15 | 1.86 | 3.69 |
| 28 | Sivagangai | 1.99 | -50.08 | -2.19 | -4.74 | -0.12 | -8.69 | 11.76 | 0.23 | 0 | 0 | 0.63 | -3.89 |
| 29 | Thirunelveli | 8.05 | -5.49 | 6.11 | 2.74 | 2.41 | 1.43 | 3.38 | -1.29 | 9.11 | 0 | 6.68 | -3.23 |
| 30 | Thoothukudi | 2.14 | -2.62 | -2.14 | 1.94 | -2.61 | -1.97 | 5.30 | 1.42 | -19.17 | 0 | -1.60 | 0.67 |
| 31 | The Nilgiris | 7.39 | 3.29 | -3.32 | 3.19 | -3.07 | -1.48 | 33.99 | 2.92 | 28.66 | 15.63 | -1.46 | 3.35 |
| 32 | Kanyakumari | 1.59 | 7.08 | 0.52 | -3.43 | -1.80 | 10.57 | 6.19 | -1.31 | -51.29 | -56.11 | 0.75 | 2.62 |
| State Total | | 4.55 | 3.79 | 3.19 | -0.58 | 1.44 | -1.43 | 4.38 | 1.99 | 11.41 | 19.93 | 3.47 | 1.48 |

It is observed from Table 2.6 that the average annual growth rate in area and yield of horticultural crops in Tamil Nadu for the triennium ending 2004-05 to 2008-09 worked out to 3.47 per cent and 1.48 per cent respectively. District wise data shows that there was tremendous increase in area under horticultural crops in Nagapattinam district as the average annual growth rate in area worked out to 13.96 per cent over the triennium ending period 2004-05 to 2008-09, probably due to the rehabilitation work undertaken after Tsunami by making use of NHM.

Turning to yield of horticultural crops, there was an impressive 9.39 per cent average annual growth rate found in Krishnagiri district. The table reveals that out of 32 districts, the annual growth rate of area under horticultural crops was found to be negative in six districts, the percentage ranging from -1.37 to -8.79 during the triennium ending 2004-05 to 2008-09. Similar trend could also be observed in terms of yield of horticultural crops over the period in 11 districts due to various factors. However, the welcoming feature is that, the growth rate of area under horticultural crop was found to be positive in 26 districts the percentage ranging from 0.37 to 13.96 during the same period. Similar increasing trend could be observed in terms of yield of horticultural crops over this period in the remaining districts in Tamil Nadu.

2.4 Growth of Area and Production of Selected Crops under NHM

Mango and Banana are the leading fruit crops of Tamil Nadu, accounting for over 84 per cent of the area under fruits and over 87 per cent of the total fruit production. Off-season production of mangos and round the year production of grapes is unique to Tamil Nadu.

2.4.1 The case of Banana

Banana is large perennial crop with leaf sheaths that trunk like pseudostem. Banana has its origin in tropical region of South East Asia. Banana is a nutritious gold mine. They are high in vitamin B6, which helps fight infection and is essential for the synthesis of heme, the iron containing part of hemoglobin. They are also rich in potassium and are a great source of fibre.

International Scenario:

Bananas are the fifth largest agricultural commodity in world trade after cereals, sugar, coffee and cocoa. India, Ecuador, Brazil and China alone produce half of total bananas of the world. The advantage of this fruit is its availability round the year.

The major banana exporting countries are Ecuador, Colombia, Costa Rica and Philippines and the major importing countries are USA, Belgium, Germany and United Kingdom. According to FAO estimates, India occupies the highest area under banana in the world. It may be noted that 11 per cent of the total global area under banana belongs to India. India ranks first in banana production, contributing about 23 per cent in world pool of banana production.

2.4.2 The Case of Mango

Introduction

Mango (*Mangifera indica* Linn) is the most import fruit of India and is known as “King of fruits”. The main mango producing states in India are Andhra Pradesh (25%), Uttar Pradesh (21%), Karnataka (9.8%), Bihar (9.7%), Gujarat (6.1%) and Maharastra (5.09%). Total export of mangoes from India is 79.06 thousand tonnes, valuing at Rs.141.9 crores during 2006-07. India exports mango to over 50 countries worldwide. India’s exports to UAE, Saudi Arabia, Qatar, Bahrain, UK, Kuwait, Singapore, Malaysia and Bangladesh together account for 97 per cent of total exports of fresh mangoes from India.

World Scenario

Mango covers an area of 4369000 ha with a production of 31.2 million tonnes. India occupies top position among mango growing countries of the world and produces 40 per cent of the total world mango production. China and Thailand are third among mango producing countries with a total tonnage of 3,676 and 1,800 thousand tonnes respectively. Brazil, Egypt, Pakistan, Mexico and China have higher productivity/ha compared to India (having an average productivity of 6.2 tonnes/ha). The details are given below in table 2.6b.

Table 2.6A Major Producing Countries of Mango in the World (2006)

| Country | Area ('000ha) | Production ('000 tonnes) | Productivity (tonnes/ha) | % Share of World Production |
|--------------------|---------------|--------------------------|--------------------------|-----------------------------|
| India | 2,021 | 12,538 | 6.2 | 40.1 |
| China | 434 | 3,676 | 8.5 | 11.8 |
| Mexico | 285 | 1,800 | 6.3 | 5.8 |
| Pakistan | 183 | 1,679 | 9.2 | 5.4 |
| Indoesia | 273 | 1,413 | 5.2 | 4.5 |
| Brazil | 84 | 1,348 | 16.0 | 4.3 |
| Philippines | 172 | 1,003 | 5.8 | 3.2 |
| Nigeria | 138 | 812 | 5.9 | 2.6 |
| Egypt | 35 | 380 | 10.9 | 1.2 |
| Others | 578 | 4,996 | 8.6 | 16.0 |
| World | 4,369 | 31,251 | 7.1 | |

Source: Indian Horticulture Database, 2006

Indian Scenario

Mango is grown almost in all the states of India. Andhra Pradesh tops the list of mango producing states. Other major producing states are Uttar Pradesh, Maharastra, Karnataka, Bihar and Gujarat. Rests of the states have quite less production. The details are given below in tables 2.6B and 2.6C

Table 2.6B Area Production and Productivity of Mango India

| Year | Area ('000ha) | Production ('000 tonnes) | Productivity (tonnes/ha) |
|---------|---------------|--------------------------|--------------------------|
| 2001-02 | 1,575.8 | 10,020.2 | 6.4 |
| 2002-03 | 1,623.4 | 12,733.2 | 7.8 |
| 2003-04 | 1,906.7 | 11,490.0 | 6.0 |
| 2004-05 | 1,970.4 | 11,829.7 | 6.0 |
| 2005-06 | 2,020.6 | 12,537.9 | 6.2 |

Source: Indian Horticulture Database, 2006

Table 2.6C Area, Production and Productivity of leading Mango growing States in India

| State | Area (1000 ha) | | | Productivity (tonnes/ha) | | |
|----------------|-------------------|---------|---------|-----------------------------|---------|---------|
| | 2003-04 | 2004-05 | 2005-06 | 2003-04 | 2004-05 | 2005-06 |
| Andhra Pradesh | 402.2 | 391.9 | 399.9 | 8.0 | 8.0 | 8.0 |
| Uttar Pradesh | 250.5 | 247.0 | 251.5 | 8.4 | 10.5 | 10.6 |
| Karnataka | 116.3 | 120.8 | 124.5 | 9.6 | 9.8 | 9.9 |
| Bihar | 140.0 | 140.1 | 140.2 | 11.0 | 6.2 | 8.7 |
| Gujarat | 69.9 | 89.7 | 96.0 | 7.1 | 8.1 | 8.0 |
| Maharastra | 425.8 | 432.7 | 444.5 | 1.5 | 1.5 | 1.4 |
| Tamil Nadu | 114.9 | 118.4 | 125.1 | 5.4 | 4.6 | 4.3 |
| West Bengal | 67.8 | 69.1 | 70.1 | 6.0 | 6.7 | 7.3 |
| Kerala | 85.4 | 90.6 | 88.0 | 4.5 | 5.8 | 5.8 |
| Orissa | 115.1 | 120.3 | 125.3 | 3.5 | 3.5 | 3.4 |
| Others | 118.8 | 149.7 | 156.2 | 4.9 | 5.0 | 5.2 |
| Total | 1,906.7 | 1,970.4 | 2,020.6 | 6.02 | 6.00 | 6.0 |

Source: Indian Horticulture Database, 2006

2.4.3 Flowers

The main flowers grown in Tamil Nadu are Jasmine, Mullai, Chrysanthemum, Marigold and Rose. Flowers occupy an area of 1,751 ha with a production of 10,488 metric tonnes and a productivity 8.17 mt/ha. Plantation crops occupy the least area of 214 ha and produce 2,882 metric tonnes at productivity of 13.81 mt/ha. Overall, as shown in Table 2.1, a total area of 49,553 ha is under the horticultural crops, which produces as much as 418,152 metric tonnes and the average productivity is 10.274 mt/ha.

Flower crops (1,751 Ha, 10,488 mt, 8.17 mt/ ha) are much in demand, locally as well as regionally and internationally. Jasmine (625 ha, 5,032 mt, 7.76 mt/ ha) is the most important of the flower crops, followed closely by rose (349 ha, 2,355 mt, 7.25 mt/ha) and chrysanthemum (184 ha, 268 mt, 2 mt/ha), Marigold (79 ha, 786 mt, 8 mt/ha), mullai (72 ha, 682 mt, 8.5 mt /ha), jadhimali (29 ha, 218 mt, 9 mt/ha) and arali (125 ha,

695 mt, 15 mt /ha) are other important and commercially viable and profitable crops for the farmers of the area. Other flower crops occupy 288 ha with a production of 452 mt and a productivity of 8.75 mt/ha. Flowers are the third most important of the horticultural crops in the district, after fruit crops and vegetable crops.

Plenty of flowers are grown up in India. Depending upon the preference of the domestic consumers, utility (like preparation of scent, flower bouquet, flower vase etc) climatic conditions, export opportunities etc, only selected flower crops are undertaken. The consumers perfume also plays a vital role in the culture of flowers. In Tamil Nadu, the following flowers are under cultivation. (i) Rose (2163 ha), (ii) Jasmine (12192 ha) (iii) Mullai (3168 ha) (iv) Jathimalli (975 ha) (v) Crossamale (2020 ha) (vi) chrysanthium (2686 ha) (vii) Marygold (825 ha) (viii) Arali (1598 ha) (ix) Tube rose (1875 ha) (x) Chevamthi (1475 ha) (xi) others (3412 ha) Total 32389 ha

Table 2.7 presents the details regarding area and production of three selected horticultural crops in Tamil Nadu for the period from TE 1980-81 to TE 2008-09 and growth rates in area and production of these three crops are illustrated in Table 2.8 for the period TE1980-81 to TE 2008-09.

Table: 2.7 Area and Production of Selected Horticulture Crops in Tamil Nadu
(area in ha; production in metric tonnes)

| Years | Banana | | Mango | | Flowers | |
|------------|--------|------------|--------|------------|---------|------------|
| | Area | Production | Area | Production | Area | Production |
| TE 1980-81 | 60423 | 1486625 | 36432 | 567860 | 0 | 0 |
| TE 1981-82 | 58341 | 1402775 | 36673 | 584160 | 0 | 0 |
| TE 1982-83 | 54933 | 1225155 | 36542 | 554327 | 0 | 0 |
| TE 1983-84 | 54112 | 1119009 | 37320 | 473133 | 0 | 0 |
| TE 1984-85 | 53457 | 1358519 | 37269 | 416301 | 0 | 0 |
| TE 1985-86 | 56839 | 1568822 | 38320 | 290724 | 0 | 0 |
| TE 1986-87 | 56574 | 1742970 | 38765 | 264824 | 0 | 0 |
| TE 1987-88 | 56346 | 1663323 | 41375 | 173200 | 0 | 0 |
| TE 1988-89 | 56353 | 1586443 | 44783 | 215963 | 0 | 0 |
| TE 1989-90 | 56200 | 1606520 | 49051 | 260127 | 0 | 0 |
| TE 1990-91 | 58435 | 1772960 | 52377 | 324653 | 0 | 0 |
| TE 1991-92 | 60785 | 1999127 | 54341 | 339020 | 1167 | 58000 |
| TE 1992-93 | 66925 | 2160267 | 57534 | 337043 | 1267 | 63667 |
| TE 1993-94 | 74589 | 2380450 | 61899 | 366723 | 1367 | 71667 |
| TE 1994-95 | 80214 | 2848543 | 67547 | 453820 | 1500 | 64444 |
| TE 1995-96 | 82565 | 3357177 | 73998 | 521000 | 1667 | 71667 |
| TE 1996-97 | 81234 | 3523423 | 79728 | 519367 | 1600 | 98000 |
| TE 1997-98 | 82526 | 3693840 | 86494 | 496660 | 1667 | 114000 |
| TE 1998-99 | 85434 | 3640127 | 92709 | 509147 | 1733 | 114000 |
| TE 1999-00 | 87370 | 3644947 | 99140 | 475843 | 1680 | 137333 |
| TE 2000-01 | 85915 | 3266940 | 104213 | 493922 | 1604 | 792778 |
| TE 2001-02 | 84144 | 3248525 | 107662 | 436312 | 1585 | 143000 |
| TE 2002-03 | 81360 | 3150084 | 110214 | 583813 | 1604 | 142333 |
| TE 2003-04 | 77467 | 2965147 | 112573 | 603508 | 1585 | 148000 |
| TE 2004-05 | 76452 | 2937811 | 115109 | 637090 | 1652 | 183756 |
| TE 2005-06 | 82411 | 3541384 | 119491 | 564185 | 1716 | 199612 |
| TE 2006-07 | 93784 | 4420272 | 123135 | 590579 | 1795 | 226286 |
| TE 2007-08 | 104216 | 5061285 | 126394 | 644865 | 1738 | 244316 |
| TE 2008-09 | 111268 | 5228118 | 128030 | 680480 | 1798 | 266794 |

Source: Department of Horticulture, Government of Tamil Nadu, Chennai-05

Note: TE 1908-81 denotes Triennium Average for the period 1978-79 to 1980-81

Table 2.7 shows that there was a declining trend in area under banana crop from TE 1980-91 to TE 1990-91 as the area declined by 3 per cent from 60423 ha in TE 1980-81 to 58435 ha in TE 1990-91. Since then an upward trend in area could be noticed and there was an appreciable increase in area by 90 per cent from 58435 ha in TE 1990-91 to 111268 ha in TE 2008-09. In tune with increase in area, the production of banana also increased manifold. In absolute term, the production of banana increased by 252 per cent from 1486625 m.tonnes in TE 1980-81 to a whopping 5228118 m.tonnes in TE 2008-09.

With regard to area under mango, Table 2.7 reveals that there was tremendous increase in area by 251 per cent from 36432 ha in TE 1980-81 to 128030 ha in TE 2008-2009. It is significant to note that the production of mango, of course steadily increased over 3 decades but the increase was not proportionate to the increase in area. The production of mango increased from 567860 m.tonnes in TE 1980-81 to 680480 m.tonnes in TE 2008-09, registering a growth rate of 19 per cent.

The statistical data regarding area and production of flowers were not available for the period from TE 1980-81 to TE 1990-91. As could be seen from Table 2.7 the area as well as production of flowers increased steadily from TE 1990-91 to TE 2008-09

A look at the Table 2.7 shows that the implementation of National Horticulture Mission Scheme yielded good results as the area and production of the selected horticultural crops banana, mango and flowers substantially increased from TE 2004-05 to TE 2008-09.

Table 2.8: Growth rate in area and yield rate of selected horticulture crops in Tamil Nadu (Percentage)

| S.No. | Period | Banana | | Mango | | Flowers\$ | |
|-------|----------------------|------------------|----------------|----------------|------------------|---------------|-----------------|
| | | Area | Yield | Area | Yield | Area | Yield |
| 1 | 1980-81 to 1990-91* | -0.09 (-0.26) | 3.00 (3.62) | 3.5 (6.34) | -13.8 (-6.47) | NA | NA |
| 2 | 1990-91 to 2000-01* | 3.9 (6.67) | 3.4 (4.11) | 13.7 (2.04) | -8.7 (-1.29) | 3.8 (4.69) | 16.3 (2.68) |
| 3 | 2000-01 to 2008-09* | 3.4 (2.64) | 3.4 (5.24) | 2.6 (14.45) | 1.4 (1.12) | 1.7 (5.71) | -4.3 (-0.60) |
| 4 | 2000-01 to 2004-05** | 1.34 | 1.48 | 1.99 | 3.11 | 0.30 | -4.84 |
| 5 | 2004-05 to 2005-06** | 2.99 | 2.90 | 1.09 | -1.15 | 1.27 | 5.24 |
| 6 | 2004-05 to 2006-07** | 5.11 | 4.65 | 1.21 | 3.84 | 1.18 | 3.32 |
| 7 | 2004-05 to 2007-08** | 6.50 | 2.34 | 1.57 | 3.69 | 1.87 | 4.04 |
| 8 | 2004-05 to 2008-09** | 7.03 | 0.91 | 1.86 | 1.70 | 3.25 | 2.28 |

Notes:

*The growth rate for the decennial period are based on semi log time trend and the figures in the parentheses are respective 't' values.

** Growth rates are based on annual averages. Annual Average Growth Rate = ((Ln(value year end)- Ln(value year begin))/number of years X 100.

\$ The growth rate of area and yield for flowers have not been calculated from 1980-81 to 1990-91 due to nonavailability of data

Table 2.8 indicates that there was a negative growth rate in area under banana to the level of -0.09 per cent and 't' value worked out to -0.26 whereas there was a positive

growth rate (3.00%) in yield during 1980-81 to 1990-91. The reverse was the case with regard to mango crop during the same period. During the period 2000-01 - 2008-09, the growth rate in area under banana drastically rose to 3.4 per cent from the negative growth rate of -0.09 during 1980-81 to 1990-91 and a marginal increase in the growth rate of yield (3.4%) could also be observed in the same period. But on the other hand, the growth rate in area under mango as evident from Table 2.8 decreased to 2.6 per cent during 2000-01 - 2008-09 from 3.5 per cent and 13.7 per cent respectively 1980-81 - 1990-91 and 1990-91 - 2000-01 whereas the growth rate in yield of mango took a positive turn which worked out to 1.4 per cent from the negative growth rate of -13.8 per cent during 1980-81 to 1990-91. In case of flowers, the growth rate in area declined to 1.70 per cent and yield dipped to a negative -4.3 per cent during 2000-01 - 2008-09 from 3.8 per cent and 16.3 per cent respectively 1990-91 to 2000-01.

While analyzing the growth rate for the reference period of the study i.e. 2004-05 to 2008-09, table 2.8 reveals that there was a high percentage of growth rate in area in respect of all the three crops namely banana, mango and flowers as the percentage being 7.03, 1.86 and 3.25 from 6.5 per cent, 1.57 per cent and 1.87 per cent respectively during 2004-05 to 2007-08. On the contrary, the growth percentage of yield in case of banana, mango, and flowers registered a declining trend as the percentage worked out to 0.91, 1.70 and 2.28 during 2004-05 to 2008-09 from 6.50 per cent, 1.57 per cent and 1.87 per cent respectively during 2004-05 to 2007-08.

2.5 Districtwise Growth of Area and Production of Selected Crops under NHM

Analysis of area and production of selected horticultural crops at district level in Tamil Nadu for the period TE 2004-05 and TE 2008-09 is presented in Table 2.9. Annual growth rate of area and yield of banana, mango and flowers is furnished in Table 2.10

Table: 2.9 Area, Production of Horticulture Crops in Tamil Nadu: TE 2004-05 & TE 2008-09

| Districts | TE 2004-05 | | | | | | TE 2008-09 | | | | | |
|----------------|------------|------------|--------|------------|---------|------------|------------|------------|--------|------------|---------|------------|
| | Mango | | Banana | | Flowers | | Mango | | Banana | | Flowers | |
| | Area | Production | Area | Production | Area | Production | Area | Production | Area | Production | Area | Production |
| Coimbatore | 3860 | 18990 | 6102 | 285671 | 969 | 7935 | 4293 | 28667 | 13157 | 479766 | 949 | 8315 |
| Cuddalore | 593 | 2833 | 3919 | 104663 | 591 | 4433 | 733 | 4017 | 4821 | 177688 | 644 | 4449 |
| Dharmapuri | 6450 | 26151 | 468 | 19879 | 1222 | 9274 | 10206 | 69224 | 1425 | 68012 | 2114 | 16825 |
| Dindugal | 13943 | 33308 | 3102 | 131764 | 2652 | 21785 | 15879 | 86407 | 5236 | 248648 | 3008 | 24365 |
| Erode | 973 | 4649 | 6433 | 249044 | 1491 | 12986 | 1082 | 5925 | 11371 | 619555 | 1461 | 11850 |
| Kancheepuram | 2381 | 12108 | 295 | 12531 | 311 | 2293 | 3062 | 15970 | 368 | 17560 | 330 | 2591 |
| Kanyakumari | 1659 | 2454 | 5440 | 177531 | 168 | 1339 | 1764 | 8445 | 5947 | 186222 | 179 | 1244 |
| Karur | 513 | 2451 | 3394 | 112532 | 221 | 1710 | 646 | 3536 | 5455 | 196786 | 588 | 5298 |
| Krishnagiri | 34483 | 139809 | 1050 | 44601 | 1867 | 14738 | 35895 | 177594 | 2354 | 112403 | 2412 | 19419 |
| Madurai | 5562 | 27851 | 2733 | 116090 | 1345 | 10943 | 6712 | 22235 | 3029 | 144622 | 1733 | 13973 |
| Nagapattinam | 1240 | 5925 | 533 | 22640 | 181 | 1416 | 1884 | 10316 | 661 | 31545 | 266 | 2053 |
| Namakkal | 948 | 4529 | 902 | 38314 | 88 | 603 | 1516 | 8301 | 2736 | 130636 | 104 | 965 |
| Perambalur | 709 | 3388 | 344 | 14612 | 85 | 720 | 739 | 4047 | 380 | 18129 | 105 | 937 |
| Pudukottai | 655 | 3130 | 3996 | 187780 | 293 | 2509 | 718 | 3674 | 3401 | 189746 | 276 | 2382 |
| Ramanathapuram | 122 | 583 | 131 | 5563 | 101 | 771 | 165 | 903 | 125 | 5957 | 97 | 732 |

Cont...

| | | | | | | | | | | | | |
|-------------------|---------------|---------------|--------------|----------------|--------------|---------------|---------------|---------------|---------------|----------------|--------------|---------------|
| Salem | 2073 | 10879 | 1335 | 56707 | 1343 | 11240 | 2736 | 13503 | 3166 | 151149 | 2092 | 17930 |
| Sivagangai | 1415 | 6761 | 990 | 42052 | 10 | 78 | 1801 | 3190 | 723 | 34498 | 13 | 116 |
| Thanjavur | 849 | 4056 | 4764 | 121550 | 187 | 1511 | 888 | 4861 | 4557 | 178684 | 251 | 2011 |
| The Nilgiris | 40 | 191 | 545 | 23150 | 19 | 185 | 29 | 161 | 819 | 39108 | 235 | 531 |
| Theni | 8173 | 79971 | 2842 | 120720 | 340 | 2348 | 9654 | 121972 | 4966 | 211051 | 371 | 3793 |
| Thirucirapalli | 2339 | 5538 | 8520 | 417825 | 882 | 8121 | 2555 | 7071 | 9972 | 428067 | 959 | 8640 |
| Tirunelveli | 4283 | 19668 | 5820 | 279400 | 1486 | 12410 | 5443 | 21663 | 10855 | 417319 | 2042 | 17507 |
| Thiruvallur | 8319 | 43786 | 1623 | 68940 | 1327 | 10115 | 10408 | 35013 | 1706 | 81427 | 1475 | 10794 |
| Thiruvannamalai | 650 | 5593 | 2600 | 110440 | 1334 | 11246 | 761 | 4165 | 3370 | 253100 | 1944 | 18055 |
| Thiruvarur | 210 | 1003 | 346 | 14697 | 18 | 124 | 207 | 1025 | 509 | 24293 | 34 | 50 |
| Thoothukudi | 615 | 2938 | 8995 | 501460 | 442 | 3669 | 718 | 3934 | 11132 | 662317 | 610 | 3961 |
| Vellore | 12558 | 55173 | 2754 | 116982 | 3100 | 24134 | 14145 | 72345 | 7763 | 620808 | 2402 | 19734 |
| Villupuram | 1076 | 5141 | 1012 | 42987 | 478 | 3374 | 1804 | 11458 | 1333 | 63660 | 384 | 3316 |
| Virudhunagar | 1753 | 10547 | 510 | 21663 | 678 | 5348 | 2676 | 12331 | 1043 | 49779 | 2256 | 5031 |
| Tamil Nadu | 118444 | 539404 | 81498 | 3461788 | 23229 | 187358 | 139119 | 761953 | 122380 | 5842535 | 27696 | 267381 |

Source: Department of Horticulture, Government of Tamil Nadu, Chennai-05.

Districtwise details regarding area and production of horticultural crops in Tamil Nadu from 2004-05 to 2008-09 are presented in Table 2.9. It could be observed from the table that area as well as production of the selected crops namely mango, banana and flowers in the State as a whole increased significantly from 2004-05 to 2008-09 which shows that the implementation of NHM had brought about favorable results.

It could be understood from Table 2.9 that the area under mango crop in Dharmapuri and Salem districts increased by 52 per cent from 6450 ha and 2073 ha respectively in 2004-05 to 10206 ha and 2736 ha respectively in 2008-09. Similarly, production of mango during these periods increased tremendously (123%) to 69224 m.tonnes and 13503 m.tonnes in Dharmapuri and Salem districts respectively from 26151m.tonnes in Dharmapuri and 10879m.tonnes in Salem in 2004-05. The same pattern of growth in area and production of banana could be observed from Table 2.9. The area under banana in Dharmapuri and Salem districts increased by 156 per cent (from 468 ha and 1335 ha) in 2004-05 to 1425 ha and 3166 ha respectively in 2008-09. In case of flower crop in Krishnagiri district, area increased by 29 per cent from 1867 ha in 2004-05 to 2412 ha in 2008-09. As regards production of flowers, the production increased (32%) to 19419 m.tonnes in 2008-09 from 14738 m tonnes in 2004-05. Thus, it could be inferred from the data that the NHM scheme implemented in 2005-06 started producing the desired results as envisaged in the mission.

Table 2.10 Average Annual Growth Rate in Area and Yield of Selected Horticulture Crops at District Level in Tamil Nadu from TE 2004-05 to TE 2008-09 (per cent per annum)

| S.No. | District | Annual growth rates (per cent)* | | | | | |
|-------|--------------------|----------------------------------|---------|-------|-------|---------|--------|
| | | Banana | | Mango | | Flowers | |
| | | Area | Yield | Area | Yield | Area | Yield |
| 1 | Chennai | NA | NA | NA | NA | NA | NA |
| 2 | Kancheepuram | 6.29 | 0.63 | 5.53 | 2.91 | 1.48 | 1.57 |
| 3 | Thiruvallur | 5.60 | -11.19 | 1.25 | 2.91 | 2.64 | -1.02 |
| 4 | Cuddalore | 5.30 | 3.43 | 5.18 | 8.05 | 2.15 | -2.06 |
| 5 | Villupuram | 12.92 | 7.12 | 6.89 | 2.93 | -5.47 | 5.04 |
| 6 | Vellore | 2.98 | 3.80 | 20.91 | 15.82 | -6.38 | 1.35 |
| 7 | Thiruvannamalai | 3.94 | -11.31 | 6.49 | 14.25 | 9.41 | 2.42 |
| 8 | Salem | 6.94 | -1.54 | 21.59 | 2.92 | 11.08 | 0.59 |
| 9 | Namakkal | 11.74 | 3.41 | 20.74 | 2.92 | 4.18 | 7.58 |
| 10 | Dharmapuri | 11.47 | 12.86 | 17.83 | 2.91 | 13.70 | 1.19 |
| 11 | Krishnagiri | 1.01 | 4.98 | 10.18 | 2.93 | 6.40 | 0.49 |
| 12 | Coimbatore | 2.66 | 7.64 | 19.21 | -6.25 | -0.52 | 1.69 |
| 13 | Thiruppur* | NA | NA | NA | NA | NA | NA |
| 14 | Erode | 2.65 | 3.41 | 14.24 | 8.54 | -0.51 | -1.78 |
| 15 | Thiruchirappalli | 2.21 | 3.90 | 3.93 | -3.33 | 2.09 | -0.54 |
| 16 | Karur | 5.76 | 3.39 | 11.86 | 2.11 | 14.46 | 3.81 |
| 17 | Perambalur | 1.04 | 3.41 | 2.49 | 2.90 | 5.28 | 1.30 |
| 18 | Ariyalur* | NA | NA | NA | NA | NA | NA |
| 19 | Pudukottai | 2.30 | 1.71 | -4.03 | 4.29 | -1.49 | 0.20 |
| 20 | Thanjavur | 1.12 | 3.40 | -1.11 | 10.74 | 7.36 | -0.21 |
| 21 | Thiruvarur | -0.36 | 0.90 | 9.65 | 2.91 | 15.90 | -38.61 |
| 22 | Nagapattinam | 10.46 | 3.41 | 5.38 | 2.91 | 9.64 | -0.34 |
| 23 | Madurai | 4.70 | -7.48 | 2.57 | 2.92 | 6.34 | -0.23 |
| 24 | Theni | 4.16 | 6.39 | 13.95 | 0.01 | 2.18 | 9.81 |
| 25 | Dindigul | 3.25 | 20.58 | 13.09 | 2.79 | 3.15 | -0.35 |
| 26 | Ramanathapuram | 7.55 | 3.39 | -1.17 | 2.88 | -1.01 | -0.29 |
| 27 | Virudhunagar | 10.57 | -6.67 | 17.79 | 3.01 | 30.05 | -31.58 |
| 28 | Sivagangai | 6.03 | -14.801 | -7.86 | 2.91 | 6.56 | 3.36 |
| 29 | Thirunelveli | 5.99 | -3.5766 | 15.58 | 22.04 | 7.95 | 0.66 |
| 30 | Thoothukudi | 3.87 | 3.05 | 5.33 | 1.63 | 8.05 | -6.14 |
| 31 | The Nilgiris | -8.04 | 3.77 | 10.18 | 2.93 | 62.88 | -36.52 |
| 32 | Kanyakumari | 1.53 | 29.36 | 2.23 | -1.03 | 1.59 | -3.43 |
| | State Total | 4.02 | 4.61 | 10.16 | 2.92 | 4.39 | 4.49 |

The table provides districtwise details regarding the annual growth rate in area and yield of banana, mango and flowers during the period TE 2004-05 -2008-09. Table 2.10 reveals that the State registered an average annual growth rate of 4.02 per cent, 10.16 per cent and 4.39 per

cent in area in respect of banana, mango and flowers respectively whereas the same for yield of the respective crop worked out to 4.61 per cent, 2.92 per cent and 4.49 per cent.

Analysing the districtwise, annual growth rate of the selected districts, Dharmapuri stood third with 11.47 per cent growth rate in area under banana and the growth percentage was moderate (6.94%) in Salem district. The Nilgiris district registered a negative growth rate (-8.04) in terms of area under banana during the period TE 2004-05 – 2008-09. In case of yield of banana, Dharmapuri district recorded a higher growth rate of 12.86 per cent and stood second next only to Dindugal district in Tamil Nadu. Salem district posted a negative growth rate of -1.54 per cent in yield rate of banana from TE 2004-05 to TE 2008-09.

With regard to area under mango crop the selected district Salem registered a record growth rate of 21.59 per cent than that of all other districts in Tamil Nadu and the growth rate in Dharmapuri district also was significant to the level of 17.83 per cent from TE 2004-05 to TE 2008-09. Sivagangai district recorded a negative growth rate -7.86 per cent in terms of area under mango. The growth percentage of yield of mango was very insignificant in Salem (2.9 per cent) of as well as in Dharmapuri districts (2.91 per cent), compared to all other districts in Tamil Nadu, whereas Tirunelveli district has registered the highest growth rate of 22.04 per cent in yield of mango.

It could be observed from Table 2.10 that the growth rate of area under flower in Krishnagiri district was a moderate 6.40 percentage whereas the Nilgiris district registered an all time record level of 62.88 per cent from TE 2004-05 to 2008-09. Out of 32 districts, six districts registered a negative growth rate in area under flower ranging from -0.51 to -5.47 per cent. It is evident from Table 2.10 that Namakkal district posted the highest growth rate of 7.58 per cent in terms of yield of flowers among all districts in Tamil Nadu from TE 2004-05 to TE 2008-09, whereas, the selected district Krishnagiri registered a growth rate of 0.49 per cent. Of the 32 districts in Tamil Nadu 14 districts had a negative growth rate in yield of flowers from TE 2004-05 to TE 2008-09.

2.6 Summary of the Chapter

Area, production and productivity of horticultural crops in Tamil Nadu were analysed in this chapter. The total geographical area of the State accounted for 13026645 ha. Of this cultivable area which was 5097011 ha during TE 2004-05 declined to 5042896 ha during TE

2008-09. Though there was a decrease in the total cultivable area during 2008-09, the area under horticultural crops on the other hand registered an increasing trend from 852939 ha during TE 2004-05 to 937831 ha during TE 2008-2009. Nearly one fifth of the cultivable area was under horticultural crops during 2008-2009.

The study reveals that NHM made a favorable impact on the growth of horticultural crops in Tamil Nadu. The area under horticultural crops increased by 19 % from 6.22 lakh ha during 2004-05 to 7.4 lakh ha during 2008-09. Similarly, production also increased from 118.07 lakh tonnes to 151.56 lakh tonnes during the same period. There was a positive growth rate in area (3.47%) of horticultural crops during the period from 2004-05 - 2005-06 to 2004-05 – 2008-09.

Analysis of district wise growth of horticultural crops in Tamil Nadu brought out the fact that the NHM scheme made good impact on area in almost all districts barring only 4 districts out of 32 districts in Tamil Nadu during the period from TE 2004-05 to TE 2008-09. In case of production also a positive growth could be witnessed in 23 districts out of 32 districts during the same period.

A considerable increase could be noticed in area as well as production of selected horticultural crops, banana, mango and flowers from the period TE 1980-81 to TE 2008-2009 in Tamil Nadu. The area of banana rose to 111268 ha in TE 2008-09 from 60423 ha in TE 1980-81. Similarly, the area of mango tremendously increased from 36432 ha in TE 1980-81 to 128030 ha during TE 2008-09. The same trend could be witnessed in the case of area under flower also. The production of banana increased (by 525 %) from 1486625 m.tonnes in TE 1980-81 to a whopping 5228118 m. tonnes in TE 2008-09.

The production of mango increased from 567860 m.tonnes in TE1980-81 to 680480 m.tonnes in TE 2008-09, by recording 19 per cent growth rate in production. The production of flowers tremendously increased from 58,000 m.tonnes during the period TE 1991-92 to 266794 m.tonnes during TE 2008-09. Thus, all the three selected crops banana, mango and flowers registered a substantial growth in terms of area and production during the period under study. An analysis of growth rate for the reference period of the study 2004-05 to 2008-09 reveals that there was a high percentage of growth rate in area in respect of all the three crops namely banana, mango and flowers to the level of 7.03 per cent, 1.86 per cent and 3.25 per cent from 6.5 per cent, 1.57 per cent and 1.78 per cent respectively during the period 2004-05 to 2007-08.

While analyzing the districtwise annual growth rate of area under banana, the selected district Dharmapuri stood third with 11.47 per cent growth rate and the growth percentage was moderate at 6.94% in Salem district. In the case of yield of banana, Dharmapuri district recorded a higher growth rate of 12.86 per cent and occupied the second place among all the districts in Tamil Nadu. As far as the growth rate of area under mango was concerned the selected district Salem stood first with 21.59 per cent and Dharmapuri district posted a growth rate of 17.83 per cent during the period from TE 2004-2005 to TE 2008-09. The growth percentage of yield of mango was not found to be significant in Salem as well as in Dharmapuri districts as the percentage being 2.92 and 2.91 respectively are lesser compared to other districts in Tamil Nadu. The growth rate in the yield of mango was as high as at 22.04 per cent in Tirunelveli district during the period from TE 2004-05 to TE 2008-09. In the case of flowers, the selected district Krishnagiri registered a moderate 6.40 per cent growth rate in area whereas the Nilgiris district posted a record growth rate of 62.88 per cent from TE 2004-05 to 2008-09. As regards the yield of flowers, Namakkal district registered a record growth rate of 7.58 per cent among all the districts in Tamil Nadu whereas the selected district Krishnagiri registered a minimal growth rate of 0.49 from TE 2004-05 to TE 2008-09.

CHAPTER III

Household Characteristics, Cropping Pattern and Production Structure

This chapter analyses the household characteristics of the sample respondents, cropping pattern adopted by them and also the production structure. The National Horticultural Mission (NHM) was launched with the main objective of promoting the cultivation of horticultural crops of all varieties. It is appropriate to examine the socio-economic characteristics of the farmers so as to understand whether the farmers would prefer to go in for horticultural crops. Similarly, the cropping pattern followed by the farmers may also influence them to make the right decision. Hence, this part discusses about the socio economic characteristics, cropping pattern and production structure of the 150 sample farmers who cultivated banana, mango and flowers in Dharmapuri, Salem and Krishnagiri districts of Tamil Nadu.

3.1 Socio-Economic Characteristics of the Selected Farmers

The socio-economic conditions and characteristics of the selected sample households are given in Table 3.1

The total number of sample households selected for the study was 150 comprising 89 marginal, 37 small, 19 medium, and 5 large farmers. The average household size of all samples worked out to 5.68. However, the marginal sample households had the highest number of members (5.73) whereas the lowest was found to be 5.40 for large farmers. As regards average number of earners, it was 3.24 for all sample households. The marginal framers who are economically poor compared to other categories of farmers had the highest number of earners (3.50) and the lowest number of 2.08 earners was found with the large sample households. The male and female combination of households worked out to 51.8 per cent and 48.2 per cent respectively. As high as 66.41 per cent of the members of the sample households belonged to the productive age group of 16-60 years and across the size group of farmers it was 70.33 per cent for large farmers and 67 for medium farmers. All the sample respondents of the study were found to be the head of the family.

Table 3.1 Demographic Profile of the Selected Farmers (% of households)

| Characteristics | | Marginal | Small | Medium | Large | Total |
|--|------------------------|----------|--------|--------|--------|--------|
| No. of HH | | 89 | 37 | 19 | 5 | 150 |
| Household size (number) | | 5.73 | 5.71 | 5.46 | 5.40 | 5.68 |
| Average numbers of earners | | 3.50 | 3.11 | 2.58 | 2.08 | 3.24 |
| Gender (% of members) | Male | 50.6 | 52.1 | 53.5 | 51.0 | 51.8 |
| | Female | 49.4 | 47.9 | 46.5 | 49.0 | 48.2 |
| Age group of the members (%) | < 16 | 29.12 | 26.65 | 24.35 | 20.52 | 25.16 |
| | 16-60 | 63.23 | 65.10 | 67.00 | 70.33 | 66.41 |
| | >60 | 7.65 | 8.25 | 8.65 | 9.15 | 8.43 |
| Identity of respondent (%) | Head | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| | Others | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Education status of the members (%) | Illiterate (> 6 years) | 17.52 | 16.16 | 17.50 | 15.65 | 16.71 |
| | Upto primary | 28.58 | 23.62 | 27.59 | 29.27 | 27.27 |
| | Up to secondary | 36.56 | 37.71 | 33.65 | 34.63 | 35.64 |
| | Upto graduate | 13.84 | 17.89 | 16.45 | 15.15 | 15.83 |
| | Above graduate | 3.50 | 4.62 | 4.81 | 5.30 | 4.56 |
| Caste(% of households) | SC | 3.28 | 3.71 | 2.82 | 2.40 | 3.05 |
| | ST | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | BC | 52.12 | 53.62 | 54.11 | 56.23 | 54.02 |
| | MBC | 39.40 | 37.10 | 37.00 | 34.60 | 37.03 |
| | General | 5.21 | 5.60 | 6.11 | 6.78 | 5.92 |
| Decision maker (% of hh) | Male | 94.15 | 92.65 | 93.15 | 95.52 | 93.86 |
| | Female | 5.85 | 7.35 | 6.85 | 4.48 | 6.14 |
| Main occupation (% of working memners) | Farming | 82.16 | 85.36 | 88.12 | 86.42 | 85.51 |
| | Self business | 3.41 | 4.42 | 6.72 | 8.68 | 5.81 |
| | Salaried/pensioners | 4.56 | 5.62 | 5.16 | 4.90 | 5.06 |
| | Wage earners | 9.87 | 4.60 | 0.00 | 0.00 | 3.62 |
| Involved in migration during the year 2009 (% of members) | | 0.62 | 0.51 | 0.00 | 0.00 | 0.28 |

Note: HH stands for Households. Similarly, SC, ST and OBC represent Schedule Caste, Schedule Tribe and Other Backward Class respectively.

As regards education, the highest 35.64 per cent of the members of the sample households studied up to secondary school, whereas 27.27 per cent of them studied upto primary school. An appreciable about 16 per cent of the members of the sample households were graduates. The illiterates, who were in the age group of more than 6 years, were found to be 16.71 per cent. It shows that literacy level of the family members of the sample households improved considerably but still it has to improve so as to attain economic development. Table 3.1 shows that illiteracy was found to be more in the marginal category of farmers, the percentage being 17.52 followed by medium farmers group (17.50%)

In the case of community of the sample households, over 50 per cent of them belonged to BC followed by MBC (37.03%). There were no ST sample households and the SC community constituted about 3 per cent of the total sample households. Nearly 6 per cent of the sample households belonged to general category. SC was found to be more (3.7%) in the small farmers category compared to other three size groups whereas more number of MBC was found in the marginal farmers category (39.40%). The male members were the decision makers in about 94 per cent of the sample households.

Table 3.1 reveals that farming was the main occupation for nearly 86 per cent of the working members of the sample households, while nearly 6 per cent of the working members were doing self business. Salaried persons and pensioners formed 5.06 per cent, while 3.62 per cent were wage earners. The percentage of members of the sample households involved in migration during 2009 worked out to a meagre 0.28.

3.2 Characteristics of Operational Holdings

Table 3.2 furnishes details regarding operational holdings of the sample respondents.

Table 3.2 Characteristics of Operational Holdings (acres per household)

| Farm Size | Owned land | Under cultivation | Cultivable waste | Non cultivable | Leased in | Leased out | NOA | NSA | GCA | Cropping intensity |
|--------------|-------------|-------------------|------------------|----------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | (1) | (1a) | (1b) | (1c) | (2) | (3) | (1+2+3) | | | |
| Marginal | 1.87 | 1.87 | 0.00 | 0.00 | 0.05 | 0.00 | 1.92 | 1.92 | 3.34 | 174 |
| Small | 4.51 | 4.51 | 0.00 | 0.00 | 0.00 | 0.00 | 4.51 | 4.51 | 7.40 | 164 |
| Medium | 8.13 | 8.13 | 0.00 | 0.00 | 0.5 | 0.00 | 8.63 | 8.63 | 13.56 | 157 |
| Large | 11.36 | 11.36 | 0.00 | 0.00 | 2.00 | 0.00 | 13.36 | 13.22 | 19.97 | 151 |
| Total | 3.63 | 3.63 | 0.00 | 0.00 | 0.28 | 0.00 | 3.91 | 3.90 | 6.20 | 163 |

Note: NOA implies Net Operated Area; NSA implies Net Sown Area; GCA implies Gross Cropped Area; Cropping intensity= (GCA/NSA)*100

It could be observed from the table that the Net Operated Area and Net Sown Area of all the sample households on an average worked out to 3.91 acres and 3.90 acres respectively. It is interesting to note that almost all the NOA was put into use. Except large farmers all the other three categories of sample households fully utilized their net operated area for cultivation. The gross cropped area of all sample households on an average was 6.20 acres which was reasonably good. The cropping intensity, calculated as 163 per cent in case of all sample households, indicates that there were brisk agricultural activities in the sample area. The net operated area of marginal farmers was 1.92 acres comprising 1.87 acres of owned land and only 0.05 acre of leased in land. The net operated area of medium farmers was 8.63 acres which included 0.5 acre

of leased in land, whereas large famers had 2.00 acres of leased in land. Interestingly, no category of sample households leased out any land. Table 3.2 shows that there was no cultivable and non cultivable waste land. As regards cropping intensity, it was high (174%) for marginal category and low (151%) for large farmers category.

3.3 Nature of Tenancy

Details of tenancy are furnished in Table 3.3

Table 3.3 Nature of Tenancy in Leasing-in Land in Acres

| Farm size | Share cropping | Fixed rent in cash | Fixed rent in kind | Both cash and kind | Against labour | Others |
|--------------------|-----------------------|---------------------------|---------------------------|---------------------------|-----------------------|---------------|
| Marginal | 0 (0.00) | 0.05 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| Small | 0 (0.00) | 0.00 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| Medium | 0 (0.00) | 0.5 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| Large | 0 (0.00) | 2.00 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| All farmers | 0 (0.00) | 0.28 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |

Note: Figures in parentheses are the percentages of total leasing in land.

As shown in Table 3.3, share cropping, fixed rent in cash, fixed rent in kind, both cash and kind etc are some of the existing forms of tenancy contract in case of leased in land. In our study, the leased in area was very meagre which worked out to only 0.28 acre on an average for all the sample households taken together. Further, the small size group of sample respondents did not have any leased in land. Table 3.3 indicates that fixed rent in cash was the nature of tenancy method followed by all the sample households.

3.4 Sources of Irrigation

Irrigation is considered to be one of the foremost inputs for agriculture. Crop failure in parts of our country happens due to lack of sufficient irrigation water. Canal irrigation, well irrigation, tank irrigation are the major sources of irrigation in our country. Details are furnished in Table 3.4

Table 3.4 Source of Irrigation of Net Operated Area in Acres

| Farm size | Canal | Well (Tube well, open well) | Tanks | Rainfed area | Net Operate Area(NOA) |
|--------------------|-----------------|--|-----------------|-------------------------|----------------------------------|
| Marginal | 0.09 (4.69) | 1.43 (74.48) | 0.12 (6.25) | 0.28 (14.58) | 1.92 (100.00) |
| Small | 0.56 (12.42) | 2.72 (60.30) | 0.55 (12.20) | 0.68 (15.08) | 4.51 (100.00) |
| Medium | 0.92 (10.66) | 6.00 (69.54) | 0.85 (9.84) | 0.86 (9.96) | 8.63 (100.00) |
| Large | 1.30 (9.73) | 9.2 (68.86) | 1.40 (10.48) | 1.46 (10.93) | 13.36 (100.00) |
| All farmers | 0.35 (9.2) | 2.59 (68.00) | 0.36 (9.2) | 0.49 (13.6) | 3.79 (100.00) |

Note: Figures in parentheses are the percentages of total NOA.

As could be understood from Table 3.4, out of the average net operated area of 3.79 acres in case of all farmers, a major chunk of 68 per cent of the land had well irrigation both tube well and open well, whereas canal and tanks were the sources of irrigation for an equal 9.2 per cent of the net operated area. The rest of 13.6 per cent of the net operated area was rainfed. The source of irrigation for 75 per cent of the net operated area of marginal farmers was well, whereas it was 69.54 per cent for medium farmers and 68.86 per cent for large farmers. It may be seen from Table 3.4 that about 15 per cent each of marginal and small farmers' net operated area was rainfed, while nearly 10 per cent of the net operated area of medium farmers was rainfed. The average rainfed area in case of all farmers was 0.49 acre.

3.5 Source and Purpose of Credit

Credit is needed for the farmers primarily to undertake agricultural operation and also for other purposes as majority of the farmers in our country immerse in debt. There were different sources of credits which are detailed in Table 3.5.

Table 3.5: Details of Source of Credit by the Selected Households

| Farm size | Institutional loan by banks | Commission agents | Trade/ML/Landlords | Friends/relatives | Govt. Programmes | Others | All sources |
|--|-----------------------------|-------------------|--------------------|-------------------|------------------|--------|-------------|
| (Rs. per household) | | | | | | | |
| Marginal | 13450.00 | 0.00 | 4000.00 | 2500 | 0.00 | 0.00 | 19950 |
| Small | 16320.00 | 0.00 | 3500.00 | 0.00 | 0.00 | 0.00 | 19820 |
| Medium | 46500.00 | 0.00 | 0.00 | 10000 | 0.00 | 0.00 | 56500 |
| Large | 135000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 135000 |
| All farmers | 22395.93 | 0.00 | 3236.67 | 2750.00 | 0.00 | 0.00 | 28382.60 |
| (Rs. per acre of net sown area) | | | | | | | |
| Marginal | 7005.21 | 0.00 | 2083.33 | 1302.08 | 0.00 | 0.00 | 10391.34 |
| Small | 3618.63 | 0.00 | 776.05 | 0.00 | 0.00 | 0.00 | 4394.68 |
| Medium | 5388.18 | 0.00 | 0.00 | 1158.75 | 0.00 | 0.00 | 6546.93 |
| Large | 10211.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10211.80 |
| All farmers | 6071.92 | 0.00 | 1427.96 | 919.34 | 0.00 | 0.00 | 8419.22 |

Note: Trade=Traders, ML=Money lenders

The average amount of loan taken from all sources worked out to Rs. 28382 per household. Out of this amount, the share of banks was a record Rs.22395 per household. The other sources were traders/moneylenders/land lords and friends and relatives. Marginal farmers (Rs.4000/HH) and small farmers (Rs.3500/HH) borrowed more amount from moneylenders. Table 3.5 reveals that medium and large sample farmers did not borrow money from money lenders/land lords, while small and large farmers did not borrow from friends and relatives. It is interesting to observe from the table that no sample respondents borrowed money from commission agents.

While calculating loan amount borrowed from above mentioned sources per acre of net sown area, it stood at Rs.8419 in case of all sample farmers. Of this, the highest amount of Rs.6071 per acre of net sown area was obtained from banks. The loan taken per acre of net sown area was found to be Rs.7005 for marginal farmers, whereas it was Rs.10211 for large framers.

Table 3.6 presents details regarding the purpose for which loan was taken from different sources by the sample respondents.

**Table 3.6: Details of Purpose of Credit by the Selected Households
(Rs per household)**

| Farm Size | Productive uses | | Non-productive uses | | | Total |
|--------------------|---------------------|------------------|---------------------|-------------------|-------------|----------------------|
| | Agriculture | Animal husbandry | Daily consumption | Social ceremonies | Others | |
| Marginal | 17057 (85.5) | 638 (3.2) | 1457 (7.3) | 798 (4.0) | 0 (0.00) | 19950 (100.00) |
| Small | 15875 (80.1) | 991 (5.0) | 854 (4.3) | 2100 (10.6) | 0 (0.00) | 19820 (100.00) |
| Medium | 53844 (95.3) | 1526 (2.7) | 565 (1.0) | 565 (1.0) | 0 (0.00) | 56500 (100.00) |
| Large | 130410 (96.6) | 2690 (2.0) | 950 (0.7) | 950 (0.7) | 0 (0.00) | 135000 (100.00) |
| All farmers | 21291.26 (87.50) | 825.25 (3.39) | 1149.87 (4.73) | 1066.21 (4.38) | 0 (0.00) | 28382.60 (100.00) |

Note: Figures in parentheses are the percentages of total.

The purpose of credit is broadly divided into productive use and non-productive use. Credit for agriculture and animal husbandry is considered as productive uses while the same for daily consumption, social ceremonies and others is considered as unproductive use. In our study as high as 87.50 per cent of the total loan taken from all sources in case of all farmers was for agriculture purpose and 3.39 per cent of the loan was for animal husbandry. Thus, it shows that nearly 91 per cent of the loan availed by the sample respondents was for productive uses, leaving only a negligible 9 per cent, for non-productive uses such as daily consumption and social ceremonies. While analyzing the purpose of credit across the size group of farmers, the large farmers utilized a record 98.60 per cent of the total loan for agriculture and animal husbandry followed by medium framers (98%). On the other hand small farmers used only 85 per cent of the loan for productive use, leaving nearly 15 per cent for daily consumption and social economies. The per household loan borrowed by marginal sample respondents was Rs.19950, whereas the per household credit availed by large farmers was a staggering Rs.135000.

3.6 Holding of Productive Farm Assets

Farm assets owned by the farmers determined the economic condition of the farmer to some extent. It is obvious that marginal and small farmers will have smaller farm assets compared to medium and large framers. Table 3.7 shows the productive farm assets owned by the sample households in terms of rupees per house hold and per acre of net sown area.

Table 3.7 Ownership of Productive Farm Asset

| Farm assets | Rupees per household | | | | | Rupees per acre of net sown area | | | | | |
|-------------------------------|----------------------|---------------|---------------|----------------|---------------|----------------------------------|--------------|--------------|--------------|--------------|------|
| | Marginal | Small | Medium | Large | Total | Marginal | Small | Medium | Large | Total | |
| Tractor | 17079 | 50676 | 140000 | 216000 | 47567 | 8895 | 11236 | 16223 | 16339 | 10649 | |
| Trolley | 2472 | 7432 | 21368 | 36000 | 7207 | 1287 | 1648 | 2476 | 2723 | 1575 | |
| Harrow | 607 | 2432 | 7368 | 15200 | 2399 | 316 | 539 | 854 | 1149 | 467 | |
| Tiller | 0 | 9730 | 18947 | 24000 | 5600 | 0 | 2157 | 2195 | 1815 | 871 | |
| Plank | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Threshing machine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Combine harvester | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other reaper (specify) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Pumpset Diesel | 0 | 3784 | 10737 | 14400 | 2773 | 0 | 839 | 1244 | 1089 | 401 | |
| Pumpset Electric | 28315 | 38649 | 60000 | 65000 | 36100 | 14747 | 8569 | 6952 | 4917 | 11908 | |
| Bullock cart | 0 | 0 | 11579 | 11600 | 1853 | 0 | 0 | 1342 | 878 | 199 | |
| Spray pump | 1573 | 1962 | 2200 | 2300 | 1773 | 819 | 435 | 255 | 174 | 631 | |
| Dairy sheds | 3775 | 5676 | 9474 | 15000 | 5339 | 1966 | 1258 | 1098 | 1135 | 1654 | |
| Animals | Cow | 11236 | 18919 | 32895 | 50000 | 17167 | 5852 | 4195 | 3812 | 3782 | 5116 |
| | Buffaloes | 6472 | 7297 | 6632 | 28800 | 7440 | 3371 | 1618 | 768 | 2178 | 2569 |
| | Bullock | 0 | 11351 | 31579 | 36000 | 7999 | 0 | 2517 | 3659 | 2723 | 1175 |
| | Calves | 4600 | 5200 | 9300 | 10400 | 5537 | 2396 | 1153 | 1078 | 787 | 1869 |
| | Goat | 6300 | 5200 | 3000 | 0 | 5401 | 3281 | 1153 | 348 | 0 | 2275 |
| Total livestock | 28608 | 47967 | 83406 | 125200 | 43544 | 14900 | 10636 | 9665 | 9470 | 13004 | |
| Any other | 0 | 0 | 24500 | 605645 | 23292 | 0 | 0 | 2839 | 45813 | 1887 | |
| Total | 82429 | 168308 | 389579 | 1130345 | 177449 | 42932 | 37319 | 45142 | 85503 | 43246 | |

3.6.1 Asset holding per Household

It is observed from Table 3.7 that the total farm assets per household worked out to Rs.177449 in case of all sample respondents. The farm assets owned by large farmers per household were as high as Rs.1130345 as against Rs.82429 only by the marginal farmers. The farm assets owned by small and medium farmers were to the tune of Rs.168308 and Rs.389579 respectively per household. The value of tractor owned by the marginal farmer was to the tune of Rs.17079 per household whereas the same owned by large farmers were as high as Rs.216000 per household. The highest value of asset owned by marginal farmer per household was livestock (Rs.28608) followed by pumpset (Rs.28315). The value of electric pumpset was put at Rs.28315 for marginal farmers per household whereas it was Rs.38649 Rs.60000 and Rs.65000 for small, medium and large farmers respectively per household. Similarly, wide variation in the value of livestock could be found among the four size group of sample respondents.

3.6.2 Asset holding per acre of Net Sown Area

The average value of farm assets owned by all sample respondents was to the tune of Rs.43246 per acre of net sown area. The value of assets owned by large farmer per acre of net sown area was found to be the highest at Rs.85503, whereas the small farmer had the lowest value of farm assets (Rs.373119) per acre of net sown area. As far as value of farm assets was concerned the marginal farmers were placed in a better position compared to small farmers. As regards tractor per acre of net sown area owned by the farmers, Table 3.7 shows that the value of the tractor possessed by the large farmers was equal to about double the value of the same owned by marginal farmers. In case of live stock, the marginal farmers possessed higher value per acre of net sown area compared to other categories of farmers and this they wanted to supplement the poor income obtained from agriculture.

3.7 Cropping Pattern of Sample Farmers

The cropping pattern adopted by the farmers depends upon the availability of irrigation water, soil condition, traditional agricultural practices etc. In order to analyse the impact of NHM on area and productivity of horticultural crops, it is worthwhile to study the cropping pattern adopted by the farmers' particularly cropping pattern of horticultural crop. Details are furnished in Table 3.8

Table 3.8 Cropping Pattern of Sample Farmers (Area in Acre/HH)

| Crops | Marginal | Small | Medium | Large | Total |
|---------------------------------|--------------------------------|--------------------------------|---------------------------------|---------------------------------|--------------------------------|
| Kharif crops | | | | | |
| Paddy | 0.40 (11.98) | 0.75 (10.14) | 2.00 (14.75) | 2.80 (14.02) | 0.77 (12.42) |
| Maize | 0.20 (5.99) | 0.35 (4.73) | 0.50 (3.69) | 0.30 (1.50) | 0.28 (4.52) |
| Groundnut | 0.16 (4.79) | 0.45 (6.08) | 0.80 (5.90) | 1.00 (5.01) | 0.34 (5.48) |
| Sugarcane | 0.25 (7.49) | 0.60 (8.11) | 0.50 (3.69) | 0.75 (3.76) | 0.38 (6.13) |
| Cholam | 0.15 (4.49) | 0.27 (3.65) | 0.19 (1.40) | 0.25 (1.25) | 0.19 (3.06) |
| Total Kharif | 1.16 (34.73) | 2.42 (32.70) | 3.99 (29.42) | 5.1 (25.54) | 1.96 (31.61) |
| Rabi crops | | | | | |
| Paddy | 0.50 (14.97) | 1.00 (13.51) | 2.20 (16.22) | 2.10 (10.52) | 0.89 (14.35) |
| Pulses | 0.30 (8.98) | 0.45 (6.08) | 0.27 (1.99) | 0.41 (2.05) | 0.34 (5.48) |
| Groundnut | 0.10 (2.99) | 0.40 (5.41) | 0.80 (5.90) | 1.20 (6.01) | 0.30 (4.84) |
| Ragi | 0.08 (2.40) | 0.24 (3.24) | 0.10 (0.74) | 0.50 (2.50) | 0.14 (2.26) |
| Total Rabi | 0.98 (29.34) | 2.09 (28.24) | 3.37 (24.85) | 4.21 (21.08) | 1.67 (26.94) |
| Horticultural crops | | | | | |
| Banana | 0.60 (17.96) | 1.20 (16.22) | 2.60 (19.17) | 4.10 (20.53) | 1.12 (18.06) |
| Mango | 0.40 (11.98) | 0.70 (9.46) | 2.00 (14.75) | 3.70 (18.53) | 0.77 (12.42) |
| Other fruits | 0.00 (0.00) | 0.15 (2.03) | 0.10 (0.74) | 0.50 (2.50) | 0.07 (1.13) |
| Vegetables | 0.10 (2.99) | 0.25 (3.38) | 0.30 (2.21) | 0.50 (2.50) | 0.18 (2.90) |
| Plantation crops | 0.06 (1.80) | 0.09 (1.22) | 0.10 (0.74) | 0.26 (1.30) | 0.08 (1.29) |
| Spices & Condiments | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Flowers | 0.04 (1.20) | 0.50 (6.76) | 1.10 (8.11) | 1.60 (8.01) | 0.34 (5.48) |
| Medicinal crops | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Others | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Total Horticultural crop | 1.20 (35.93) | 2.89 (39.05) | 6.20 (45.72) | 10.66 (53.38) | 2.56 (41.29) |
| Gross Cropped Area | 3.34 (100.00) | 7.40 (100.00) | 13.56 (100.00) | 19.97 (100.00) | 6.20 (100.00) |

Note: Figures in parentheses are percentages of gross cropped area of respective farmer category.

Table 3.8 exhibits the cropping pattern followed by the sample farmers. It is understood from the table that the sample farmers raised field crops in kharif and rabi seasons and also cultivated horticultural crops of different varieties. Table 3.8 reveals that the gross cropped area of all farmers worked out to 6.20 acre per household. The gross cropped area of large farmers was as high as 19.97 acres per household, whereas the same for marginal farmers was just 3.34 acres per household. Medium farmers also had a high gross cropped area of 13.56 acres per household compared to marginal and small farmers.

It is observed from Table 3.8 that the total area under kharif crop accounted for 1.96 acres per household which was 31.61 per cent of the total gross cropped area. Paddy, maize, groundnut, sugarcane and cholam were the crops cultivated by the sample farmers during the kharif season of the reference period. The total area under these crops cultivated by marginal, small, medium and large farmers, accounted for 1.16 acres, 2.42 acres, 3.99 acres and 5.1 acres per household respectively. The area under kharif crops formed 34.73 per cent of the gross cropped area in case of marginal farmers, whereas it was less at 25.50 per cent for large farmers, 29.42 per cent for medium and 32.70 per cent for small farmers. Among different crops cultivated during kharif season, paddy was raised in more area compared to other crops by all the four categories of sample farmers. Cholam found the last place in terms of area during kharif season.

When compared to kharif crop, the area under rabi was little lesser. The total area under rabi crop worked out to 1.67 acres per household which accounted for 26.94 per cent of the gross cropped area. The area cultivated during rabi season by marginal farmers per household was 29.34 per cent of the gross cropped area, whereas for small, medium and large farmers it was 28.24 per cent, 24.85 per cent and 21.08 per cent respectively. Like wise in kharif season, in the rabi reason also, paddy was found to be the predominant crop cultivated by all sample farmers. Pulses, groundnut, and ragi were the other crops cultivated during rabi season.

As regards horticultural crops, the total area worked out to 2.56 acres per household in case of all sample farmers. The area under horticultural crops was 1.20 acres, 2.19 acres, 6.20 acres and 10.66 acres for marginal, small, medium and large farmers respectively. While analysing the area cultivated during kharif and rabi seasons in terms of percentage of gross cropped area, it was found to be higher in case of horticultural crops compared to kharif and rabi crops. About 36 per cent of the gross cropped area was under horticultural crops in case of

marginal farmers whereas it was 39.05 per cent, 45.72 per cent and 53.28 per cent in case of small, medium and large farmers respectively. The total horticulture area of marginal farmers was just 1.20 acres per household as against the higher area of 10.66 acres per household of large farmers. The total horticultural crop area was 2.89 acres and 6.20 acres per household in case of small and medium sample farmers respectively. Banana, mango, flower crops, vegetables, fruits etc were the horticulture crops cultivated by the sample farmers.

The area under banana was 17.96 per cent of the gross cropped area per household in case of marginal farmers whereas it was 20.53 per cent in case of large farmers. When compared to other three categories of sample farmers, the area under banana was the lowest for small farmers as it accounted for 16.22 per cent of the gross cropped area per household. In case of all sample farmers it was 1.12 acres per household.

As regards mango crop, the marginal farmers cultivated an area of 0.40 acre per household which was nearly 12 per cent of the gross cropped area whereas the small, medium and large farmers cultivated an area of 0.70 acre, 2.00 acres and 3.70 acres per household respectively. To put it in percentage it was 9.46 per cent, 14.75 per cent and 18.53 per cent of the gross cropped area respectively.

The area under flower was little less compared to banana and mango as it accounted for only 1.20 per cent, 6.76 per cent, 8.11 per cent and 8.01 per cent per household of gross cropped area for marginal, small, medium and large sample farmers respectively. In absolute term the area under flower was as low as 0.04 acre per household in case of marginal farmers as against the 1.60 acre per household of large 1.10 acre per household of medium and 0.50 acre per household of small sample farmers. The area under flower in case of all sample farmers accounted for 5.48 per cent per household.

Vegetables were cultivated by all sample farmers and the area worked out to 0.18 acre per household. Spices and condiments and medicinal crops were not cultivated by any of the sample respondents. It could be seen from Table 3.8 that the selected horticultural crops, banana, mango and flowers were the major crops cultivated in terms of area per household by the sample respondents.

3.8 Irrigated Cropping Pattern

Irrigation is one of the vital inputs required for cultivation. In the sample districts major area was found to be irrigated and the irrigated cropping pattern is illustrated in Table 3.9.

Table 3.9 Cropping Distribution of Irrigated Area of Sample Farmers (acre per household)

| Crops | Marginal | Small | Medium | Large | Total |
|---------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Kharif crops | | | | | |
| Paddy | 0.40 (100.00) | 0.75 (100.00) | 2.00 (100.00) | 2.80 (100.00) | 0.77 (100.00) |
| Maize | 0.13 (65.00) | 0.25 (71.43) | 0.35 (70.00) | 0.20 (66.67) | 0.20 (71.43) |
| Groundnut | 0.16 (100.00) | 0.45 (100.00) | 0.70 (87.50) | 0.75 (75.00) | 0.32 (94.12) |
| Sugarcane | 0.25 (100.00) | 0.60 (100.00) | 0.50 (100.00) | 0.75 (100.00) | 0.37 (97.37) |
| Cholam | 0.10 (66.67) | 0.13 (48.15) | 0.10 (52.63) | 0.15 (60.00) | 0.11 (57.89) |
| Total Kharif | 1.04 (89.66) | 2.18 (90.08) | 3.65 (91.48) | 4.65 (91.18) | 1.77 (90.31) |
| Rabi crops | | | | | |
| Paddy | 0.5 (100.00) | 1.00 (100.00) | 2.20 (100.00) | 2.10 (100.00) | 0.89 (100.00) |
| Pulses | 0.22 (73.33) | 0.31 (68.89) | 0.15 (55.56) | 0.31 (75.61) | 0.24 (70.59) |
| Groundnut | 0.10 (100.00) | 0.40 (100.00) | 0.65 (81.25) | 1.14 (95.00) | 0.27 (90.00) |
| Ragi | 0.08 (100.00) | 0.24 (100.00) | 0.10 (100.00) | 0.50 (100.00) | 0.14 (100.00) |
| Total Rabi | 0.90 (91.84) | 1.95 (93.30) | 3.10 (91.99) | 4.05 (96.20) | 1.54 (92.22) |
| Horticultural crops | | | | | |
| Banana | 0.60 (100.00) | 1.20 (100.00) | 2.60 (100.00) | 4.10 (100.00) | 1.12 (100.00) |
| Mango | 0.35 (87.50) | 0.59 (84.29) | 1.87 (93.50) | 3.60 (97.30) | 0.71 (92.21) |
| Other fruits | 0.00 (0.00) | 0.15 (100.00) | 0.10 (100.00) | 0.50 (100.00) | 0.07 (100.00) |
| Vegetables | 0.10 (100.00) | 0.25 (100.00) | 0.30 (100.00) | 0.50 (100.00) | 0.16 (88.89) |
| Plantation crops | 0.06 (100.00) | 0.06 66.67 | 0.08 (80.00) | 0.16 (61.54) | 0.07 (87.50) |
| Spices & Condiments | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Flowers | 0.04 (100.00) | 0.50 (100.00) | 1.10 (100.00) | 1.60 (100.00) | 0.34 (100.00) |
| Medicinal crops | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Others | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Total Horticultural crop | 1.15 (95.83) | 2.75 (95.16) | 6.05 (97.58) | 10.46 (98.12) | 2.47 (96.48) |
| Gross Irrigated Area | 3.09 (92.51) | 6.88 (92.97) | 12.80 (94.40) | 19.16 (95.94) | 5.78 (93.23) |
| Net Irrigated Area | 1.64 (85.42) | 3.83 (84.92) | 7.77 (90.03) | 11.90 (90.02) | 3.30 (84.62) |

Note:

1. Figures in parentheses are percentage of irrigated area to sown area under respective crop.
2. Figures in parentheses are percentage of irrigated area to gross irrigated area.
3. Figures in parentheses are percentage of irrigated area to net irrigated area.

It could be observed from Table 3.9 that out of total kharif area in case of all sample farmers 90.31 per cent was irrigated. Across the size group of farmers, medium category had the highest (91.48%) percentage of irrigated area whereas the marginal category had the lowest irrigated area (89.66%) per household. Of the five kharif crops raised by the sample farmers only maize and cholam were cultivated in unirrigated or rainfed condition by marginal and small farmers' category whereas medium and large farmers cultivated groundnut also in addition to maize and cholam.

As far as rabi crops were concerned, pulses were cultivated under unirrigated condition by all the sample farmers whereas medium and large farmers cultivated groundnut as unirrigated crop. Of the total rabi crop area, 92.22 per cent was irrigated per household in case of all sample farmers. Among the four categories of farmers, the large size group had the highest percentage of irrigated (96.20%) area compared to 91.84 per cent, 93.30 per cent and 91.99 per cent irrigated area per household of marginal, small and medium sample farmers respectively.

In the case of horticultural area of all sample farmers, 96.48 per cent was irrigated per household. The irrigated area was the highest (98.12%) for large farmers followed by medium (97.58%), marginal (95.83%) and small (95.16%) farmers. Out of the three selected horticultural crops, banana and flower crops were fully under irrigated area in case of all the sample farmers. As regards mango crop, 92.21 per cent was irrigated crop per household in case of all sample farmers. In case of mango crop, the lowest irrigated area of 84.29 per cent was for small farmers whereas the large farmers had the highest 97.30 per cent of the irrigated area.

It may be understood from Table 3.9 that the gross irrigated area of all sample farmers worked out to 5.78 acre per household which was 93.23 per cent of the gross cropped area. The per household gross irrigated area of marginal farmers was 3.09 acres while it was 6.88 acres, 12.80 acres and 19.16 acres for small, medium and large farmers respectively. Regarding net irrigated area, the table shows that it accounted for 84.62 per cent of the net sown area in case of all sample farmers.

3.9 Area under HYV and Organic farming

3.9.1 Area under HYV

Area under high yielding varieties (HYV) of crops cultivated by the sample farmers is depicted in Table 3.10.

Table 3.10 Area Under HYV Crops (acre per household)

| Crops | Marginal | Small | Medium | Large | Total |
|---|--------------------------|--------------------------|---------------------------|---------------------------|--------------------------|
| Kharif crops | | | | | |
| Paddy | 0.40 (11.98) | 0.75 (10.14) | 2.00 (14.75) | 2.80 (14.02) | 0.77 (12.42) |
| Maize | 0.13 (3.89) | 0.25 (3.38) | 0.35 (2.58) | 0.20 (1.00) | 0.20 (3.23) |
| Groundnut | 0.16 (4.79) | 0.45 (6.08) | 0.70 (5.16) | 0.75 (3.76) | 0.32 (5.16) |
| Sugarcane | 0.25 (7.49) | 0.60 (8.11) | 0.50 (3.69) | 0.75 (3.76) | 0.37 (5.97) |
| Cholam | 0.10 (2.99) | 0.13 (1.76) | 0.10 (0.74) | 0.15 (0.75) | 0.11 (1.77) |
| Total Kharif | 1.04 (31.14) | 2.18 (29.46) | 3.65 (26.92) | 4.65 (23.28) | 1.77 (28.55) |
| Rabi crops | | | | | |
| Paddy | 0.5 (14.97) | 1.00 (13.51) | 2.20 (16.72) | 2.10 (10.52) | 0.89 (14.35) |
| Pulses | 0.22 (6.59) | 0.31 (4.19) | 0.15 (1.11) | 0.31 (1.55) | 0.24 (3.87) |
| Groundnut | 0.10 (2.99) | 0.40 (5.14) | 0.65 (4.79) | 1.14 (5.71) | 0.27 (4.35) |
| Ragi | 0.08 (2.40) | 0.24 (3.24) | 0.10 (0.74) | 0.50 (2.50) | 0.14 (2.26) |
| Total Rabi | 0.90 (26.95) | 1.95 (26.35) | 3.10 (22.86) | 4.05 (20.28) | 1.54 (24.84) |
| Horticultural crops | | | | | |
| Banana | 0.60 (17.96) | 1.20 (16.22) | 2.60 (19.17) | 4.10 (20.53) | 1.12 (18.06) |
| Mango | 0.35 (10.48) | 0.59 (7.97) | 1.87 (13.79) | 3.60 (18.03) | 0.71 (11.45) |
| Other fruits | 0.00 (0.00) | 0.15 (2.03) | 0.10 (0.74) | 0.50 (2.50) | 0.07 (1.13) |
| Vegetables | 0.10 (2.99) | 0.25 (3.38) | 0.30 (2.21) | 0.50 (2.50) | 0.16 (2.58) |
| Plantation crops | 0.06 (1.80) | 0.06 (0.81) | 0.08 (0.59) | 0.16 (0.80) | 0.07 (1.13) |
| Spices & Condiments | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Flowers | 0.04 (1.20) | 0.50 (6.76) | 1.10 (8.11) | 1.60 (8.01) | 0.34 (5.48) |
| Medicinal crops | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Others | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Total Horticultural crop | 1.15 (34.43) | 2.75 (37.16) | 6.05 (44.62) | 10.46 (52.38) | 2.47 (39.84) |
| Gross Cropped area (all HYV crops) | 3.09 (92.51) | 6.88 (92.97) | 12.80 (94.40) | 19.16 (95.94) | 5.78 (93.23) |
| Gross Cropped area (all crops) | 3.34 (100.00) | 7.40 (100.00) | 13.56 (100.00) | 19.97 (100.00) | 6.20 (100.00) |

Note: Figures in parentheses are percentage of GCA of respective farmer category.

The gross cropped area under high yielding varieties crops cultivated by all sample farmers was 5.78 acres per household which was found to be 93.23 per cent of the gross cropped area of all crops. The area under high yielding varieties during kharif season was 1.77 acres out of 1.96 acres of total area per household in case of all sample farmers which constituted 28.55 per cent of the gross cropped area. The area under high yielding varieties cultivated during kharif season by marginal farmers was 1.04 acres out of 1.16 acres of total area per household which formed 31.14 per cent of the gross cropped area, whereas in terms of percentage, the high yielding varieties area was less for the small, medium and large categories, compared to marginal size group. Table 3.10 reveals that the entire paddy and sugarcane crops were high yielding varieties across all the size groups of sample farmers.

During rabi season, the total high yielding varieties area worked out to 1.54 acres per household which accounted for 24.84 per cent of the gross cropped area. Here again, in terms of percentage of gross cropped area, the marginal farmers topped among the four categories with 26.95 per cent (0.90 acres) of the gross cropped area under high yielding varieties while the least went to large farmers (20.28%). Turning to area under high yielding varieties of horticultural crops, the table shows that out of total 2.56 acres, 2.47 acres were under high yielding varieties crops which accounted for 39.84 per cent of gross cropped area.

It is observed from Table 3.10 that unlike kharif and rabi crops, in terms of percentage of gross cropped area, the area, under high yielding varieties of horticultural crops was less for marginal farmers compared to other categories of sample farmers. It may be noticed from the table that the percentage of gross cropped area under high yielding varieties went on increasing with the increase in size of holdings (size group) as the figures worked out to 34.43 per cent, 37.16 per cent, 44.62 per cent and 52.38 per cent in case of marginal, small, medium and large farmers respectively. As could be observed from Table 3.10 that the gross cropped area of all high yielding varieties of crops cultivated by the marginal, small, medium, and large categories of sample farmers was put at 92.51 per cent, 92.97 per cent, 94.40 per cent and 95.94 per cent of the gross cropped area respectively. The point to be observed from the table is that out of the three selected horticultural crops, the total area under banana and flowers were cultivated fully with high yielding varieties across all categories of sample farmers.

3.9.2 Organic Farming:

Excessive use of chemical fertilizers and pesticides as a mean of intensive cultivation to boost up our food production has caused considerable damages to our soil health and the environment. This has been criticized recently by many environmentalists. This has focused the attention of several experts in ecologically sound viable and sustainable farming system, known as organic farming.

It is production system which avoids or largely excludes the use of synthetically compounded inorganic chemicals. This system entirely relies on crop rotation, crop residues, animal manures, legumes, green manures, off-farm organic wastes, bio-fertilizers, mechanical cultivation and aspects of biological pest control to maintain soil productivity and tilth to supply nutrients and to control insect's weeds and other pests. This system is often, referred as biological farming, regenerative farming and sustainable farming eco friendly farming

Organic farming is essential because

1. Chemical fertilizers may have an adverse effect on soil life they do not supply humus, have an adverse effect on physical, chemical and biological prosperities of soil.
2. Chemical fertilizers are costly
3. Indiscriminate application of pesticides could lead to residues in horticultural crops which are consumed mostly in raw state by us.
4. The continuous use of pesticides is ecologically unsustainable as pests acquire resistance
5. There is a premium for the horticultural produces which are raised under organic farming.

Details regarding area under organic farming are presented in Table 3.11

Table 3.11 Area Under Organic Farming (area in acre per household)

| | Marginal | Small | Medium | Large | Total |
|--|----------|-------|--------|-------|-------|
| Kharif crops during 2008 | | | | | |
| Total Kharif | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Rabi crops during 2008 | | | | | |
| Total Rabi | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Horticulture crops during 2008-09 | | | | | |
| Mango | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Banana | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Flower | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total horticultural crops | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Gross cropped area | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Organic farming of horticultural crops especially the selected crop banana, mango and flowers was not practised by the farmers in the selected area. It is evident from Table 3.11 that no sample farmers resorted to organic method of cultivation.

3.10 Production, Costs and Returns by Farm size

3.10.1 Total production, total cost and net returns from all crops cultivated by all sample farmers per household are presented in Table 3.12A.

**Table 3.12A Value of Output, Cost and Net Returns per Household for 2008-2009-
Aggregate of All Crops (rupees per household)**

| Farmer category | Value of output (main+ by product) | Variable cost | Fixed Cost | | Total cost of production | Net returns (Farm) | Non-farm income | Total income |
|-----------------|------------------------------------|---------------|---------------|-------------|--------------------------|--------------------|-----------------|--------------|
| | | | Material Cost | Labour Cost | | | | |
| Marginal | 182099 | 70356 | 2880 | 1043 | 74279 | 107820 | 11860 | 119680 |
| Small | 532473 | 195283 | 6594 | 2760 | 204637 | 327836 | 22947 | 350783 |
| Medium | 894793 | 330771 | 7387 | 6386 | 353182 | 541610 | 135405 | 677006 |
| Large | 1366948 | 498777 | 32548 | 9544 | 540870 | 826078 | 28793 | 1115200 |
| Total | 398294 | 110868 | 5356 | 2427 | 157315 | 240980 | 30808 | 280484 |

Note: Labour cost includes the imputed value of family labour

As could be seen from the table the total value of out put both main and by product was to the tune of Rs.398294 per household in case of all sample farmers. Among the four categories of farmers, the large farmers had the highest value of output to the tune of Rs.1366948 per household followed by medium size group (Rs.894793). The value of output produced by marginal farmers per household worked out to Rs.182099 whereas for medium farmers the value of output was to the tune of Rs. 894793.

The total variable cost incurred by all the sample farmers worked out to Rs. 10868 per household. Among the different categories of farmers, the variable cost incurred by the large farmers was to the tune of Rs.498777 which was found to be the highest per household variable cost followed by medium farmers (Rs.330771). The variable cost of small and marginal farmers was Rs. 195283 and Rs.70356 per household respectively.

The total material cost and labour cost incurred by all the sample farmers taken together worked out to Rs.5356 and Rs.2427 per household respectively.

The net returns realized by a sample farmer per household after having incurred a total cost of production of Rs.157315 were Rs.240980. Among the different size group of farmers, the

large farmers incurred the highest cost of production of Rs.540870 per household which was commensurate with highest returns to the tune of Rs.826078 per household. The total cost of production of medium farmers was Rs.353182 per household while the net returns stood at Rs.541610 per household. All the size group of sample farmers earned reasonable returns from agriculture which was made possible by the cultivation of horticultural crops. In fact cultivation of horticultural crops involves more expenditure compared to paddy, groundnut, etc but at the same time these crops generate considerable returns to the farmers, which encourage them to go in for horticultural crops.

Table 3.12A reveals that all the size group of sample farmers made non farm income from business, salary / pension, wages etc. The total income of all farmers taken together was to the tune of Rs.280484 per household. As evident from Table 3.12A, the total income of large farmers was as high as Rs.1115200 per household which included non farm income of Rs.28793 per household. The lowest total income was earned by marginal farmers which was to the tune of Rs.119680 per household including the non farm income of Rs.1860 per household. The total income of medium farmers was Rs.677006 per household which included the highest non farm income of Rs.135405 per household.

3.10.2 Per Acre Production, Cost and Returns

Details regarding per acre production, cost and returns are furnished in Table 3.12B.

Table 3.12B Value of Output, Cost and Net Returns per Acre for 2008-2009- Aggregate of All Crops

(rupees per acre)

| Farmer category | Value of output (main+by product) | | Variable Cost | | Material Cost | | Labour Cost | | Total cost of production | | Net returns (Farm business income) | |
|-----------------|-----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------------------|-----------------|------------------------------------|-----------------|
| | Per acre of NSA | Per acre of GCA | Per acre of NSA | Per acre of GCA | Per acre of NSA | Per acre of GCA | Per acre of NSA | Per acre of GCA | Per acre of NSA | Per acre of GCA | Per acre of NSA | Per acre of GCA |
| Marginal | 94843 | 54507 | 36664 | 21060 | 1500 | 862 | 543 | 312 | 38687 | 22234 | 56156 | 32273 |
| Small | 118065 | 71991 | 43300 | 26402 | 1462 | 891 | 612 | 373 | 45374 | 27666 | 72691 | 44325 |
| Medium | 103684 | 66040 | 38328 | 24413 | 1856 | 1182 | 740 | 471 | 40925 | 26066 | 62759 | 39974 |
| Large | 103400 | 68479 | 37729 | 24986 | 2462 | 1631 | 722 | 478 | 40913 | 27095 | 62487 | 41384 |
| Total | 101976 | 67346 | 38535 | 24770 | 1568 | 1324 | 591 | 448 | 40684 | 26542 | 61282 | 40804 |

Notes: Labour cost includes the imputed value of family labour; NSA - net sown area; and GCA - gross cropped area

The total value of output including by product in case of all the sample farmers was to the tune of Rs.101976 per acre of net sown area and Rs.67346 per acre of gross cropped area. Among the four categories of sample farmers, value of output per acre of net sown area and per acre of gross cropped area was the highest for the small farmers followed by medium farmers. The value of output was to the tune of Rs.94843 per acre of net sown area for the marginal farmer which was found to be the lowest compared to other categories of sample farmers. As regards variable cost, it was Rs. 38535 and Rs. 24770 per acre of net sown area and per acre of gross cropped area respectively in case of all the sample farmers. The variable cost per acre of NSA (Rs.43300) and per acre of gross cropped area (Rs.26402) incurred by marginal farmers was found to be high compared to the same incurred by other categories of sample farmers. The lowest variable cost of Rs.36664 per acre of net sown area and Rs.21060 per acre of gross cropped area was incurred by the marginal farmers. Material cost worked out to Rs.1568 per acre of net sown area and Rs.1324 per acre of gross cropped area. With regard to labour cost, it was Rs.591 per acre of net sown area and Rs. 448 per acre of gross cropped area in case of all farmers.

When it comes to total cost of production, it was about Rs.40684 per acre of net sown area and Rs.26542 per acre of gross cropped area in case of all sample farmers. While analyzing the total cost of production across the size groups, the highest amount of Rs.45374 per acre of net sown area and Rs.27666 per acre of gross cropped area was found to be incurred by small farmers.

Table 3.12B reveals that the cost of cultivation per acre of net sown area and per acre of gross cropped area was found to be lowest in case of marginal farmers as the figures were Rs.38687 and Rs.22234 respectively.

As regards net returns from agriculture, the average per acre net returns of net sown area and per acre net returns of gross cropped area were to the tune of Rs.61282 and Rs.40804 respectively. Among the different categories of sample farmers the highest net returns per acre of net sown area and per acre of gross cropped area as the amount being Rs.72691 and Rs.44325 were obtained by medium farmers. Whereas the lowest net returns to the tune of Rs.56156 per acre of net sown area and Rs.32273 per acre of gross cropped area were realised by marginal farmers. An analysis of value of output and cost of production brings out the fact that the high

cost of cultivation incurred by the small farmers was suitably rewarded with high net returns resulting from high quantity of output.

3.11 Summary of the Chapter

Socio economic conditions and characteristics of the farmers were dealt with in this chapter. Characteristics of operational holdings, nature of tenancy, sources of irrigation, sources and purpose of credit, cropping pattern, production cost and returns were also analysed in this chapter.

The total number of sample respondents for the study was 150 comprising 89 marginal, 37 small, 19 medium and 5 large farmers. The average household size was 5.68 persons. The average number of earners was found to be 3.24. As regards the sex of sample respondents, it was 51.8 per cent male and 48.2 per cent female. About 66 per cent of the members of the sample households belonged to the productive age group of 16-60 years. As regards education, about 83 per cent of the sample respondents had education ranging from primary to graduation level. About 17 per cent of the sample respondents were illiterates. As far as community of the sample respondents was concerned BC was found to be the dominant community claiming more than 50 per cent whereas SC community constituted just 3 per cent only. Farming was found to be the main occupation for about 86 per cent of the working members of the sample households.

As regards operational holding, average net operated area and net sown area of the sample households accounted for 3.91 acres and 3.90 acres respectively. The average gross cropped area worked out to 6.20 acres and cropping intensity was 163 per cent. The leased in area was found to be abysmally low at 0.28 acre on an average and fixed rent in cash was the nature of tenancy existed among the sample households.

Tank, Canal and well were the sources of irrigation for the sample households and among them wells were found to be the major source, irrigating 68 per cent of the land of the sample households. A little more than one tenth of the net operated area was rainfed.

The average amount of loan borrowed from different sources accounted for Rs.28382 per household. About 87 per cent of the loan taken from all sources was for agricultural purpose. With regard to asset holding, it accounted for Rs.177449 per household and Rs.43246 per acre of NSA on an average.

The sample respondents raised paddy, maize, groundnut, sugarcane and cholam during kharif season and paddy, pulses, groundnut and ragi during rabi season. As regards horticultural crops, banana, mango, flowers, vegetables, other fruits and plantation crops were cultivated by the sample respondents. The total area under kharif crop accounted for 1.96 acres per household whereas it was 1.67 acres per households for rabi crop. In case of horticultural crops, the total area worked out to 2.56 acres per household. The area under banana on an average accounted for 1.12 acres per household. The average area under mango worked out to 0.77 acre per household whereas the average area under flower was very minimal at 0.34 acre per household. The study reveals that a little more than 90 per cent of the area was irrigated per household during kharif as well as in rabi seasons. In the case of horticultural crops, about 96 per cent of the area was irrigated per household.

The total value of output on an average was to the tune of Rs.398294 per household. The total cost of production worked out to Rs.157315 per household while the realized net returns on an average were to the tune of Rs.240980 per household. The total income including non farm income earned by the sample respondents was of Rs.280484 per household. The total value of output per acre of net sown area and per acre of gross cropped area worked out to Rs.101976 and Rs.67346 respectively. The total cost of production calculated in terms of per acre of net sown area and per acre of gross cropped area accounted for Rs.40684 and Rs.26542 respectively. In case of net returns from agriculture, the average per acre net returns of net sown area and per acre net returns of gross cropped area were to the tune of Rs.61282 and Rs.40804 respectively.

CHAPTER – IV

Production Structure and Resource Use under Horticulture Crops

The production structure, use of resources under horticulture including cost of cultivation, quantum of output produced, net returns generated from the selected crops are analysed in this chapter.

4.1 Economics of Production, Cost and Resource Use in Horticulture

Details regarding economics of production, cost and resource use in horticulture are presented in Table 4.1 to 4.3 for the three selected crops namely banana, mango and flowers.

4.1.1 The Case of Banana Crop

As regards banana, the average area planted by all sample farmers worked out to 2.09 acres. The average area of banana planted by marginal farmers was just 1.10 acres, whereas the same cultivated by small, medium and large farmers was 2.60 acres, 4.30 acres and 7.50 acres respectively. Cost of cultivation was divided into variable cost and fixed cost. Fixed cost included both material cost and labour cost.

As could be seen from Table 4.1 total variable cost incurred towards the cultivation of banana was to the tune of Rs.53897 per acre which constituted 96.26 per cent of the total cost of production. Among the four categories of farmers, total variable cost ranges from Rs.53250 to Rs.55273 per acre. The highest variable cost per acre of banana was incurred by large farmers while the lowest by marginal farmers. Among the different items of variable cost, maximum percentage (23.44 %) was consumed by interest on working capital in case of all farmers per acre. Among the size group of farmers, large farmers spent the lowest 21.61 per cent of the total cost on interest on working capital whereas it was 24.07 per cent for the marginal farmers. The next major item of expenditure was on manure and fertilizers followed by weeding and inter-cultural operation and plant protection. Manure and fertilizer consumed 17.37 per cent of the total cost in case of all farmers per acre followed by 13.06 per cent and 13.01 per cent for weeding and inter-cultural practices and pesticides respectively. The market/mandi fee was found to be the lowest variable cost (0.25%) per acre in case of all farmers.

Table 4.1 Cost of Cultivation, Production and Net returns per acre from Banana Crop

| Farm Size | | Marginal | Small | Medium | Large | All Farmers |
|---------------------------------------|---|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Average area planted (acres) | | 1.10 | 2.60 | 4.30 | 7.50 | 2.09 |
| Preparatory tillage | | 3000 (5.43) | 2850 (5.02) | 2600 (4.53) | 2600 (4.46) | 2899 (5.18) |
| Manure & Fertilizers | | 9000 (16.29) | 10000 (17.62) | 12000 (20.90) | 12000 (20.59) | 9726.67 (17.37) |
| Transplanting & gap filling | | 1000 (1.81) | 1000 (1.76) | 1000 (1.74) | 1000 (1.72) | 1000 (1.78) |
| Irrigation, Canal, electricity | | 3200 (5.79) | 3500 (6.17) | 3000 (5.23) | 3150 (5.41) | 3247 (5.80) |
| Weeding and inter cultural operations | | 7000 (12.67) | 7500 (13.22) | 8000 (13.94) | 9000 (15.44) | 7316 (13.06) |
| Topping & Pruning | | 3350 (6.06) | 3350 (5.90) | 2800 (4.87) | 2800 (4.80) | 3262 (5.83) |
| Plant protection, pesticides | | 7000 (12.67) | 7500 (13.22) | 8000 (13.93) | 8000 (13.73) | 7283 (13.01) |
| Repair maintenance & deprecation | | 2000 | 1500 | 1000 | 500 | 1700 |
| Harvesting & collection | | (3.62) | (2.64) | (1.74) | (0.86) | (3.04) |
| Grading, Storage, transport & packing | | 800 (1.45) | 800 (1.41) | 600 (1.07) | 600 (1.03) | 768 (1.37) |
| Market/mandi fee | | 150 (0.27) | 150 (0.26) | 100 (0.17) | 100 (0.17) | 142 (0.25) |
| Miscellaneous | | 700 (1.27) | 700 (1.23) | 500 (0.87) | 500 (0.86) | 668 (1.19) |
| Interest on working capital | | 13300 (24.07) | 13000 (22.91) | 12698 (22.12) | 12593 (21.61) | 13126 (23.44) |
| Variable Labor cost | | 2750 (4.98) | 2900 (5.11) | 2610 (4.55) | 2430 (4.17) | 2758 (4.93) |
| Total Variable Cost | | 53250 (96.38) | 54750 (96.48) | 54908 (95.65) | 55273 (94.85) | 53897 (96.26) |
| Fixed cost | Planting materials, fuel material, preparation cost, supporting material and irrigation | 1520 (2.75) | 1480 (2.60) | 1930 (3.36) | 2450 (4.20) | 1593 (2.85) |
| | Labour Cost | 480 (0.87) | 520 (0.92) | 570 (0.99) | 550 (0.94) | 503 (0.89) |
| Total Cost | | 55250 (100.00) | 56750 (100.00) | 57408 (100.00) | 58273 (100.00) | 55994 (100.00) |
| Total Revenue | | 150000 | 160000 | 170000 | 175000 | 155833 |
| Total Revenue – Total Cost | | 94750 | 103250 | 112592 | 116727 | 99839 |
| Total Revenue – Total Variable Cost | | 96750 | 105250 | 115092 | 119727 | 101935 |
| Output produced/acre (quintals) | | 190 | 210 | 205 | 215 | 197 |

The share of total fixed cost was less than 4 per cent of the total cost per acre in the case of all the sample farmers taken together. Fixed cost had two components namely material cost and labour cost, the former worked out to 2.85 per cent of the total cost while the later was just

0.89 per cent of the total cost per acre in case of all sample framers. The material cost incurred by the marginal farmers was Rs.1520 (2.75%) while it was Rs.1480 (2.60%), Rs.1930 (3.36%) and Rs.2450 (4.20%) for small, medium, and large farmers respectively. The total cost of cultivation worked out to Rs.55994 per acre in case of all sample farmers. As evident from Table 4.1, the total cost incurred by marginal, small, medium and large farmers towards the cultivation of an acre of banana was to the tune of Rs.55250, Rs.56750, Rs.57408 and Rs.58273 respectively.

Against the average total cost, the average total revenue earned by a farmer from the cultivation of an acre of banana was to the tune of Rs.155833. As could be observed from Table 4.1, total revenue varies from size group to size group as the large farmers made the highest revenue of Rs.175000 per acre whereas the lowest Rs.150000 per acre was earned by the marginal farmers. The total revenue obtained by small and medium farmers stood at Rs.160000 and Rs.170000 per acre respectively. The average net returns obtained by a sample farmer from an acre of banana were found to be Rs.99839. The lowest net returns of Rs.94750 per acre were secured by marginal farmers whereas the highest Rs. 116727 net returns per acre of banana were obtained by large farmers. The small and medium farmers made a net return of Rs.103250 and Rs.112592 per acre respectively.

The average output produced by a sample farmer stood at 197 quintals of banana per acre. The output of banana produced by marginal, small, medium and large farmers was 190 quintals, 210 quintals, 205 quintals and 215 quintals per acre respectively. The significant point to be observed here is that as the area of operation increased, the cost, both variable and fixed cost, also increased among the four categories of sample farmers. But at the same time, the higher cost of cultivation was compensated by higher net returns because of higher output produced per acre. For instance, the cost of cultivation of banana incurred by marginal farmers was Rs.55250 per acre whereas the same incurred by large farmer was Rs.58273 per acre. Against this, the net returns obtained by the marginal farmers were to the tune of Rs.94750 per acre whereas it was Rs.116727 per acre in case of large farmer. Thus, the higher cost of cultivation was suitably rewarded with higher net returns resulting from higher output.

4.1.2 The case of Mango crop

Mango, being a perennial crop, it would take minimum 4 to 5 years to attain the bearing stage.

Table 4.2 Cost of Cultivation, Production and Net returns per acre from Mango Crop

| Farm Size | | Marginal | Small | Medium | Large | All Farmers |
|---------------------------------------|---|---------------------------------|---------------------------------|---------------------------------|---------------------------------|------------------------------------|
| Average area planted (acres) | | 1.30 | 2.90 | 5.40 | 8.20 | 2.44 |
| Preparatory tillage | | 350 (3.48) | 475 (3.92) | 420 (3.26) | 525 (3.41) | 395.53 (3.57) |
| Manure & Fertilizers | | 2075 (20.67) | 2450 (20.23) | 2850 (22.12) | 3100 (20.14) | 2299.83 (20.74) |
| Transplanting & gap filling | | 240 (2.39) | 210 (1.73) | 235 (1.82) | 260 (1.69) | 232.63 (2.1) |
| Irrigation, Canal, electricity | | 450 (4.48) | 525 (4.34) | 470 (3.65) | 540 (3.51) | 474.03 (4.27) |
| Weeding and inter cultural operations | | 200 (1.99) | 645 (5.33) | 690 (5.36) | 850 (5.52) | 393.5 (3.55) |
| Topping & Pruning | | 40 (0.4) | 50 (0.41) | 45 (0.35) | 40 (0.26) | 43.1 (0.39) |
| Plant protection, pesticides | | 820 (8.16) | 1160 (9.58) | 1040 (8.07) | 1350 (8.77) | 949.4 (8.56) |
| Repair maintenance & deprecation | | 1030 (10.25) | 1610 (13.29) | 1925 (14.94) | 1840 (11.95) | 1313.43 (11.84) |
| Harvesting & collection | | 60 (0.6) | 65 (0.54) | 50 (0.39) | 50 (0.32) | 59.63 (0.54) |
| Grading, Storage, transport & packing | | 145 (1.45) | 120 (0.99) | 210 (1.63) | 160 (1.04) | 147.57 (1.33) |
| Market/mandi fee | | 0 | 0 | 0 | 0 | 0 |
| Miscellaneous | | 0 | 0 | 0 | 0 | 0 |
| Interest on working capital | | 360 (3.58) | 395 (3.26) | 447 (3.47) | 761 (4.94) | 393.02 (3.54) |
| Variable Labor cost | | 1974 (19.65) | 1763 (14.56) | 1542 (11.97) | 2260 (14.68) | 1876.77 (16.92) |
| Total Variable Cost | | 7744 (77.1) | 9468 (78.19) | 9924 (77.03) | 11736 (76.23) | 8578.45 (77.35) |
| Fixed cost | Planting materials, fuel material, preparation cost, supporting material and irrigation | 1680 (16.73) | 1900 (15.69) | 2100 (16.29) | 2850 (18.51) | 1826.47 (16.46) |
| | Labour Cost | 620 (6.17) | 740 (6.11) | 860 (6.67) | 810 (5.26) | 686.33 (6.19) |
| Total Cost | | 10044 (100.00) | 12108 (100.00) | 12884 (100.00) | 15396 (100.00) | 11091.25 (100.00) |
| Total Revenue | | 12500 | 14600 | 17400 | 18300 | 13832 |
| Total Revenue – Total Cost | | 2456 | 2492 | 4516 | 2904 | 2740.75 |
| Total Revenue – Total Variable Cost | | 4756 | 5132 | 7476 | 6564 | 5253.55 |
| Output produced/acre (quintals) | | 4.31 | 5.03 | 6.00 | 6.31 | 4.77 |

Cost of cultivation of mango production and net returns from mango crop per acre are illustrated in Table 4.2

The average area of mango crop planted by all the sample farmers was 2.44 acres per household. The average area per household in case of marginal, small, medium and large farmers worked out to 1.30 acres, 2.90 acres, 5.40 acres and 8.20 acres respectively. The total variable cost incurred towards the cultivation of mango crop per acre by a sample farmer was Rs.8578.45 which constituted 77.35 per cent of the total cost. The total variable cost varies among the different categories of sample farmers. The highest variable cost towards the cultivation of mango was incurred by large farmer which accounted for Rs.11736 per acre whereas the lowest cost to the tune of Rs.7744 per acre was incurred by marginal farmers. The total variable cost per acre of mango worked out to Rs.9468 and Rs.9924 in case of small and medium farmers respectively.

Total variable cost as shown in Table 4.2 consisted of different items such as preparatory tillage, manure, fertilizers, transplanting, gap filling, plant protection, pesticides, repair maintenance, variable labour cost and the like. Of the various components of variable cost, the major item of expenditure was on manure and fertilizer across all size groups of farmers which accounted for 20.67 per cent, 20.23 per cent, 22.12 per cent and 20.14 per cent of the total cost of cultivation per acre in case of marginal, small, medium and large farmers respectively. Variable labour cost was found to be the second major item of expenditure followed by repair and maintenance cost and plant protection and pesticides across all size group of farmers.

Fixed cost consisted of material cost and labour cost. Material cost was the major item of fixed cost which accounted for 16.46 per cent of the total cost per acre. An amount of Rs. 2850 per acre was spent on material cost per acre by large farmers which were found to be the highest among the four categories of farmers. The material cost was as low as Rs.1680 per acre in case of marginal farmers whereas it was Rs.1900, 2100 per acre in case of small and medium farmers. Labour cost accounted for around 6 per cent of the total cost in case of marginal, small, medium and large farmers each.

The total cost of cultivation of mango was put at Rs.11091 per acre in case of all sample farmers taken together. However, the cost varies among the four categories of farmers as it was as high as Rs.15396 per acre for large farmers whereas it was Rs.12500 per acre for the marginal farmers. Small and medium farmers spent an amount of Rs.14600 and Rs.17400 towards the cultivation of an acre of mango.

The total net returns earned by a sample farmer from mango were to the tune of Rs.2740 per acre. Among the four categories of farmers, the highest net returns of Rs.4516 per acre were generated by medium farmers and the lowest Rs.2456 per acre was obtained by marginal farmers. The small and large farmers made net returns of Rs.2492 and Rs.2904 per acre. The net returns obtained from mango cultivation were found to be small when compared to the net returns realized from banana and flower because of the low output produced. Most of the sample respondents growing mango reported that they started cultivating mango trees very recently. As mentioned above, mango crop has a long gestation period and during gestation period the farmers will have to spend on inputs and labour whereas no output could be harvested until bearing period begins. This was the basic reason for the sample farmers to obtain a meagre output to the level of 4.77 quintals per acre.

As evident from Table 4.2, the medium and large farmers secured an output of 6.00 quintals and 6.31 quintals per acre which were found to be high while marginal and small farmers obtained as low as 4.31 quintals and 5.03 quintals per acre of mango cultivation.

4.1.3 The Case of Flower Crop

Cost of cultivation, production and net returns from flower crop are presented in Table 4.3

The average area of flower crop cultivated by the sample farmers worked out to 2.39 acres per household. Costs were divided into variable cost and fixed cost. Variable cost included different components while fixed cost was subdivided into material cost and labour cost. The total variable cost worked out to Rs.53108, consisting about 97 per cent of the total cost of cultivation of flower per acre in case of all the sample farmers taken together. Large farmers incurred a higher variable cost of Rs. 54950 per acre closely followed by medium farmers (Rs.54890). The lowest variable cost of Rs.52500 per acre of flower cultivation was incurred by marginal farmers. Table 4.3 reveals that under variable cost, interest on working capital was found to be high as Rs.12000 which constituted 22.40 per cent of the total cost in case of marginal farmers. The next major item of variable cost being manure and fertilizer, consumed 16.94 per cent (Rs.9200) of the total cost per acre in case of marginal farmers.

Table 4.3 Cost of Cultivation, Production and Net Returns per acre from Flower Crop

| Farm Size | | Marginal | Small | Medium | Large | All Farmers |
|---------------------------------------|---|---------------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------------------|
| Average area planted (acres) | | 1.05 | 2.80 | 6.10 | 9.20 | 2.393 |
| Preparatory tillage | | 2850 (5.25) | 2700 (4.89) | 2400 (4.20) | 2400 (4.16) | 2741 (4.98) |
| Manure & Fertilizers | | 9200 (16.94) | 10200 (18.49) | 13000 (22.73) | 13000 (22.51) | 10054.7 (18.28) |
| Transplanting & gap filling | | 750 (1.38) | 800 (1.45) | 750 (1.31) | 750 (1.30) | 762.333 (1.39) |
| Irrigation, Canal, electricity | | 3000 (5.52) | 2700 (4.89) | 2300 (4.02) | 2450 (4.24) | 2819 (5.13) |
| Weeding and inter cultural operations | | 5000 (9.21) | 5250 (9.52) | 7000 (12.24) | 7000 (12.12) | 5381.67 (9.79) |
| Topping & Pruning | | 4000 (7.37) | 4000 (7.25) | 3000 (5.25) | 3000 (5.19) | 3840 (6.98) |
| Plant protection, pesticides | | 4000 (7.37) | 4200 (7.61) | 7000 (12.24) | 7000 (12.12) | 4529.33 (8.24) |
| Repair maintenance & deprecation | | 1850 | 1200 | 900 | 900 | 1537.67 |
| Harvesting & collection | | (3.41) | (2.81) | (1.57) | (1.56) | (2.80) |
| Grading, Storage, transport & packing | | 2000 (3.68) | 1950 (3.54) | 800 (1.40) | 800 (1.39) | 1795.67 (3.27) |
| Market/mandi fee | | 3000 (5.52) | 2500 (4.53) | 2000 (3.50) | 2000 (3.46) | 2716.67 (4.94) |
| Miscellaneous | | 3000 (5.52) | 3000 (5.44) | 3000 (5.25) | 3000 (5.19) | 3000 (5.46) |
| Interest on working capital | | 12000 (22.10) | 13000 (23.57) | 11000 (19.23) | 11000 (19.05) | 12086.7 (21.98) |
| Variable Labor cost | | 1850 (3.41) | 1910 (3.46) | 1740 (3.04) | 1650 (2.86) | 1844.2 () |
| Total Variable Cost | | 52500 (96.69) | 53410 (96.83) | 54890 (95.98) | 54950 (95.15) | 53108.9 (96.57) |
| Fixed cost | Planting materials, fuel material, preparation cost, supporting material and irrigation | 1280 (2.36) | 1110 (2.01) | 1560 (2.73) | 2080 (3.60) | 1300.2 (2.36) |
| | Labour Cost | 520 (0.96) | 640 (1.16) | 740 (1.29) | 720 (1.25) | 584.13 (1.06) |
| Total Cost | | 54300 (100.00) | 55160 (100.00) | 57190 (100.00) | 57750 (100.00) | 54993.2 (100.00) |
| Total Revenue | | 132450 | 139750 | 142600 | 152700 | 136211.3 |
| Total Revenue – Total Cost | | 78150 | 84590 | 85410 | 94950 | 81218.1 |
| Total Revenue – Total Variable Cost | | 79950 | 86340 | 87710 | 97750 | 83102.4 |
| Output produced/acre (Quintals) | | 120 | 135 | 140 | 142 | 126.97 |

Weeding and inter cultural operations, topping, pruning and plant protection, pesticides were the other major items of expenditure under variable cost in case of marginal farmers. The same trend reflected in case of other category of farmers also in respect of variable cost. Interest

on working capital was as high as Rs.13000 per acre (23.57%) for small farmers whereas it was Rs.11000 each for medium and large farmers.

The highest amount of Rs.13000 was spent on manure and fertilizer by medium and large farmers each. The expenditure incurred by a sample farmer on weeding and inter cultural operations was to the tune of Rs.5381 per acre.

As regards material cost under fixed cost category, the amount worked out to Rs. 1300 by a sample farmer per acre. Large farmers incurred a material cost of Rs.2080 per acre which was found to be the highest amount compared to other categories of farmers. Marginal farmers spent the lowest amount of Rs.1150 per acre on material cost compared to other farmers. As could be observed from Table 4.3 the labour cost incurred by a sample farmer accounted for a meagre 1.06 per cent of the total cost of production per acre.

The total cost of production in case of all the farmers taken together worked out to Rs.54993.20 on an average per acre. Among the four categories of farmers the total cost as could be seen from Table 4.3 was high (Rs.57750) for large farmers followed by medium (Rs.57190) farmers. The marginal farmers incurred the lowest total cost of cultivation per acre of flower to the tune of Rs. 54300. Table 4.3 shows that the total revenue generated from an acre of flower crop by a sample farmer was to the tune of Rs.136211 against a total cost of Rs.54993 per acre. The total revenue earned by the large farmer was as high as Rs.152700 per acre of flower crop while it was low at Rs.132450 per acre for marginal farmers. Compared to marginal and small farmers, the medium farmers obtained higher total revenue of Rs.142600 per acre. The net returns obtained by a sample household from the cultivation of flower came to Rs.81218 per acre. There were fluctuations observed in the net returns generated by different categories of farmers. The highest net returns (Rs.94950) were obtained by large farmers whereas the net returns of marginal farmers were low at Rs.78150 per acre. The total revenue and net returns are linked to the quantum of output produced. It could be understood from Table 4.3 that the more the output the more was the revenue and net returns and vice versa. The flower growers in our study secured an average output of 126.97 quintals of flower per acre. The output produced by the marginal, small, medium and large farmers was 120 quintals, 135 quintals, 140 quintals and 142 quintals per acre. However, it may be noted here that all the sample farmers irrespective of size groups generated a reasonable revenue and net returns from flower cultivation which implies that NHM scheme was much helpful to them to reap the benefit.

4.2 Net Returns from Horticultural versus Non-Horticultural Crops

Table 4.4 furnishes details regarding net returns from horticultural and non-horticultural crops.

Table 4.4 Net Returns (Gross Value of Output – Total Cost) from Horticultural and non Horticultural Crops (All HHs) (Rs. per acre)

| Crops | Marginal | Small | Medium | Large | Total |
|--|----------------|----------------|----------------|----------------|----------------|
| Kharif crops during 2008 | | | | | |
| Paddy | 6350 | 8720 | 8650 | 8600 | 7301 |
| Maize | 1150 | 1750 | 1700 | 1710 | 1386 |
| Groundnut | 6200 | 7020 | 6940 | 6600 | 6510 |
| Sugarcane | 12500 | 16300 | 13570 | 14395 | 13636 |
| Cholam | 750 | 1100 | 1150 | 1200 | 902 |
| Total Kharif | 5390 | 6978 | 6402 | 6501 | 5946.93 |
| Rabi crops during 2008 | | | | | |
| Paddy | 6670 | 7740 | 6950 | 7000 | 6980 |
| Pulses | 3300 | 4420 | 4050 | 4070 | 3697 |
| Groundnut | 7200 | 9300 | 8690 | 8800 | 7960 |
| Ragi | 800 | 1800 | 1650 | 1800 | 1188 |
| Total Rabi | 4492.5 | 5815 | 5335 | 5417.5 | 4956.27 |
| Horticultural crops during 2008-09 | | | | | |
| Banana | 94750 | 103250 | 112592 | 116727 | 99839 |
| Mango | 2456 | 2492 | 4516 | 2904 | 2741 |
| Other fruits | - | 2320 | 2120 | 2210 | 915 |
| Vegetables | 5760 | 6025 | 4750 | 4825 | 5666 |
| Plantation crops | 2865 | 2615 | 3425 | 3550 | 2897 |
| Spices & Condiments | - | - | - | - | - |
| Flowers | 78150 | 84590 | 85410 | 94950 | 81218 |
| Medicinal crops | - | - | - | - | - |
| Others | - | - | - | - | - |
| Total Horticultural crop | 36796.2 | 33548.7 | 35468.8 | 37527.7 | 35851.4 |
| Average net returns per acre of GCA | 32273 | 44325 | 39974 | 41384 | 40804 |
| Average net returns per acre of NSA | 56156 | 72691 | 62759 | 62487 | 61282 |

Note: NSA - net sown area; and GCA - gross cropped area.

As shown in the table the average net returns realized by a sample household from kharif crop was put at Rs.5946.93 per acre. When compared to other categories of farmers, small farmers generated higher net returns of Rs.6978 per acre from kharif crop whereas marginal farmers obtained the lowest net returns of Rs.5390 per acre. The net returns generated by the medium and large farmers were more or less equal to the tune of Rs.6402 and Rs.6501 per acre.

When compared to food grains, the net returns obtained from sugarcane was found to be high. The net returns obtained from kharif paddy crop were Rs.7301 per acre while the same from sugarcane were as high as Rs.13636 per acre. Among the food crops paddy, maize and cholam produced during kharif season, the net returns generated from paddy, was found to be high across all size groups of sample households.

When compared to kharif crop, the net returns realized from rabi crop was much low during the reference year 2008-09. This might be attributed to monsoon failure. The average net returns generated by a sample household from the rabi crops was to the tune of Rs.4956.23 per acre. Among the farmer size groups, the small farmers secured higher net returns of Rs.5815 per acre followed by large (Rs.5417.50) and medium (Rs.5335) farmers. The lowest net return of Rs.17920 per acre was obtained by marginal farmers from rabi crop. Among the different crops cultivated during rabi season, the net returns secured from groundnut were found to be high across all size groups of farmers.

Turning to horticultural crops, Table 4.4 reveals that the average net return generated by a sample household was calculated to be Rs.35851.39 per acre. Of the different categories of sample farmers, the large farmers were able to generate a higher net return of Rs.225166 per acre followed by marginal farmers (Rs.36796.20) and medium farmers (Rs.35468.83). Small farmers realized poor net returns of Rs.33548.67 per acre compared to other categories of sample farmers.

It is significant to note that, of the three selected horticultural crops, the net returns generated from banana crop was found to be high at Rs.99839 per acre in case of all the sample farmers taken together. Out of different categories of farmers, Table 4.4 shows that the large farmers obtained higher net returns to the tune of Rs.116729 per acre of banana followed by medium farmers (112592). The net returns generated from banana were low at Rs.94750 per acre for the marginal farmers.

In the case of mango crop, the net return generated by the sample farmers was to the tune of Rs.2740.75 per acre. Of the different categories of farmers, the highest net returns of Rs.4516 per acre were obtained by medium farmers while the lowest net returns of Rs.2456 were secured by marginal farmer.

As far as net returns from flowers were concerned, Table 4.4 shows that it was an average Rs.81218.10 per acre for all the flower growers. While analyzing the net returns from flowers

across the size groups, the table reveals that large farmers realized the highest net returns to the tune of Rs.94950 per acre whereas the net returns of marginal farmers were Rs.78150 per acre.

4.3 Use of Human Labour in Horticultural versus Non-Horticultural Crops

Production of crops both horticultural and non horticultural involves a lot of human labours on different activities at various stages of cultivation. Table 4.5 exhibits the use of human labour cropwise and Table 4.6 presents the activitywise use of human labour.

4.3.1 Cropwise use of Human Labour

It could be understood from Table 4.5 that the mandays of human labour used for all the kharif crops by the sample households on an average worked out to 20.76 per acre.

Table 4.5 Use of Human Labour in Crop Production (man days per acre)

| Farm Size → | Marginal | Small | Medium | Large | Total |
|---|-----------------|--------------|---------------|--------------|--------------|
| Kharif crops during 2008 | | | | | |
| Paddy | 29 | 27 | 27 | 26 | 28.15 |
| Maize | 17 | 15 | 13 | 13 | 15.86 |
| Groundnut | 25 | 23 | 23 | 21 | 24.12 |
| Sugarcane | 28 | 26 | 25 | 25 | 27.03 |
| Cholam | 9 | 9 | 7 | 6 | 8.65 |
| Total Kharif | 21.60 | 20.00 | 19.00 | 18.20 | 20.76 |
| Rabi crops during 2008 | | | | | |
| Paddy | 30 | 28 | 28 | 27 | 29.15 |
| Pulses | 15 | 13 | 11 | 11 | 13.87 |
| Groundnut | 25 | 24 | 22 | 22 | 24.27 |
| Ragi | 13 | 13 | 11 | 10 | 12.65 |
| Total Rabi | 20.75 | 19.50 | 18.00 | 17.50 | 19.99 |
| Horticultural crops during 2008-09 | | | | | |
| Banana | 37 | 35 | 32 | 30 | 36.64 |
| Mango | 35 | 33 | 30 | 30 | 34.71 |
| Other fruits | - | 25 | 24 | 22 | 24.45 |
| Vegetables | 20 | 21 | 20 | 18 | 20.18 |
| Plantation crops | 26 | 24 | 22 | 22 | 25.37 |
| Spices & Condiments | - | - | - | - | - |
| Flowers | 25 | 23 | 23 | 22 | 24.07 |
| Medicinal crops | - | - | - | - | - |
| Others | - | - | - | - | - |
| Total Horticultural crop | 28.60 | 26.83 | 25.17 | 24.00 | 27.57 |
| Average (all crops) | 23.65 | 22.11 | 20.73 | 19.90 | 22.77 |

It is evident from the table that marginal farmers, compared to other categories, used more mandays per acre (21.6). The man days required by the large farmers was found to be low

at 18.2. Of the different kharif crops, paddy required more mandays which ranges from 26 to 29 per acre whereas the fodder crop cholam consumed the minimum man days to the tune of 6 to 9 per acre. As regards rabi crop, the mandays required on an average worked out to 19.99 per acre. Here again, the mandays used by the small farmers were found to be high at 20.75 per acre whereas the large farmers used only 17.5 mandays per acre. Likewise in kharif crop, in the rabi also paddy consumed more mandays when compared to other rabi crops. Paddy on an average required 29.15 mandays per acre. The least number of mandays used was for ragi crop (12.65) followed by pulses (13.87). Groundnut required 24.27 mandays per acre.

It may be observed from Table 4.5 that for horticultural crops the sample farmers used 27.57 mandays on an average per acre. As in the case of kharif and rabi crops, the same kind of variation existed among the four categories of sample households cultivating horticultural crops regarding the use of mandays. The number of mandays used by marginal farmers for all horticultural crops was found to be high at 28.6 while the same for large farmers worked out to 24.0 per acre. The small and medium farmers used 26.83 mandays and 25.17 mandays per acre respectively in case of all horticultural crops. Table 4.5 reveals that among the different horticultural crops cultivated by the sample farmers the highest number of mandays used was for banana crop (36.64) followed by mango crop (34.71) and the lowest number of mandays required was for vegetables (20.18). As far as the use of human labour for kharif, rabi and horticultural crops were concerned a special feature found from the study was that the mandays of human labour used varied depending upon the size of the farm. There was a negative relationship between the size of farm and requirement of mandays as the size of farm increased the use of human labour decreased and the vice versa. Table 4.5 shows that the use of human labour in case of all crops on an average worked out to 23.65, 22.11, 20.73 and 19.90 mandays per acre for marginal, small, medium and large farmers respectively.

4.3.2 Activitywise Use of Human Labour

Table 4.6 provides details on the use of human labour in the cultivation of horticultural crops according to different activities.

Table 4.6 Use of Human Labour in All Horticultural Crops by Activities
(man days per acre)

| | Farm Size | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| | Marginal | Small | Medium | Large | Total |
| (A) Recurring activities undertaken every year# | | | | | |
| Preparatory tillage | 2.20 | 2.00 | 1.80 | 1.70 | 2.08 |
| Manure & fertilizer | 1.80 | 2.00 | 1.90 | 1.90 | 1.87 |
| Transplanting & gap filling | 2.00 | 2.20 | 1.90 | 1.80 | 2.03 |
| Irrigation, electricity and diesel | 1.20 | 1.60 | 1.40 | 1.40 | 1.33 |
| Weeding and inter cultural operations | 4.00 | 4.30 | 4.00 | 4.00 | 4.07 |
| Topping/pruning | 0.00 | 0.20 | 0.30 | 0.30 | 0.10 |
| Plant protection, pesticides etc. | 2.00 | 2.00 | 1.80 | 1.90 | 1.97 |
| Harvesting and collection | 3.00 | 3.00 | 2.90 | 2.80 | 2.98 |
| Grading, storage, transport, packing | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Miscellaneous – I | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sub total of recurring activities | 17.20 | 18.30 | 17.00 | 16.80 | 17.43 |
| (B) Fixed activities undertaken during the plantation year ## | | | | | |
| (a) Planting material like seedling, nursery etc | 2.00 | 1.50 | 1.30 | 1.10 | 1.74 |
| (b) Field preparation – digging, pit making, fencing etc. | 8.00 | 6.00 | 5.80 | 5.00 | 7.12 |
| (c) Supporting material – bamboo, iron angles, etc | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| (d) Laying down of permanent irrigation | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (e) Any other | 0.40 | 0.03 | 0.07 | 0.10 | 0.28 |
| Sub total of fixed activities | 11.40 | 8.53 | 8.17 | 7.20 | 10.14 |
| Gross total | 28.60 | 26.83 | 25.17 | 24.00 | 27.57 |

Note: # Mandays are calculated by dividing the labour cost by the prevailing wage rate during the year in which cost was incurred. For example, for the bearing period, wage rate is for 2008-09 but for gestation period wage rate is during the gestation year.

Mandays are calculated, dividing labour cost by the prevailing wage rate during the year of plantation.

Activities are divided into recurring activities and fixed activities. Table 4.6 reveals that human labour required for all recurring activities on an average worked out to 17.43 mandays per acre of horticultural cultivation. Of the different recurring activities, weeding and inter-cultural operations consumed more mandays (4.07) per acre compared to other activities. The least number of mandays required per acre was for topping/pruning (0.10). The number of mandays required for harvesting and preparatory tillage was 2.98 and 2.08 per acre respectively. Transplanting consumed 2.03 mandays per acre while plant protection required 1.97 mandays per acre. Among the different categories of sample households marginal variation existed in the use of human labour on the recurring activities. When it comes to fixed activities, the use of human labour on an average worked out to 10.14 mandays per acre. Of the different fixed activities, the use of the human labour was found to be very high for field preparation which accounted for 7.12 mandays per acre. The mandays used on supporting activity was 1.00 and planting material activity required 1.74 mandays per acre. Among the different categories of

farmers marginal farmers used 2.10 mandays per acre for planting activity whereas large farmers used just 1.10mandays for the same. Like wise for field preparation the human labour used by marginal farmers was 8 mandays per acre as against 5.00 mandays used by large farmers. Table 4.6 shows that the human labour used on all activities by the marginal, small, medium and large farmers accounted for 28.60, 26.83, 25.17 and 24.00 mandays per acre of horticultural crop.

4.4 Marketing Channels of Horticultural Crop

The major problem faced by the farmers who produce sufficient quantity of food grains, non-food crops and horticultural crops in our country is the lack of efficient marketing system. Agricultural produces are not getting reasonable and fair prices as the supply chain is large where intermediaries /Commission agents play a major role. The various marketing channels through which the horticultural produces were sold are shown in Table 4.7

Table 4.7: Marketing Channels through Which Horticultural Products Were Sold by the Selected Households During 2008-09
(in quintal per household)

| | Wholesale market | Local Market | Village directly | Co-operative | Govt. agencies | Intermediaries at farm gate | Merchant or pre arranged | Others | Aggregate |
|-----------------|---------------------------------|-------------------------------|------------------|--------------|----------------|---------------------------------|---------------------------------|--------|-----------------------------------|
| Mango | | | | | | | | | |
| Marginal | 1.00 (12.07) | 1.1 (13.29) | - | - | - | 6.18 (74.64) | - | - | 8.28 (100.00) |
| Small | 5.20 (22.92) | 2.19 (9.65) | - | - | - | 15.3 (67.43) | - | - | 22.69 (100.00) |
| Medium | 8.58 (16.57) | 4.2 (8.11) | - | - | - | 39 (75.32) | - | - | 51.78 (100.00) |
| Large | 7.3 (8.75) | 3.62 (4.34) | - | - | - | 72.5 (86.91) | - | - | 83.42 (100.00) |
| Total | 3.21 (16.15) | 1.85 (9.30) | - | - | - | 14.80 (74.55) | - | - | 19.8491 (100.00) |
| Banana | | | | | | | | | |
| Marginal | - | - | - | - | - | 364.8 (100.00) | - | - | 364.8 (100.00) |
| Small | 212.1 (22.39) | - | - | - | - | 735 (77.61) | - | - | 947.1 (100.00) |
| Medium | 339.15 (19.17) | - | - | - | - | 1430 (80.83) | - | - | 1769.15 (100.00) |
| Large | 592.3 (20.84) | - | - | - | - | 2250 (79.16) | - | - | 2842.3 (100.00) |
| Total | 115.02 (14.96) | - | - | - | - | 653.88 (85.04) | - | - | 768.902 (100.00) |
| Flowers | | | | | | | | | |
| Marginal | 106 (46.01) | 10.4 (4.51) | - | - | - | 42 (18.23) | 72 (31.25) | - | 230.4 (100.00) |
| Small | 70 (11.50) | 78.85 (12.95) | - | - | - | 220 (36.13) | 240 (39.42) | - | 608.85 (100.00) |
| Medium | 220 (18.21) | 98.2 (8.13) | - | - | - | 480 (39.73) | 410 (33.93) | - | 1208.2 (100.00) |
| Large | 420.1 (22.37) | 67.25 (3.58) | - | - | - | 740 (39.42) | 650 (34.63) | - | 1877.35 (100.00) |
| Total | 122.03 (24.28) | 40.30 (8.02) | - | - | - | 164.65 (32.77) | 175.52 (34.93) | - | 502.504 (100.00) |

Note: Figures in parentheses are the percentage of total output of respective crops sold.

It may be seen from the table that the selected horticultural crops mango, banana and flowers were marketed through wholesale markets, local market and intermediaries at farm gate.

4.4.1 The Case of Mango:

It could be observed from Table 4.7 that out of total 19.84 quintals of mango per household marketed by the sample mango growers a major chunk of 74.55 per cent was sold through intermediaries at farm gate. The quantity of mango marketed through wholesale market and local market was 3.21 quintals (16.15%) and 1.85 quintals (9.30%) respectively per household. Large farmers sold as high as 86.91 per cent of the mango out of 83.42 quintals per household through intermediaries followed by medium (75.32%) farmers. The lowest 67.43 per cent of 22.69 quintals of mango per household produced by small farmers were marketed through intermediaries. It could be understood from Table 4.7 that small farmers sold 22.92 per cent of the total 2.69 quintals of mango per household through wholesale market whereas large farmers preferred to sell only 8.75 per cent of the 83.42 quintals of mango per household through this source. It is inferred from the data that all size group of sample farmers growing mango crop sold major portion of the mango through intermediaries at farm gate.

4.4.2 The Case of Banana

As could be seen from Table 4.7 that banana cultivated by the sample respondents was sold through two sources only namely wholesale market and intermediaries at farm gate. Out of the total quantity of 768.90 quintals of banana per household 85.04 per cent of the produce was sold through intermediaries. It is interesting to note that the marginal farmers sold the entire quantity through intermediaries as they didn't want to take the strain of harvesting and transporting the produce to the market, local or wholesale. Of the other three categories of farmers, medium size group of farmers sold over 80 per cent of the 1769.15 quintals of banana per household through intermediaries followed by marginal farmers. Small farmers preferred to market 22.39 per cent of the 947.1 quintals of banana per household through wholesale market whereas medium and large farmers sold 19.17 per cent and 20.84 per cent of the produce through wholesale market.

4.4.3 The Case of Flowers

Sample households who cultivated flowers in Krishnagiri district marketed their output through wholesale market, local market, intermediaries and merchant. Out of the total quantity of 502.50 quintals produced per household 34.93 per cent and 32.77 per cent of the produces were sold through merchant and intermediaries respectively. Over 24 per cent of the flowers harvested were sold through wholesale market. Marginal farmers sold maximum quantity of 46.01 per cent of the 230.40 quintals of flower per household through wholesale market whereas small farmers sold a maximum of 39.42 per cent of the 608.85 quintals per household through merchant. Medium farmers sold maximum 39.73 per cent of the 1208.2 quintals per household through intermediaries. Large farmer preferred to sell maximum quantity of 39.42 per cent of 1870.35 quintals per household through intermediaries. The common feature observed from the analysis is that of the different marketing channels intermediaries played a key role in marketing the produce of all the three selected crops mango, banana and flowers in the sample area which shows the ineffective marketing system existing in the marketing of agricultural commodities.

4.7 Summary of the Chapter

Economics of production, cost and resource use in horticultural were analysed in this chapter. Cost of cultivation output and net returns of selected crop banana, mango and flower and use of human labour in the cultivation of these crops were studied.

The average area of banana planted by the sample farmers worked out to 2.09 acres per household. The total cost of cultivation of banana including variable cost and fixed cost on an average was to the tune of Rs.55994 per acre whereas the average revenue earned by a farmer was Rs.155833 per acre. The average output produced by a sample farmer was calculated to be 197 quintals of banana per acre. The average area of mango cultivated by the sample farmers was 2.44 acres per household.

The total cost of cultivation of mango was put at Rs.11091 per acre. Against this cost, the total net returns generated by the sample farmers on an average was as low as Rs.2740 only per acre as the trees were under gestation period and start yielding sufficient returns after attaining the bearing period.

As regards flowers, the average area planted by the sample farmers worked out to 2.39 acres per household. The total cost of production of flowers including variable cost and fixed

cost on an average was to the tune of Rs.54993 per acre. The total revenue generated from an acre of flower was to the tune of Rs.136211. The average output produced by the sample farmers worked out to 126.97 quintals of flower per acre.

A comparison of net returns obtained from horticultural crops and non horticultural crops was made in this chapter. The study reveals that the average net returns generated by a sample household from kharif crop were to the tune of Rs.5946 per acre whereas the average net returns obtained from rabi crop were put at Rs.4956 per acre. But at the same time the average net returns generated from horticultural crops were much higher compared to kharif and rabi crops. The average net returns from horticultural crops stood at Rs.35851 per acre. Of the three selected horticultural crops the average net returns obtained from banana were found to be high at Rs.99839 per acre followed by flowers (Rs, 81218). The net returns generated from mango were abysmally low at Rs.2740 pre acre.

Human laborers were employed in different activities of agriculture. The study shows that human labour used for all the kharif crops by the sample households on an average worked out to 20.76 mandays per acre while it was little less at 19.99 mandays per acre in case of rabi crop. When compared to kharif and rabi crops the human labour use in horticultural cultivation was found to be higher which worked out to 27.57 days on an average for all horticultural crops. The study reveals that human labour required for all recurring activities in horticulture on an average worked out to 17.43 man days per acre whereas for fixed activities the figure was found to be 10.14 mandays per acre.

As regards the marketing channels, the selected horticultural crops banana, mango and flowers produced by the sample households were sold through wholesale markets and intermediaries at farm gate. In the case of mango, nearly 75 per cent of the produce was marketed through intermediaries at farm gate. Similarly, over 85 per cent of the banana produced was also sold through the same channel. In case the of flowers, nearly 35 per cent of the produce was marketed through merchants whereas about 33 per cent was sold through intermediaries.

CHAPTER V

Impact of NHM on the Expansion of Horticultural Crops

5.1 Impact of NHM on Acre and Yield of Selected Horticultural Crops

The Centrally sponsored scheme of National Horticulture Mission (NHM) was implemented in the country with effect from 2005-2006 for the holistic development of horticulture sector. The main objective of the Mission was to promote the holistic growth of the horticulture sector through area based regionally differentiated cluster approach for development of horticultural crops having comparative advantage. The scheme has different components such as area expansion under horticultural crops, rejuvenation of old and senile orchards, tissues culture labs, integrated pest management, protected cultivation etc. An attempt is made here to assess the impact of the NHM scheme on area expansion, yield and other objectives of the scheme.

5.1.1 The case of Banana Crop:

Banana is an annual crop which the sample respondents were cultivating regularly. After the launch of NHM scheme the farmers were motivated to bring more area under banana cultivation because of the benefits accrued from the scheme. As could be seen from Table 5.1 the marginal farmers cultivated an average area of 0.60 acre during 2004-05 which increased to 0.72 acre during 2009-10. This trend in area increase could be observed in case of other three size groups also. There were ups and downs in area cultivated by different size groups from 2004-05 to 2009-10. The overall area of banana cultivated worked out to 1.11 acres on an average during 2004-05 which marginally rose to 1.12 acres during 2008-09 and further increased to 1.29 acres during 2009-10. When it comes to yield, the marginal farmers obtained a yield of 172 quintals per acre whereas small, medium and large farmers got higher yield which might be due to better agricultural practices followed by these groups. The average yield obtained marginally increased from 196 quintals per acre in 2004-05 to 198 quintals per acre in 2008-09 (1%) and further rose by 14 per cent to 224 quintals during 2009-10.

**Table 5.1 Impact of NHM on Area and Yield of Selected Horticultural Crops
(All Households)**

| Year | Area cultivated in acres per household | | | | | Yield rate obtained in quintals per acre | | | | |
|----------------|--|-------|--------|-------|-------|--|-------|--------|-------|-------|
| | Marginal | Small | Medium | Large | Total | Marginal | Small | Medium | Large | Total |
| Mango | | | | | | | | | | |
| 2004-05 | 0.40 | 0.70 | 2.00 | 3.70 | 0.77 | 0 | 0 | 0 | 0 | 0.00 |
| 2005-06 | 0.40 | 0.70 | 2.00 | 3.70 | 0.77 | 0 | 0 | 0 | 0 | 0.00 |
| 2006-07 | 0.40 | 0.70 | 2.00 | 3.70 | 0.77 | 0 | 0 | 0 | 0 | 0.00 |
| 2007-08 | 0.40 | 0.70 | 2.00 | 3.70 | 0.77 | 1.5 | 2.0 | 2.8 | 3.5 | 1.85 |
| 2008-09 | 0.40 | 0.70 | 2.00 | 3.70 | 0.77 | 4.31 | 5.03 | 6.0 | 6.31 | 4.77 |
| 2009-10 | 0.40 | 0.70 | 2.00 | 3.70 | 0.77 | 8.2 | 9.7 | 12.9 | 18.0 | 9.49 |
| Banana | | | | | | | | | | |
| 2004-05 | 0.60 | 1.20 | 2.60 | 4.00 | 1.11 | 172 | 230 | 230 | 241 | 196 |
| 2005-06 | 0.71 | 1.00 | 2.10 | 3.20 | 1.04 | 210 | 260 | 212 | 232 | 223 |
| 2006-07 | 0.68 | 1.300 | 2.40 | 3.66 | 1.15 | 220 | 192 | 217 | 210 | 212 |
| 2007-08 | 0.66 | 1.24 | 2.36 | 3.71 | 1.12 | 180 | 236 | 235 | 196 | 202 |
| 2008-09 | 0.60 | 1.20 | 2.60 | 4.10 | 1.12 | 190 | 210 | 205 | 215 | 198 |
| 2009-10 | 0.72 | 1.34 | 2.92 | 4.90 | 1.29 | 230 | 222 | 196 | 242 | 224 |
| Flowers | | | | | | | | | | |
| 2004-05 | 0.02 | 0.40 | 1.0 | 0.9 | 0.27 | 110 | 126 | 132 | 121 | 117 |
| 2005-06 | 0.03 | 0.42 | 1.1 | 0.9 | 0.29 | 136 | 132 | 146 | 132 | 136 |
| 2006-07 | 0.36 | 0.40 | 1.0 | 1.2 | 0.48 | 117 | 116 | 152 | 126 | 122 |
| 2007-08 | 0.38 | 0.50 | 1.2 | 1.3 | 0.55 | 128 | 141 | 143 | 151 | 134 |
| 2008-09 | 0.04 | 0.50 | 1.1 | 1.6 | 0.34 | 120 | 135 | 140 | 142 | 127 |
| 2009-10 | 0.05 | 0.62 | 1.4 | 1.5 | 0.41 | 142 | 128 | 162 | 158 | 142 |

Precision Farming:

Precision farming has been pioneered by Tamil Nadu and is a leading proponent of this technology. More than 20,000 ha of area have been brought under precision farming for horticulture crops. The technology includes proper selection of crops, crop varieties, drip irrigation and scientific crop cultivation practices. Precision farming has been practised in a big way for growing vegetables and fruits like banana in the State. Farmers have achieved 30-50 per cent increase in productivity across various crops. The achievement of the State in promoting cultivation of tissue culture banana under precision farming has been commendable. The farmers used to obtain yields of 25 to 30 mt/ ha when they cultivated traditional varieties of bananas. After switching over to cultivation of tissue culture grand naine variety farmers obtained yields of 80 to 100 mt/ ha.

Value Addition:

Banana can be preserved for 3 months or more by reducing the moisture in it by drying or frying. It is mainly used in hotels, restaurant, bars, home etc. To prepare banana wafers, green bananas are used, which are cleaned, sliced and fried. This is a popular snack food and has a good demand in the market.

Banana powder is prepared from pulp of fruits. It can be used in bakery and confectionary industries, in treatment for certain disease and in intestinal disorder. It is also a very useful diet for infants. Demand can be increased by proper marketing.

5.1.2 The case of Mango Crop:

Table 5.1 furnishes details regarding impact of NHM on area and yield of selected horticultural crops. Mango, being a perennial crop, the sample farmers belonging to all size groups induced by the NHM scheme, started cultivating the crop and the area under the crop cultivated by each category remained the same as 0.40 acre, 0.70 acre, 2.00 acres and 3.70 acres for marginal, small, medium and large farmers respectively throughout the period from 2004-05 to 2009-10. The average area under mango crop per household worked out to 0.77 acre.

During gestation period, there was no yield procured from mango crop as evident from Table 5.1. The sample respondents started securing yield from 2007-08 onwards and the yield being 1.5, 2.00, 2.8, 3.5 and 1.85 quintals per acre for marginal, small, medium large and total farmers respectively. Till then the yield went on increasing and the yield obtained by marginal, small, medium and large farmers during 2008-09 worked out to 4.31quintals, 5.03 quintals, 6.0 quintals and 6.31 quintals and the over all yield rate stood at 4.77 quintals per acre. The table reveals that there was a positive relationship between size group of farmers and the yield rate. The bigger the size group the more was the yield and the vice versa. There was an impressive growth of 158 per cent in the yield rate between 2004-05 and 2008-09 and very impressive growth rate of 413 per cent between 2004-05 and 2009-10.

Israeli Agronomists Train Tamil Nadu Mango Growers

Horticulture scientists from Israel are training orchard owners and mango growers in Krishnagiri district to adopt unique technology to rejuvenate their mango trees for increased and better productivity of the fruits. These agronomists study the trees, sans causing any damage. This system has been named Canopy Management system. A portable pruning machine, a

projection of which can be hoisted to considerable height is used in this system. Under the National Horticulture Mission, the Indian Government has procured machines used in the Canopy Management Pruning System Machine. These machines boast of multi functions such as plucking fruits to reduce post harvest losses and spraying insecticides.

5.1.3 The case of Flowers:

Table 5.1 reveals that the area under flower constantly increased from 2004-05 to 2008-09 across all size group of farmers. The marginal farmers cultivated an area of 0.02 acre during 2004-05 which increased to 0.04 acre in 2008-09 and further increased to 0.05 acre. The area under flower cultivated by large farmers increased from 0.9 acre during 2004-05 to 1.6 acres during 2008-09. Similarly, the area under flower cultivated by small and medium size groups also showed an upward trend. The average area cultivated by all sample respondents worked out to 0.27 acre in 2004-05 which increased to 0.34 acre during 2008-09. With regard to yield of flower, the marginal farmers obtained 110 quintals per acre whereas a higher yield level of 126 quintals, 132 quintals and 121 quintals were obtained by small, medium and large farmers respectively during 2004-05. The yield of flowers increased over the period and it stood at 120 quintals, 135 quintals 140 quintals and 142 quintals per acre for marginal, small, medium and large farmers respectively during 2008-09. The yield on an average increased by 8.5 per cent which was 117 quintals per acre during 2004-05, and rose to 127 quintals during 2008-2009. The increase in area and yield of selected horticultural crops from 2004-05 to 2008-09 could be attributed to the working of NHM Scheme implemented since 2005-06.

Green House Cultivation (Protected Cultivation)

Tamil Nadu has emerged as a hub for protected cultivation. Hosur, Ooty, Kodaikanal and Coimbatore have emerged clusters. Protected cultivation ensures controlled atmospheric conditions which are very much conducive for plant growth besides protecting the crop from the vagaries of a nature. Drip with fustigation gives a boost to the crop growth and extends the crop harvesting period. This has emerged as available technology for providing farmers with manifold increase in their incomes from small and marginal holdings. Cut flowers like rose, carnation, and vegetables like colored capsicum, tomatoes and cucumbers are being cultivated. The success of protected cultivation is mainly due to the increased incomes realized by the farmers. On an average farmers earn about Rs.20, 000 to Rs.30, 000 per month from a 1000 sq. mt. of green

house. About 1700 green houses have been established till now in the State at a cost of Rs.48.08 crores in 152.5 ha.

5.2 Rejuvenation/Protection, Resource Procurement through NHM.

**Table 5.2 Area Rejuvenated/Protected through NHM Resource Provision
(area in acre per household under rejuvenation)**

| Year | Area for which certified inputs procured | | | | | Area for which non-certified inputs procured | | | | |
|---------------|--|-------|--------|-------|-------|--|-------|--------|-------|-------|
| | Marginal | Small | Medium | Large | Total | Marginal | Small | Medium | Large | Total |
| Banana | | | | | | | | | | |
| 2004-05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2005-06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006-07 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2007-08 | 0.10 | 0.15 | 0.40 | 0.70 | 0.17 | 0 | 0 | 0 | 0 | 0 |
| 2008-09 | 0.19 | 0.38 | 0.81 | 1.39 | 1.08 | 0 | 0 | 0 | 0 | 0 |
| Mango | | | | | | | | | | |
| 2004-05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2005-06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006-07 | 0.10 | 0.10 | 0.30 | 0.40 | 0.14 | 0 | 0 | 0 | 0 | 0 |
| 2007-08 | 0.25 | 0.35 | 0.75 | 1.50 | 0.38 | 0 | 0 | 0 | 0 | 0 |
| 2008-09 | 0.42 | 0.72 | 1.34 | 2.58 | 1.23 | 0 | 0 | 0 | 0 | 0 |
| Flower | | | | | | | | | | |
| 2004-05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2005-06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006-07 | 0.01 | 0.02 | 0.12 | 0.25 | 0.03 | 0 | 0 | 0 | 0 | 0 |
| 2007-08 | 0.06 | 0.10 | 0.28 | 0.40 | 0.11 | 0 | 0 | 0 | 0 | 0 |
| 2008-09 | 0.09 | 0.21 | 0.54 | 0.83 | 0.70 | 0 | 0 | 0 | 0 | 0 |

Details regarding area rejuvenated and protected through NHM resource provisions are presented in Table 5.2. It could be observed from the table that the area for which certified inputs were procured accounted for 1.08 acres on an average for all households in case of banana crop during 2008-09. Similarly, for mango crop the average area for all households worked out to 1.23 acres and in case of flowers it was 0.70 acre. It could be understood from Table 5.2 that certified inputs procurement took place since 2007-08 for banana crop and since 2006-07 for mango and flower. The table reveals that non-certified inputs were not procured by any size group of farmers growing banana, mango and flowers during the period from 2004-05 to 2008-09.

The extent of increase in area and productivity due to rejuvenation/protection supported by NHM is furnished in Table 5.3

Table: 5.3**Increase in Area and Productivity due to Rejuvenation/ Protection Supported by the NHM**

| Details of the Items | Marginal | Small | Medium | Large | Total |
|--|----------|-------|--------|-------|-------|
| Name of the crops for which rejuvenation or protection support was provided under NHM (% of households) | | | | | |
| Mango | 7.4 | 10.3 | 12.2 | 7.1 | 36.9 |
| Banana | 6.2 | 7.2 | 7.6 | 2.3 | 23.3 |
| Flowers | 2.0 | 3.2 | 4.5 | 2.3 | 12.0 |
| Area expansion by rejuvenation (acres per household per crop) | | | | | |
| Mango | 0.13 | 0.24 | 0.43 | 0.80 | 0.41 |
| Banana | 0.04 | 0.13 | 0.27 | 0.47 | 0.36 |
| Flowers | 0.03 | 0.07 | 0.18 | 0.27 | 0.23 |
| Existing area rejuvenated under the NHM (acres per household per crop) | | | | | |
| Mango | 0.42 | 0.72 | 1.34 | 2.58 | 1.23 |
| Banana | 0.19 | 0.38 | 0.81 | 1.39 | 1.08 |
| Flowers | 0.09 | 0.21 | 0.54 | 0.83 | 0.70 |
| Number of trees per acre rejuvenated | | | | | |
| Mango | 5 | 22 | 74 | 140 | 22 |
| Banana | 45 | 52 | 48 | 55 | 47.44 |
| Flowers | 80 | 90 | 85 | 95 | 83.6 |
| Productivity enhancement as a result of rejuvenation (quintals per acre) | | | | | |
| Mango | 0 | 0 | 0 | 0 | 0 |
| Banana | 11 | 17 | 18 | 19 | 14 |
| Flowers | - | - | - | - | - |

Table 5.3 shows that 36.9 per cent, 23.3 per cent and 12.00 per cent of the total sample respondents growing mango, banana and flowers respectively were provided with rejuvenation support under NHM. In case of mango growers, the highest percentage (12.2%) was found in medium size group followed by small (10.3%) farmers. Surprisingly the lowest percentage (7.1%) of rejuvenation support was found in large farmers. The same pattern could be witnessed in case of banana crop also. The table reveals that medium farmers stood at the top with 7.6 per cent, whereas the lowest percentage (2.3%) went to large farmers. On the whole, 23.3 per cent of banana cultivators were benefited by the rejuvenation support. The rejuvenation support received under NHM in case of flower crop worked out to 2.0 per cent, 3.2 per cent, 4.5 per cent and 2.3 per cent for marginal, small, medium and large farmers respectively.

Area expansion by rejuvenation took place under NHM. Table 5.3 indicates that the area expansion of mango crop per household was the highest for (0.80 acre) large farmers followed by medium farmers while the marginal farmers had the lowest of 0.13 acre per household. The average area increased under mango worked out to 0.41 acre for all households. With regard to

banana crop the table shows that the average area expanded by rejuvenation accounted for 0.36 acre for all households. In case of flowers the area expansion by rejuvenation was 0.23 acre on an average for all households. It is significant to note that there was a positive relationship between extent of area expansion and size group of farmers.

In the case of mango, the existing area rejuvenated on an average for all sample respondents worked out to 1.23 acres per household whereas it was 1.08 acres for banana and 0.70 acre for flowers. Table 5.3 reveals that the number of mango trees rejuvenated per acre was 5, 22, and 74,140 by marginal, small, medium and large farmers respectively. In the case of banana, the number of trees rejuvenated by marginal, small, medium and large farmers was 45,52,48 and 55 respectively. With regard to flower the number of plants rejuvenated was 80 by marginal farmers and the highest 95 by large farmer.

There was a visible change observed in the productivity of mango, banana and flower as a result of rejuvenation initiatives.

5.3 NHM Reaching out to the Households with Resource Provisions.

One of the objectives of NHM scheme was to bring more area under horticultural crops with improved varieties. According to the guidelines of the scheme, the assistance for cultivation will be for a maximum area of 4 ha per beneficiary. The amount of assistance will be spread over a period of three years in the ratio of 60:20:20 for the first, second and third year respectively and the amount will be provided on the account of the expenditure on planting material and cost of inputs.

Table: 5.4 Source of NHM Resource Procurement All Crops during 2004-05 to 2009-10 (percentage of household)

| Farm Size | Department of Horticulture | Private nursery | Fellow farmers | Through Contract farm | Others |
|------------------|-----------------------------------|------------------------|-----------------------|------------------------------|---------------|
| Marginal | 62.9 | 11.3 | 8.9 | - | 16.9 |
| Small | 62.1 | 21.6 | 8.10 | - | 8.10 |
| Medium | 52.6 | 26.3 | 5.26 | - | 15.8 |
| Large | 60.0 | 20.0 | - | - | 20.00 |
| Total | 61.30 | 16.00 | 8.00 | - | 14.70 |

NHM resource procurement particulars are illustrated in Table 5.4. It is understood from the table that the source of resource procurement over 60 per cent of the sample respondents was department of horticulture followed by private nursery (14%). Other sources of procurements

were fellow farmers and others from the period 2004-05 to 2009-10. Department of horticulture was the source of procurement for nearly 63 per cent of the marginal farmers and over 62 per cent of the small farmers which shows that the government department of horticulture played a major role in the NHM resource procurement

Table: 5.5 Promotional Activities of NHM (No of HHs saying Yes)

| Description | Marginal | Small | Medium | Large | Total |
|--|-----------------|--------------|---------------|--------------|----------------|
| Making available good quality planting material like nursery | 85 (95.5) | 34 (91.9) | 18 (95.0) | 5 (100) | 142 (94.7) |
| Rejuvenation with improved cultivators | 21 (24.0) | 9 (24.0) | 5 (26.0) | 1 (20.0) | 36 (24.0) |
| Upgrading the existing tissue culture unit | - | - | - | - | - |
| Mother stock block maintenance under poly cover to protect from adverse weather conditions | - | - | - | - | - |
| Raising root stock seedlings under net house conditions | - | - | - | - | - |
| Polyhouse with ventilation, insect proof netting, fogging and sprinkler irrigation | 5 (5.6) | 4 (10.8) | 3 (15.8) | 1 (20.0) | 4.37 (8.65) |
| Pump house to provide sufficient irrigation with /without storage tank, community tank | - | - | - | - | - |
| Soil sterilization stem sterilization system with boilers | - | - | - | - | - |
| Establishment of new garden or seed production | 20 (22.5) | 11 (29.7) | 6 (31.6) | 2 (40.0) | 39 (26.0) |
| Protected cultivation like green house, shade net, plastic tunnel | 18 (20.2) | 8 (21.6) | 5 (26.3) | 2 (40.0) | 33 (22.0) |
| Precision farming implements | - | - | 3 (15.8) | 1 (20.0) | 4 (2.6) |
| Promotion of integrated nutrient management or integrated pest management | 70 (78.7) | 30 (81.1) | 15 (78.9) | 5 (100.0) | 120 (80.0) |
| Help provided for organic farming (vermin compost unit, mobile processing unit) | - | - | - | - | - |
| Post harvest management like pack house, storage unit, mobile processing unit | - | - | 3 (15.8) | 3 (60.0) | 6 (4.0) |
| Training and capacity building | 81 (91.0) | 33 (89.1) | 15 (78.9) | 3 (60.00) | 132 (88.0) |

Note: Figures in parentheses are percentage of HHs saying 'Yes'

Table 5.5 shows the promotional activities of NHM. With regard to the question on availability of good quality planting materials, like nursery nearly 95 per cent of the sample households answered in the affirmative, whereas in the case of rejuvenation with improved

cultivators a majority (76%) of sample households replied in the negative. Only 8.65 per cent of the sample respondents had polyhouse with ventilation, insect proof setting, fogging and sprinkler irrigation. Table 5.5 reveals that a majority 80 per cent of the sample households availed the facility of promotion of integrated nutrient management or integrated pest management. A vast majority of 88 per cent of the sample households participated in the training and capacity building program conducted under NHM scheme. However, other promotional activities such as upgrading the existing tissue culture unit, mother stock block maintenance under poly cover to protect from adverse weather conditions etc were not availed by any of the sample household.

5.4 Subsidy Provision under NHM

The details of subsidy provided under NHM scheme are depicted in Table 5.6. The table is subdivided into 5 parts based on the kind of information.

Table 5.6 Details of Subsidy Provided by NHM

| Details of the Items | | Marginal | Small | Medium | Large | Total |
|---|--|----------|-------|--------|-------|-------|
| A) Cropwise distribution of farmers availing subsidy | | | | | | |
| Mango | | 31 | 12 | 6 | 1 | 50 |
| Banana | | 29 | 13 | 6 | 2 | 50 |
| Krishnagiri | | 29 | 12 | 7 | 2 | 50 |
| B) Details of activities for which subsidy was provided (no. of households) | | | | | | |
| Mango | Planting Material | 31 | 12 | 6 | 1 | 50 |
| | Fertilizers, pesticides and other inputs | 31 | 12 | 6 | 1 | 50 |
| | Drip/Sprinkler | 11 | 6 | 5 | 2 | 24 |
| | Vermi compost | 31 | 12 | 6 | 1 | 50 |
| | Modern Nursery | 0 | 0 | 0 | 0 | 0 |
| Banana | Planting Material | 0 | 0 | 0 | 0 | 0 |
| | Fertilizers, pesticides and other inputs | 29 | 13 | 6 | 2 | 50 |
| | Drip/Sprinkler | 0 | 0 | 0 | 0 | 0 |
| | Vermi compost | 29 | 13 | 6 | 2 | 50 |
| | Modern Nursery | 0 | 0 | 0 | 0 | 0 |
| Flowers | Planting Material | 0 | 0 | 0 | 0 | 0 |
| | Fertilizers, pesticides and other inputs | 29 | 12 | 7 | 2 | 50 |
| | Drip/Sprinkler | 5 | 3 | 4 | 3 | 15 |
| | Vermi compost | 29 | 12 | 7 | 2 | 50 |
| | Modern Nursery | 0 | 0 | 0 | 0 | 0 |
| C) Amount of aggregate investment (Rs. per household) | | | | | | |
| Mango | Planting Material | 2102 | 5200 | 9405 | 18218 | 4045 |
| | Fertilizers, pesticides and other inputs | 3985 | 9870 | 17841 | 34545 | 7672 |
| | Vermi compost | 10443 | 13702 | 22236 | 33800 | 13107 |
| | Drip/Sprinkler | 996 | 2468 | 4460 | 8636 | 7475 |
| | Modern Nursery | 0 | 0 | 0 | 0 | 0 |
| Banana | Planting Material | 0 | 0 | 0 | 0 | 0 |
| | Fertilizers, pesticides and other inputs | 4380 | 8865 | 16920 | 29160 | 8642 |
| | Drip/Sprinkler | 0 | 0 | 0 | 0 | 0 |

| | | | | | | |
|---|--|-------|-------|-------|-------|-------|
| | Vermi compost | 900 | 2025 | 4200 | 7290 | 1844 |
| | Modern Nursery | 0 | 0 | 0 | 0 | 0 |
| Flowers | Planting Material | 0 | 0 | 0 | 0 | 0 |
| | Fertilizers, pesticides and other inputs | 1200 | 2970 | 0 | 0 | 1409 |
| | Drip/Sprinkler | 5475 | 7905 | 18200 | 51870 | 9696 |
| | Vermi compost | 218 | 525 | 0 | 0 | 253 |
| | Modern Nursery | 0 | 0 | 0 | 0 | 0 |
| D) Amount of subsidy provided by NHM (per household) | | | | | | |
| Mango | Planting Material | 1617 | 4004 | 7238 | 14014 | 3113 |
| | Fertilizers, pesticides and other inputs | 3066 | 7592 | 13724 | 26572 | 5901 |
| | Drip/Sprinkler | 8033 | 10540 | 17105 | 26000 | 10083 |
| | Vermi compost | 766 | 1898 | 3431 | 6643 | 1475 |
| | Modern Nursery | 0 | 0 | 0 | 0 | 0 |
| Banana | Planting Material | 0 | 0 | 0 | 0 | 0 |
| | Fertilizers, pesticides and other inputs | 2920 | 5910 | 11280 | 19440 | 5361 |
| | Drip/Sprinkler | 0 | 0 | 0 | 0 | 0 |
| | Vermi compost | 600 | 1350 | 2800 | 4860 | 1230 |
| | Modern Nursery | 0 | 0 | 0 | 0 | 0 |
| Flowers | Planting Material | 0 | 0 | 0 | 0 | 0 |
| | Fertilizers, pesticides and other inputs | 800 | 1980 | 0 | 0 | 940 |
| | Drip/Sprinkler | 3650 | 5270 | 13685 | 39000 | 6858 |
| | Vermi compost | 145 | 350 | 0 | 0 | 168 |
| | Modern Nursery | 0 | 0 | 0 | 0 | 0 |
| E) Subsidy as percentage of investment (%) | | | | | | |
| Mango | Planting Material | 70.00 | 70.00 | 70.00 | 70.00 | 70.00 |
| | Fertilizers, pesticides and other inputs | 70.00 | 70.00 | 70.00 | 70.00 | 70.00 |
| | Drip/Sprinkler | 70.00 | 70.00 | 70.00 | 70.00 | 70.00 |
| | Vermi compost | 70.00 | 70.00 | 70.00 | 70.00 | 70.00 |
| | Modern Nursery | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Banana | Planting Material | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Fertilizers, pesticides and other inputs | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| | Drip/Sprinkler | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Vermi compost | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| | Modern Nursery | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Flowers | Planting Material | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Fertilizers, pesticides and other inputs | 50.00 | 50.00 | 0.00 | 0.00 | 25.00 |
| | Drip/Sprinkler | 50.00 | 50.00 | 33.00 | 33.00 | 41.50 |
| | Vermi compost | 50.00 | 50.00 | 0.00 | 0.00 | 25.00 |
| | Modern Nursery | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

5.4.1 Cropwise Distribution of Farmers Availing Subsidy

This part of Table 5.6 needs no explanation as all the 150 sample households cultivating mango, banana and flowers availed subsidy.

5.4.2 Details of Activities for which subsidy was provided

Subsidy as revealed from Table 5.6 was provided for planting materials, fertilizer, pesticides, other inputs, drip/sprinkler irrigation, vermi composite and modern nursery in respect of all the three selected crops mango, banana and flowers.

It is understood from Table 5.6 that all the 50 sample households growing mango crop received subsidy for planting material, fertilizer, pesticides, other inputs and vermi compost. Forty eight per cent of the sample respondents received subsidy for drip/sprinkler irrigation and none of the sample farmers received subsidy for modern nursery.

In case of banana none of the sample respondents got subsidy for planting materials, drip/sprinkler irrigation and modern nursery while cent per cent received subsidy for fertilizer, pesticides, other inputs and vermi compost.

All the 50 sample farmers of Flower crop availed the subsidy for fertilizer, pesticides, other inputs and vermi compost. Majority of large and small size groups of farmers availed drip/sprinkler irrigation subsidy and the total number of sample households in this case was 15.

5.4.3 Amount of Aggregate Investment

It could be observed from Table 5.6 that in case of mango the highest amount of investment was on vermi compost which worked out to Rs13107 per household whereas in case of banana and flower the highest investment was on fertilizer, pesticides and drip/sprinkler irrigation respectively. The least investment of Rs.7475 per household could be found in drip and sprinkler irrigation in case of mango crop. The lowest amount of Rs.1844 and Rs.253 per household was invested on vermi compost in case of banana and flower crops respectively. Across the different categories of farmers, large farmers invested highest amount compared to other categories of farmers on fertilizers, pesticides and other inputs per household in case of mango and banana respectively. The lowest investment of Rs.996 per household was made by marginal farmers on drip sprinkler irrigation in case of mango crop. The same category invested the lowest amount on vermi compost in case of banana and flowers per household compared to other categories of farmers.

5.4.4 Amount of subsidy provided by NHM

The amount of subsidy provided under NHM scheme per household on an average in case of mango ranges from Rs.1475 to Rs.10083. It is significant to note that the highest subsidy amount of Rs.10083 per household in case of mango was provided to drip/sprinkler irrigation whereas the lowest amount of Rs.1475 per household was given to vermi compost. It may be seen from Table 5.6 that of the four categories of sample respondents the large farmers were provided the highest amount of subsidy per household to the tune of Rs.26752 for fertilizer, pesticides and other inputs followed by Rs.26000 for drip/sprinkler irrigation incase of mango

crop, whereas the lowest amount of Rs.766 per household for vermi compost was paid to marginal farmers.

In the case of banana, subsidy was provided for only two activities viz., fertilizer, pesticides, other inputs and vermi compost. The subsidy amount provided for these two activities are Rs.5361 and Rs.1230 per household respectively. As in the case of mango the highest amount of subsidy per household was provided to large farmers when compared to other three categories of farmers.

In the case of flowers, the subsidy provided per household on an average ranges from Rs.168 to Rs.6858. It is evident from Table 5.6 that highest amount of subsidy was provided for drip/sprinkler irrigation.

5.4.5 Subsidy as Percentage of Investment

It may be seen from Table 5.6 that the amount of subsidy formed 70 per cent of the total investment made each on planting material, fertilizer, pesticides, other inputs, drip/sprinkler irrigation and vermi compost in case of mango crop across all categories of sample farmers. In case of banana, the quantum of subsidy constituted a uniform 50 per cent of the investment each on fertilizer, pesticides, other inputs and drip/sprinkler irrigation for all the sample respondents. With regard to flower crop, subsidy as percentage of investment on fertilizer, pesticides and other inputs and drip and sprinkler irrigation in case of marginal and small farmers each worked out to an equal 50 per cent and the over all average was 25 per cent. In case of drip/sprinkler irrigation, the subsidy amount received formed 41.50 per cent of the investment on an average. The medium and large farmers as could be seen from Table 5.6 got an equal 33 per cent of the investment as subsidy under NHM scheme. The average amount of subsidy as percentage of investment worked out to 25 per cent for vermi compost.

5.5. Training and Capacity Building by NHM

Training and demonstrations are necessary for the farmers to know the modern technologies and methods of cultivation and practise them on the field. Imparting training to the farmers as well as to the extension workers and capacity building were considered as a part of the NHM scheme. The sample beneficiary farmers participated in the training programme and availed the facilities under NHM. The information regarding the sources of training and dissemination activities provided to the sample respondents is presented in Table 5.7.

Table: 5.7 Sources of Training/Dissemination Activity Provided to the Farmers

| Details of the Items | Marginal | Small | Medium | Large | Total |
|---|----------|-------|--------|-------|-------|
| A) Frequency of the training provided during the year (No. per household per year) | | | | | |
| State Horticulture Department | 0.60 | 0.72 | 0.58 | 0.73 | 0.66 |
| State Agricultural University | 0.20 | 0.15 | 0.30 | 0.25 | 0.22 |
| Krishi Vigyan Kendras | 0.48 | 0.56 | 0.62 | 0.67 | 0.58 |
| Kisan Call Centre | 0.10 | 0.12 | 0.15 | 0.22 | 0.15 |
| Cooperatives/Local bodies | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Special Research Stations | 0.15 | 0.18 | 0.23 | 0.28 | 0.21 |
| NGO | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| All Sources | 1.55 | 1.78 | 1.94 | 2.23 | 1.87 |
| B) Average number of days per household during the year | | | | | |
| State Horticulture Department | 0.80 | 0.98 | 1.10 | 1.52 | 1.10 |
| State Agricultural University | 0.18 | 0.16 | 0.32 | 0.28 | 0.24 |
| Krishi Vigyan Kendras | 1.20 | 0.48 | 1.25 | 1.45 | 1.09 |
| Kisan Call Centre | 0 | 0 | 0 | 0 | 0 |
| Cooperatives/Local bodies | 0 | 0 | 0 | 0 | 0 |
| Special Research Stations | 0.10 | 0.25 | 0.36 | 0.58 | 0.32 |
| NGO | 0 | 0 | 0 | 0 | 0 |
| All Sources | 2.28 | 1.87 | 3.03 | 3.83 | 2.75 |
| C) Training sessions organized within village or nearby village (% of households) | | | | | |
| State Horticulture Department | 12 | 18 | 16 | 18 | 16 |
| State Agricultural University | 2 | 4 | 5 | 6 | 4 |
| Krishi Vigyan Kendras | 8 | 8 | 12 | 11 | 10 |
| Kisan Call Centre | 0 | 0 | 0 | 0 | 0 |
| Cooperatives/Local bodies | 0 | 0 | 0 | 0 | 0 |
| Special Research Stations | 4 | 8 | 9 | 8 | 7 |
| NGO | 0 | 0 | 0 | 0 | 0 |
| All Sources | 26 | 38 | 42 | 43 | 37 |
| D) Training sessions organized within town or state capital (% of households) | | | | | |
| State Horticulture Department | 24 | 26 | 21 | 18 | 22 |
| State Agricultural University | 2 | 4 | 8 | 6 | 5 |
| Krishi Vigyan Kendras | 36 | 24 | 20 | 22 | 26 |
| Kisan Call Centre | 0 | 0 | 0 | 0 | 0 |
| Cooperatives/Local bodies | 0 | 0 | 0 | 0 | 0 |
| Special Research Stations | 12 | 8 | 9 | 11 | 10 |
| NGO | 0 | 0 | 0 | 0 | 0 |
| All Sources | 74 | 62 | 58 | 57 | 63 |

As far as frequency of the training was concerned it was 1.87 times per household per year through all sources. The frequency of training provided to large farmers on an average worked out to 2.23 times per household per year which was found to be the highest frequency among all the four categories of sample respondents and the lowest being 1.55 per cent in case of marginal farmers. Training was imparted by different sources and among them the State Horticulture Department stood first with a frequency of 0.66 time on an average per household

per year followed by Krishi Vigyan Kendras (0.58). The Kisan Call centre got the least frequency level of 0.15 time on an average per household per year.

The average number of days training provided through all sources was 2.75 per household per year whereas it was high at 3.83 days for large farmers. The average number of days training provided was the lowest for small farmers as the figures worked out to 1.87 days per household per year. Among the different sources of training, the State Horticulture Department occupied the first place with an average number of 1.10 days of training per household during the year closely followed by Krishi Vigyan Kendra (1.09 days). It is evident from Table 5.7 that the average number of days training provided by State Agriculture University was found to be the lowest (0.24 day) compared to other sources.

The percentage of sample households attended training sessions organized within village or nearby village through all sources was 37. It could be observed from Table 5.7 that 16 per cent of the sample households attended the training organized within village or nearby village by the State Horticulture Department and the second major source was Krishi Vigyan Kendras where 10 per cent of the households participated. The lowest 4 per cent of households participated in the training programmes conducted by State Agricultural University. None of the households attended the training organized by the Kisan Call Centre, Co-operatives Local bodies and NGOs. Among different categories of farmers, 18 per cent each of small and medium sample households participated in the training organized within village or nearby village by the State Agriculture Department and the marginal farmers was found to be less in number in attending the training (12%). A maximum 12 per cent of medium farmers and 11 per cent of large farmers attended the training conducted by Krishi Vigyan Kendra within village or nearby village.

When compared to the percentage of sample households attended the training programme organized within village or nearby village, the percentage of households participated in the training organized within town or state capital by all sources was found to be more, the former being 37 per cent the latter worked out to 63 per cent. Table 5.7 reveals that on an average 26 per cent of the sample households attended the training organized within town or state capital by Krishi Vigyan Kendra. The least 5 percentage of households attended the training organized within town or state capital by State Agriculture University. Among the different categories of farmers, the highest 74 per cent of marginal sample households participated in the training

organized within town or state capital by all farmers, whereas only 57 per cent of the large farmers attended the same.

The reason behind more percentage of sample households preferred to attend the training organized within town or state capital might be due to their inclination towards visiting towns and cities and to have a change of atmosphere.

5.6 Perception of Households About the NHM:

Table 5.8 presents the perception of households about NHM. The sample respondents expressed their views on to what extent the NHM scheme helped them to increase the area, enhance productivity, ensure protection etc. A vast majority of over 89 per cent of the sample respondents reported that the scheme helped them by providing seedlings/nursery and over 47 per cent were of the opinion that the scheme helped them by providing material inputs. The NHM scheme assisted the farmers to increase the area under horticulture crops by these ways.

According to 70 per cent of the sample respondent's subsidy provision was the good point in the policy towards NHM as evident from Table 5.8. Financial assistance provided under NHM as the good point in the policy towards NHM was expressed by 68 per cent whereas 62 per cent of the sample respondents considered building infrastructure as the good point.

Table 5.8 shows that on an average 83 per cent of the sample respondents were of the opinion that NHM increased employment opportunities for the farmers and agricultural labourers by increasing area under horticultural crops that were manually operated, whereas 56 per cent of them opined that NHM increased employment opportunities by providing subsidy to those who diversified their crops from field crop to horticultural crops. Surprisingly, 13 per cent of the total sample respondents reported that NHM did not increase employment opportunities in any way.

With regard to increase in income as a result of adoption of horticultural crops under NHM 40 per cent of the total sample respondents expressed that their income increased by less than 20 per cent. It could be observed from Table 5.8 that 25 per cent of all sample respondents opined that their income enhanced by 40 to 60 per cent after adopting horticultural crops with the help of NHM while 14 per cent of the total respondents' income rose by 20 to 40 per cent. It is interesting to note that 5 per cent of the total sample respondents reported that their income increased by a record 60 to 100 per cent.

Table: 5.8 Perceptions of Households about the NHM
(% of households saying yes)

| Details of the Items | Marginal | Small | Medium | Large | Total |
|---|----------|-------|--------|-------|-------|
| A) How NHM has helped you to increase your area under horticultural crops | | | | | |
| By providing seedling/nursery | 88.8 | 91.9 | 89.5 | 80 | 89.36 |
| By providing martial inputs | 68 | 22 | 11 | 3 | 47.27 |
| By capacity building material inputs | 36 | 17 | 7 | 3 | 26.54 |
| By providing processing facilities | 0 | 0 | 0 | 0 | 0 |
| By providing market for our end product | 0 | 0 | 0 | 0 | 0 |
| By providing procurement facility | 0 | 0 | 0 | 0 | 0 |
| B) What are the good points in the policy towards NHM | | | | | |
| Financial assistance | 62 | 74 | 68 | 66 | 68 |
| Building infrastructure | 43 | 69 | 72 | 63 | 62 |
| Capacity building (awareness camps) | 48 | 54 | 52 | 47 | 50 |
| Subsidy provision | 62 | 68 | 76 | 72 | 70 |
| Any other | 0 | 0 | 0 | 0 | 0 |
| C) Do you think NHM has increased employment opportunities for the farmers and agricultural laborers | | | | | |
| By increasing area under horticultural crops that are manually operated | 78 | 83 | 88 | 82 | 83 |
| By establishing horticultural processing units in the local areas | 0 | 0 | 0 | 0 | 0 |
| By providing subsidy to those who have diversified their crops from field to horticultural crops | 42 | 48 | 66 | 69 | 56 |
| No NHM has not increased employment in the any way | 6 | 8 | 17 | 19 | 13 |
| D) Do you think your income has grown up after adopting horticultural crops with the help of NHM | | | | | |
| Less than 20 % | 25 | 36 | 48 | 49 | 40 |
| 20 to 40 % | 9 | 13 | 18 | 16 | 14 |
| 40 to 60 % | 12 | 18 | 22 | 26 | 20 |
| 60 to 100 % | 0 | 6 | 5 | 9 | 5 |
| No increase at all | 54 | 27 | 7 | 0 | 78 |
| E) Are farmers in your village aware about the NHM | | | | | |
| They have actively benefited from the subsidies provided by the NHM | 92 | 89 | 95 | 97 | 92 |
| They actively participate in the training programme provided by the NHM | 59 | 65 | 79 | 90 | 73 |
| They have benefited from the infrastructural building up being done by the NHM | 32 | 62 | 68 | 73 | 59 |
| They have been able to raise their area under horticultural crops with the help of NHM | 39 | 48 | 62 | 66 | 54 |
| No they stand aloof and completely unaware about the activities of NHM | 0 | 0 | 0 | 0 | 0 |
| F) What changes do you suggest to make NHM more effective? | | | | | |

| | | | | | |
|--|----|----|----|----|----|
| Subsidy provision for fencing | 56 | 42 | 69 | 63 | 58 |
| More subsidy amount | 26 | 42 | 46 | 45 | 40 |
| Provision for planting material | 26 | 32 | 38 | 39 | 34 |
| Processing facilities | 24 | 28 | 38 | 12 | 26 |
| Cold wind and frost resistant variety availability | 0 | 0 | 0 | 0 | 0 |
| Increase power supply | 32 | 36 | 39 | 48 | 39 |
| Assured marketing | 48 | 56 | 64 | 58 | 57 |
| Good market condition | 12 | 18 | 22 | 29 | 20 |
| Revision of cost estimate required | 36 | 38 | 45 | 48 | 42 |
| Single phase connection for NHM | 64 | 69 | 68 | 72 | 68 |

However, 2.1 per cent of the total sample respondents disputed with the views of others by saying that there was no increase in income at all after adopting horticultural crops with the help of NHM.

With regard to awareness of the farmers about NHM, a vast majority of 92 per cent of the sample respondents reported that since they were aware of the scheme, they actively benefited from the subsidy provided by NHM. Awareness of the programme was reported by 73 per cent of the sample households that they actively participated in the training programmes organized by NHM. The statement of 59 per cent of the total sample respondents was that they were benefited from the infrastructural building up being done by NHM whereas 54 per cent reported that they were able to raise their area under horticulture crops with the help of NHM. It is significant to mention here that none of the sample respondents reported that he/she was unaware of the NHM.

Various suggestions were put forth by the sample respondents to make the NHM more effective. As high as 68 per cent of the sample respondents suggested that providing single phase electricity connection to them would help them much to improve their horticultural operations. Another significant suggestion put forth by 58 per cent of the total sample respondents was provision of subsidy for fencing their horticultural field. A considerable percentage (57%) of sample respondents wanted to have assured marketing for their horticultural crops as this is considered to be the key infrastructure for the farmers to make remunerative prices for their produce. Enhanced subsidy amount, provision for planting material, increased power supply etc were other suggestions voiced by 34 to 40 per cent of the total respondents.

5.7 Summary of the Chapter

This chapter made an attempt to assess the impact of NHM on the expansion of horticultural crops. While analyzing the impact of NHM on area the study found that there was no change in the area under mango crop cultivated by the sample respondents and it remained the same during the period from 2004-2005 to 2009-10. The average area under mango crop per household worked out to 0.77 acre.

In the case of banana crop, area expansion could be witnessed over the period. The average area under banana crop was 1.11 acres during 2004-05 which marginally rose to 1.12 acres during 2008-09 and further increased to 1.29 acres during 2009-10. The area under flower crop also increased to some extent as it was 0.27 acre per household in 2004-05 which increased to 0.34 acre per household during 2008-09. Impact of NHM on yield was visible as the average yield of banana obtained by the sample respondents marginally increased from 196 quintals per acre in 2004-05 to 198 quintals per acre in 2008-09 and further rose to 224 quintals during 2009-10. In the case of mango, the yield substantially increased from 1.85 quintals per acre in 2007-08 to 4.77 quintals per acre in 2008-09 and increased to a higher level of 9.49 quintals during 2009-10. With regard to yield of flower, it increased from 117 quintals per acre in 2004-05 to 127 quintals in 2008-09 registering a growth rate of 8.5 per cent over the period.

The average area for which certified inputs were procured under rejuvenation and protection through NHM resource provision accounted for 1.08 acres, 1.23 acres and 0.70 acre per household respectively in case of banana, mango and flower crops during 2008-09. It is found from the study that rejuvenation support was given to nearly 23 per cent, 37 per cent and 12 per cent of the sample respondents growing banana, mango and flowers respectively under NHM. Area under banana, mango and flowers expanded due to rejuvenation under NHM. The average area expanded under banana, mango and flowers accounted for 0.36 acre, 0.41 acre and 0.23 acre respectively.

Majority of the sample respondents availed the promotional activities such as availability of good quality planting materials like nursery, rejuvenation with improved cultivators, integrated nutrient management or integrated pest management and so on.

As regards subsidy, it was provided for planting materials, fertilizers, pesticides, other inputs drip/sprinkler irrigation, vermi compost and modern nursery in respect of all the selected crops banana, mango and flowers. In case of banana, all the 50 sample respondents received

subsidy for fertilizer, pesticides, other inputs and vermi compost, while all the 50 sample households growing mango availed subsidy for planting material, fertilize, pesticides, other inputs and vermi compost and this held good for flower crop also.

The average amount of subsidy under NHM for mango crop ranges from Rs.1475 to Rs.10083 per household. In case of banana the average subsidy amount provided for fertilizer pesticide other inputs and vermi compost, was to the tune of Rs.5361 and Rs.1230 per household respectively. In case of flowers, the subsidy provided ranges from Rs.168 to Rs.6858 per household.

Training was imparted to the farmers under NHM. As regard frequency of training, it was 1.87 times per household per year through all sources. The average number of days training provided through all sources was 2.75 per household per year.

As regards perception of sample households about NHM, over 89 per cent of them reported that the scheme helped them by providing seedlings/nursery. According to 70 per cent of the sample respondents, subsidy provision was the good point, in the policy towards NHM. About 80 per cent of the sample respondents opined that NHM increased employment opportunities for the farmers and agricultural labourers by increasing area under horticultural crops.

Out of various suggestions put forth by the sample households, providing single phase electricity connection so as to enable them to improve their horticultural operations was voiced by 68 per cent of the sample respondents. Nearly 60 per cent of the sample respondent suggested for providing subsidy for fencing their horticultural crops.

CHAPTER VI

Concluding Remarks and Policy Suggestions

6.1 Introduction

The Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India launched a centrally sponsored scheme namely “National Horticulture Mission (NHM)” in 2005 for the holistic development of horticulture sector, duly ensuring horizontal and vertical linkages with the active participation of all the stake holders.

The National Horticultural Mission focuses on horticulture mission, development, post harvest management, processing and marketing. The mission also focuses on promoting processing of horticultural produce and value addition.

Tamil Nadu is one of the pioneering states in implementing the NHM scheme effectively to achieve the objectives of the scheme. The performance of Tamil Nadu in implementing the National Horticulture Mission is exemplary and was appreciated at the National level. Tamil Nadu was given the best performing State Award under the National Horticulture Mission by the Hon’ble Union Minister for Agriculture during the National conference on Horticulture Production and productivity on 17.02.2012. The citation of the award reads that ‘Tamil Nadu State has been an active participant under the National Horticulture Mission (NHM) through its State Horticulture Development Mission since the inception of the NHM scheme in 2005-06. The basis for the award is that, as a result of NHM intervention, the production of horticulture crops has increased from 1.1 million MT in 2004-05 to about 18 million MT and is now contributing about 8 per cent of horticulture production in the country. Major share of production is from vegetables (42 %), the fruits (banana and mango) followed by vegetables (36 %). Tamil Nadu has attained leadership in the production of banana and is the third largest producer of horticultural crops in the country.

The achievement has been possible as a result of the sustained effort made by the State in ensuring effective delivery of the NHM programme in conjunction with other programmes of the Government of India such as Rashtriya Krishi Vikas Yojana (RKVY), Micro Irrigation, Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS) in an integrated manner.

In recognition of the meritorious performance by the State, the Ministry of Agriculture, Department of Agriculture and Co-operation, placed on record its appreciation and recognizes Tamil Nadu as one of the **Best Performing States** under the National Horticulture Mission.

The award recognizes that under the National Horticulture Mission Tamil Nadu has promoted area expansion of focus horticulture crops, high density planting, precision farming and protected cultivation of flowers and vegetables.

In Tamil Nadu, the implementation of the scheme started in the year 2005-06, with 100 per cent assistance and from the year 2007-08 onwards, the scheme is being implemented with the financial assistance from the Union and State Governments in the ratio of 85:15.

Under this scheme, the cultivation of nine focus crops including mango, banana, and flowers are being promoted through a cluster approach. Nearly 2.5 lakh ha has been brought under horticulture cultivation and 3.5 lakh farmers have benefited with a financial outlay of Rs.512 crores from the inception of the scheme in 2005-06.

Horticulture University: Three Sites Identified

It is a solid proof that the NHM is a great success in Tamil Nadu in general and the Krishnagiri District in particular and it reflects in selecting this area for the proposed Horticulture University. Three places have been identified for a horticulture university to be established in Krishnagiri district. As the district had abundant cultivation of vegetables, fruits and flowers, and has a good scope for further planned development, it would become one of the developed and model districts in the State. The University would improve crop pattern and develop new varieties of crops which would improve the economic conditions of the horticulturists of the state.

The hopes of the planners and the policy makers have not been disappointed but rather success has come about in a way that the Mission has accomplished its mandates and objectives, throughout the country, and more so in Tamil Nadu, as the developments here were on expected lines and in consonance with the national and State objectives as well.

SWOT Analysis of Horticulture in Tamil Nadu

From a general analysis of the Horticulture Mission in Tamil Nadu, it is possible to draw certain conclusions and recommendations. The SWOT analysis of the horticulture in Tamil Nadu shows the following strengths, weaknesses opportunities and threats.

The Strengths

- The State is ideally suited for exports given the strategic location of airports and sea ports.
- Prevalence of off-season cropping (for example: mango and grape are unique to Tamil Nadu).
- Presence of leading institutions like Tamil Nadu Agricultural University (TNAU), AERC, and other Research Institutions
- State Government policies facilitate growth of the sector (TANFLORA, AEZ's)

The Weaknesses

- There is a lack of awareness on hi-tech horticulture/ quality consciousness among growers.
- Lack of adherence to phyto-sanitary standards hinders acceptance in foreign markets.
- The presence of small land holdings hampers adoption of best practices.
- Lack of price discovery mechanism often leads to wide fluctuation on market prices.
- There is low focus on post harvest management and facilities like cold storage, pre-cooling and waxing centers, processing units etc.
- The marketing channels are not well developed.

The Opportunities

- Large tracts of dry lands/ rain –fed areas/ wastelands can be utilized for promotion of horticulture.
- There is an opportunity to set up processing industries for horticultural crops on the back of improved post harvest practices.

- There are export opportunities to the Far East, Middle East and Western countries which can be tapped
- There is an increasing demand in developed countries for Green foods/ Organic foods.
- There is a growing trend in contract farming initiatives which need to be encouraged through supportive policies.

The Threats

- The dwindling water resources could pose a serious issue in the coming years.
- Non-availability of work force for agriculture during season.

While the identified strengths could be further strengthened through careful consideration of certain elements and components of the National Horticulture Mission, the weakness can be overcome through select strategies, opportunities can be taken to further develop horticulture to new heights and threats may be eliminated through policy suggestions and appropriate actions.

6.2 Summary of Findings

6.2.1 Objectives, Data and Methodology

Main Objectives of the Study:

The main objectives of the study are:

- To assess the impact in terms of increase in area, production and productivity of identified horticultural crops covered under NHM, keeping 2004-2005 as the base year in the State in general and for the identified crops/districts in particular.
- To assess the extent to which the scheme has helped in creating employment opportunities and enhancement of income of the farmers
- To suggest measures for improving the implementation strategy of NHM in Tamil Nadu

Data and Methodology

The study area under evaluation consists of three districts of the State of Tamil Nadu, namely, Dharmapuri, Krishnagiri and Salem, all of them in the northwestern part of the State. Hence, the database for evaluation of the National Horticulture Mission in Tamil Nadu is from the three districts, although State level performance has been assessed using the secondary data available, from the Department of Horticulture.

The sources of data were both primary and secondary. As regards the primary data, a survey of 150 farmers from the three selected districts, by using the household schedule for studying the impact of the National Horticulture Mission in Tamil Nadu, was made and the data so collected were analyzed and interpreted.

The secondary sources were primarily the library and documentary sources and the State agencies were helpful in providing some aggregate data for the districts, which were appropriately assessed and analyzed for use in the report. Totally 13 villages in the 3 districts were covered for the study. A main thrust was given to banana and mango for Dharmapuri district, mango and banana for Salem district and flowers for Krishnagiri district.

6.2.2 Area, Production and Productivity of Horticultural Crops in the state

Area, production and productivity of horticultural crops in Tamil Nadu were analysed in this chapter. The total geographical area of the State accounted for 13026645 ha. Of this cultivable area which was 5097011 ha during TE 2004-05 declined to 5042896 ha during TE 2008-09. Though there was a decrease in the total cultivable area during 2008-09 the area under horticultural crops on the other hand registered an increasing trend from 852939 ha during TE 2004-05 to 937831 ha during TE 2008-2009. Nearly one fifth of the cultivable area was under horticultural crops during 2008-2009.

The study reveals that NHM made a favorable impact on the growth of horticultural crops in Tamil Nadu. The area under horticultural crops increased (by 19 %) from 6.22 lakh ha during 2004-05 to 7.4 lakh ha during 2008-09. Similarly, production also increased from 118.07 lakh tonnes to 151.56 lakh tonnes during the same period. There was a positive growth rate (in percentage) in area of the horticultural crops from 2.36 during the period from 2004-05 to 2005-06 to 3.47 during the period 2004-05 to 2008-09.

Analysis of district wise growth of horticultural crops in Tamil Nadu brought out the fact that the NHM scheme made good impact on area in almost all districts barring only 4 districts out of 32 districts in Tamil Nadu during the period from TE 2004-05 to TE 2008-09. In case of production also a positive growth could be witnessed in 23 districts out of 32 districts during the same period.

A considerable increase could be noticed in area as well as production of selected horticultural crops banana, mango and flowers from the period TE 1980-81 to TE 2008-2009 in

Tamil Nadu. The area of banana rose to 111268 ha in TE 2008-09 from 60423 ha in TE 1980-81. Similarly, the area of mango tremendously increased from 36432 ha in TE 1980-81 to 128030 ha during TE 2008-09. The same trend could be witnessed in case of area under flower crop also. The production of banana increased (by 525 %) from 1486625 m.tonnes in TE 1980-81 to a whopping 5228118 m. tonnes in TE 2008-09. As far as production of mango was concerned it increased (there was 19 per cent growth rate in production) from 567860 m.tonnes in TE1980-81 to 680480 m.tonnes in TE 2008-09. The production of flowers tremendously increased from 58,000 m.tonnes during the period TE 1991-92 to 266794 m.tonnes during TE 2008-09. Thus, all the three selected crops banana, mango and flowers registered a substantial growth in terms of area and production during the period under study. An analysis of growth rate for the reference period of the study 2004-05 to 2008-09 reveals that there was a high percentage of growth rate in area in respect of all the three crops namely banana, mango and flowers to the level of 7.03 per cent, 1.86 per cent and 3.25 per cent from 6.5 per cent, 1.57 per cent and 1.78 per cent respectively during the period 2004-05 to 2007-08.

While analyzing the annual growth rate of area under banana district wise the selected district Dharmapuri stood third with 11.47 per cent growth rate and the growth percentage was moderate (6.94%) in Salem district. In case of yield of banana Dharmapuri district recorded a higher growth rate of 12.86 per cent and occupied the second place among all the districts in Tamil Nadu. As far as the growth rate of area under mango was concerned the selected district Salem stood first with 21.59 per cent and Dharmapuri district posted a growth rate of 17.83 per cent during the period from TE 2004-2005 to TE 2008-09. The growth percentage of yield of mango was not found to be significant in Salem as well as in Dharmapuri districts the percentage being 2.92 and 2.91 respectively compared to other districts in Tamil Nadu. The growth rate in yield of mango was as high as at 22.04 per cent in Tirunelveli district during the period from TE 2004-05 to TE 2008-09. In the case of flowers, the selected district Krishnagiri registered a moderate 6.40 per cent growth rate in area whereas the Niligiris district posted a record growth rate of 62.88 per cent from TE 2004-05 to 2008-09. As regards the yield of flowers, Namakkal district registered a record growth rate of 7.58 per cent among all the districts in Tamil Nadu whereas the selected district Krishnagiri registered a minimal growth rate of 0.49 from TE 2004-05 to TE 2008-09.

6.2.3 Household characteristics cropping pattern and production structure

Socio economic conditions and characteristics of the farmers were dealt with in this chapter. Characteristics of operational holdings, nature of tenancy, sources of irrigation, sources and purpose of credit, cropping pattern, production cost and returns were also analysed in this chapter.

The total number of sample respondents for the study was 150 comprising 89 marginal, 37 small, 19 medium and 5 large farmers. The average household size was 5.68 persons. The average number of earners was found to be 3.24. As regards sex of sample respondents, it was 51.8 per cent male and 48.2 per cent female. About 66 per cent of the members of the sample households belonged to the productive age group of 16-60 years. As regards education, about 83 per cent of the sample respondents had education ranging from primary to graduation level. About 17 per cent of the sample respondents were illiterates. As far as community of the sample respondents was concerned BC was found to be the dominant community claiming more than 50 per cent whereas SC community constituted just 3 per cent only. Farming was found to be the main occupation for about 86 per cent of the working members of the sample households.

As regards operational holding, average net operated area and net sown area of the sample households accounted for 3.91 acres and 3.90 acres respectively. The average gross cropped area worked out to 6.20 acres and cropping intensity was 163 per cent. The leased in area was found to be abysmally low at 0.28 acre on an average and fixed rent in cash was the nature of tenancy existed among the sample households.

Tank, Canal and well were the sources of irrigation for the sample households and among them wells were found to be the major source, irrigating 68 per cent of the land of the sample households. A little more than one tenth of the net operated area was rainfed.

The average amount of loan borrowed from different sources accounted for Rs.28382 per household. About 87 per cent of the loan taken from all sources was for agricultural purpose. With regard to asset holding, it accounted for Rs.177449 per household and Rs.43246 per acre of NSA on an average.

The sample respondents raised paddy, maize, groundnut, sugarcane and cholam during kharif season and paddy, pulses, groundnut and ragi during rabi season. As regards horticultural crops, banana, mango, flowers, vegetables, other fruits and plantation crops were cultivated by the sample respondents. The total area under kharif crop accounted for 1.96 acres per household

whereas it was 1.67 acres per households for rabi crop. In case of horticultural crops, the total area worked out to 2.56 acres per household. The area under banana on an average accounted for 1.12 acres per household. The average area under mango worked out to 0.77 acre per household whereas the average area under flower was very minimal at 0.34 acre per household. The study reveals that a little more than 90 per cent of the area was irrigated per household during kharif as well as in rabi seasons. In case of horticultural crops, about 96 per cent of the area was irrigated per household.

The total value of output on an average was to the tune of Rs.398294 per household. The total cost of production worked out to Rs.157315 per household while the net returns on an average realized were to the tune of Rs.240980 per household. The total income including non farm income earned by the sample respondents was to the tune of Rs.280484 per household. The total value of output per acre of net sown area and per acre of gross cropped area worked out to Rs.101976 and Rs.67346 respectively. The total cost of production calculated in terms of per acre of net sown area and per acre of gross cropped area accounted for Rs.40684 and Rs.26542 respectively. In case of net returns from agriculture, the average per acre net returns of net sown area and per acre net returns of gross cropped area were of Rs.61282 and Rs.40804 respectively.

6.2.4 Production structure and resource use under Horticulture crops

Economics of production, cost and resource use in horticultural were analysed in this chapter. Cost of cultivation output and net returns of selected crop banana, mango and flower and use of human labour in the cultivation of human labour in the cultivation of these crops were studied.

The average area of banana planted by the sample farmers worked out to 2.09 acres per household. The total cost of cultivation of banana including variable cost and fixed cost on an average was to the tune of Rs.55994 per acre whereas the average revenue earned by a farmer was Rs.155833 per acre. The average output produced by a sample farmer was calculated to be 197 quintals of banana per acre. The average area of mango cultivated by the sample farmers was 2.44 acres per household.

The total cost of cultivation of mango was Rs.11091 per acre. Against this cost, the total net returns generated by the sample farmers on an average was as low as Rs.2740 only per acre

as the trees were under gestation period and start yielding sufficient returns after attaining the bearing period.

As regards flowers, the average area planted by the sample farmers worked out to 2.39 acres per household. The total cost of production of flowers including variable cost and fixed cost on an average was to the tune of Rs.54993 per acre. The total revenue generated from an acre of flower was to the tune of Rs.136211. The average output produced by the sample farmers worked out to 126.97 quintals of flower per acre.

A comparison of net returns obtained from horticultural crops and non horticultural crops was made in this chapter. The study reveals that the average net returns generated by a sample household from kharif crop were to the tune of Rs.5946 per acre whereas the average net returns obtained from rabi crop were put at Rs.4956 per acre. But at the same time the average net returns generated from horticultural crops were much higher compared to kharif and rabi crops. The average net returns from horticultural crops stood at Rs.35851 per acre. Of the three selected horticultural crops the average net returns obtained from banana were found to be high at Rs.99839 per acre followed by flowers (Rs, 81218). The net returns generated from mango were abysmally low at Rs.2740 pre acre.

Human laborers were employed in different activities of agriculture. The study shows that human labour used for all the kharif crops by the sample households on an average worked out to 20.76 mandays per acre while it was little less at 19.99 mandays per acre in case of rabi crop. When compared to kharif and rabi crops the human labour use in horticultural cultivation was found to be higher which worked out to 27.57 days on an average for all horticultural crops. The study reveals that human labour required for all recurring activities in horticulture on an average worked out to 17.43 man days per acre whereas for fixed activities the figure was found to be 10.14 mandays per acre.

As regards the marketing channels, the selected horticultural crops banana, mango and flowers produced by the sample households were sold through wholesale markets and intermediaries at farm gate. In case of mango nearly 75 per cent of the produce was marketed through intermediaries at farm gate. Similarly, over 85 per cent of the banana produced was also sold through the same channel. In case of flowers nearly 35 per cent of the produce was marketed through merchant whereas about 33 per cent was sold through intermediaries.

6.2.5 Impact of NHM on the expansion of Horticultural Crops

This chapter made an attempt to assess the impact of NHM on the expansion of horticultural crops. While analyzing the impact of NHM on area the study reveals that there was no change in the area under mango crop cultivated by the sample respondents and it remained the same during the period from 2004-2005 to 2009-10. The average area under mango crop per household worked out to 0.77 acre.

In the case of banana crop, area expansion could be witnessed over the period. The average area under banana crop was 1.11 acres during 2004-05 which marginally rose to 1.12 acres during 2008-09 and further increased to 1.29 acres during 2009-10. The area under flower crop also increased to some extent as it was 0.27 acre per household in 2004-05 which increased to 0.34 acre per household during 2008-09. Impact of NHM on yield was visible as the average yield of banana obtained by the sample respondents marginally increased from 196 quintals per acre in 2004-05 to 198 quintals per acre in 2008-09 and further rose to 224 quintals during 2009-10. In case of mango, the yield substantially increased from 1.85 quintals per acre in 2007-08 to 4.77 quintals per acre in 2008-09 and increased to a higher level of 9.49 quintals during 2009-10. With regard to yield of flower, it increased from 117 quintals per acre in 2004-05 to 127 quintals in 2008-09 registering a growth rate of 8.5 per cent over the period.

The average area for which certified inputs were procured under rejuvenation and protection through NHM resource provision accounted for 1.08 acres, 1.23 acres and 0.70 acre per household in case of banana, mango and flower crops during 2008-09. It is found from the study that rejuvenation support was given to nearly 23 per cent, 37 per cent and 12 per cent of the sample respondents growing banana, mango and flowers respectively under NHM. Area under banana, mango and flowers expanded due to rejuvenation under NHM. The average area expanded under banana, mango and flowers accounted for 0.36 acre, 0.41 acre and 0.23 acre respectively.

Majority of the sample respondents availed the promotional activities such as availability of good quality planting materials like nursery, rejuvenation with improved cultivators, integrated nutrient management or integrated pest management and so on.

As regards subsidy, it was provided for planting materials, fertilizers, pesticides, other inputs drip/sprinkler irrigation, vermi compost and modern nursery in respect of all the selected crops banana, mango and flowers. In case of banana, all the 50 sample respondents received

subsidy for fertilizer, pesticides, other inputs and vermi compost, while all the 50 sample households growing mango availed subsidy for planting material, fertilizer, pesticides, other inputs and vermi compost and this held good for flower crop also.

The average amount of subsidy under NHM for mango crop ranges from Rs.1475 to Rs.10083 per household. In case of banana the average subsidy amount provided for fertilizer pesticide other inputs and vermi compost, was to the tune of Rs.5361 and Rs.1230 per household respectively. In case of flowers, the subsidy provided ranges from Rs.168 to Rs.6858 per household.

Training was imparted to the farmers under NHM. As regard frequency of training, it was 1.87 times per household per year through all sources. The average number of days training provided through all sources was 2.75 per household per year.

As regards perception of sample households about NHM, over 89 per cent of them reported that the scheme helped them by providing seedlings/nursery. According to 70 per cent of the sample respondents, subsidy provision was the good point, in the policy towards NHM. About 80 per cent of the sample respondents opined that NHM increased employment opportunities for the farmers and agricultural labourers by increasing area under horticultural crops.

Out of various suggestions put forth by the sample households, providing single phase electricity connection so as to enable them to improve their horticultural operations was voiced by 68 per cent of the sample respondents. Nearly 60 per cent of the sample respondent suggested for providing subsidy for fencing their horticultural crops.

6.2.5.1 Banana

Precision farming has been pioneered by Tamil Nadu and is a leading proponent of this technology. This technology includes proper selection of crops, crop varieties, drip irrigation and scientific crop cultivation practices. Precision farming has been practised in a big way for growing banana crop in the state.

Value addition:

Banana can be preserved for 3 months or more by reducing the moisture in it by drying or frying. It is mainly used in hotels, restaurants, homes etc. To prepare banana wafers, green bananas are used, which are cleaned, sliced and fried. This is a popular snack food and has a

good demand in the market. Banana powder is prepared from pulp of fruits. It can be used in bakery and confectionary industries, in treatment of certain diseases and intestinal disorders. It is also a very useful diet for infants. Its demand can be increased by proper marketing.

6.2.5.2 Mango

Israeli agronomists train Tamil Nadu mango growers

Horticulture scientists from Israel are training orchard owners and mango growers in Tamil Nadu's Krishnagiri district to adopt unique technology to rejuvenate their mango trees for increased and better productivity of the fruits. These agronomists study the trees, sans causing any damage. This system has been named Canopy Management system. A portable pruning machine, a projection of which can be hoisted to considerable height is used in this system. Under the National Horticulture Mission, the Indian Government has procured machines used in the Canopy Management Pruning System Machine. These machines boast of multi functions such as plucking fruits to reduce post harvest losses and spraying insecticides.

6.2.5.3 Flower

Flower Cultivation:

- a.** Green house cultivation (protected cultivation) Tamil Nadu emerged as a hub for protected cultivation which ensures controlled atmospheric conditions. Cut flowers like rose, carnation etc, are being cultivated under green house cultivation technique. The success of this cultivation is mainly due to the increased income realized by the farmers.
- b.** A sample from a selected village in Krishnagiri district owned a 5 acre tract, which was yielding an annual income of RS.50, 000 for the family till 2 years back. Because of the sincere adoption of NHM guidelines, the farmer was confident that his earning would be six times more as Rs. 3 lakhs and that too from just 1,000 sq m. and he credited it to the National Horticulture Mission, as this scheme has helped farmers to use advanced horticultural techniques to boost their yields.

Most important factor of the initiatives was providing a 50 per cent subsidy to farmers to take up polyhouse farming. As a result of this, farmers construct a metal structure covered with sheets of polythene, which allows them to control temperature and the moisture inside and enables higher yields throughout the year. As more and more farmers showed a willingness to

adopt modern techniques, nearly 2,500 ha were brought under the NHM in Krishnagiri during last few years at a cost of Rs.5.26 crore. This made Krishnagiri the most successful NHM district in Tamil Nadu and can claim to be the hub for flower industry in Tamil Nadu.

6.3 Policy Suggestions

1. The State is ideally suited for exports given the strategic location of airports and sea ports.

Trade and marketing arrangements in place, both spatially and economically, are able to support horticultural crop exports, particularly mangoes. Mangoes are a much preferred and demanded fruits not only locally and regionally but also nationally and internationally. There are indeed varieties of mangoes which are all the time favorites of people in India and abroad that the demand for them is never low. In the recent years, the export in mangoes has been on an increase which should be nurtured and promoted to reach greater heights. It would be appropriate to create policy support facilitating the export of mangoes, in the international arena. Flowers are already being exported to various countries to meet the needs of the gift givers and party-goers. Promotional efforts would be in order for making horticultural crops in constant demand and use.

2. Prevalence of off-season cropping (for example: mango, grapes is unique to Tamil Nadu).

There are increasingly greater areas of mango cultivation which take to off-season cropping. Mangoes and grapes are grown off-season in Tamil Nadu and as such potentials for other crops being grown off-season may be explored with a view to improving area and production of horticultural crops.

3. Presence of leading institutions like Tamil Nadu Agricultural University (TNAU) and other Research Institutions.

Such institutions as the TNAU and other research centres are an advantage to the State as they will be involved in furthering the cause of horticulture and also improve the status of the farmers in the State.

4. State Government policies facilitate growth of the sector (TANFLORA, AEZ's)

Continued support of the Government in facilitating the growth of the horticultural sector must be appreciated. Further and newer areas of development must be encouraged so that the sector becomes one improving the GDP and the per capita agricultural incomes.

5. There is a lack of awareness on Hi-tech horticulture/quality consciousness among growers.

Despite enormous growth in hi-tech in the country and in the State, this lack of awareness of hi-tech horticulture has been an impediment in the growth and development of horticulture. Much needs to be done by way of bringing awareness among the farmers, especially small and marginal farmers. Also important are the efforts at improving the quality of products and spreading quality consciousness among the growers. Newer strategies involving non-governmental organizations may be sought to be developed for this purpose.

6. The presence of small land holdings hampers adoption of best practices.

This is a greater problem and is difficult to resolve unless consolidation of land holdings takes place in tune with the needs of the sector. Unless consolidation occurs spontaneously in response to the needs of the horticultural sector, adoption of best practices may continue to be hampered.

7. There is low focus on post harvest management and facilities like cold storage, pre-cooling and waxing centres and processing units.

This is true as of now, but efforts are underway to improve the situation. But what has been done so far is not adequate for the purpose. Further efforts on providing facilities like cold storage, pre-cooling and waxing centres at the local level at low, affordable prices and also processing units may be encouraged. Local farmers may be encouraged to set up their own facilities, either individually or in a cooperative spirit with Government assistance for doing so in response to the local needs.

8. The dwindling water resources could pose a serious issue in the coming years.

The farmers practicing horticulture in the selected three districts of Dharmapuri (banana), Krishnagiri (flower) and Salem (mango) depend on rain water and wells, some of them of course bore wells, for their irrigation. There is concern on the dwindling water resources, especially, of ground water and to a certain extent the uncertain rains (climate change has now added a new dimension of either unusually excess rains or excess temperatures). There is need to consolidate water resources, primarily river or canal irrigation, if horticulture should go on without a let down. The best thing to do, given the limited options, are the popularization of rainwater

harvesting and shoring up underground water resources and also introducing irrigation technologies such as drip and sprinkler irrigation to save on water. The farmers are already aware of these options and methods but improved awareness about their value in the immediate future would be useful.

9. Non-availability of work force for agriculture during season.

This is indeed an insurmountable problem for a variety of reasons. The most important of them are: (a) the increasing unavailability of local agricultural labour, which is largely being catered to by the National Rural Employment Guarantee Scheme and (b) the increasing bargaining power of the local and specialized labour. The NREGS has now attracted most of the local agricultural labour that prefer to work for the program related activities. The labour in the last few years has become increasingly powerful because of the increasing demand for them on the one hand and the bargaining power on the other. This may escalate into a crisis in the future, unless some drastic attempts are not made by the government and labour associations to resolve the crisis.

10. Strategies for further Improvement of Horticulture

As for Tamil Nadu is concerned, the important things to do to improve the prospects and consequences of the National Horticulture Mission are to:

- Organize farmers' groups, cooperatives on the national/state models, self-help groups, producer companies and other associations;
- Provide for collection centres and transportation to local markets; and
- Provide for a network of cold chain storages/reefer van all over the country in cooperative/private/public sector.

11. Development of a new variety in Banana - hope for farmers due to improved traits.

Researchers at the National Research Centre for Banana (NRCB), Tamil Nadu have developed a new hybrid plantain variety named “**Udhayam**” which is robust by nature and able to withstand strong winds. The variety is found to be tolerant to low temperatures and can be grown in a wide variety of soils.

It was found that the new variety exhibited several traits, such as more bunch weight (37-45 kgs), more hands per bunch (18), more fingers per hand (17-18) and longer fingers (13-16 cm) than other varieties. This variety is tolerant to Sigatoka leaf spot virus disease and nematode infestations, which are common in banana plantations. The fruits can be harvested 13-14 months

after planting and the yield is 40 per cent more than the local varieties, which comes to harvest in 14-15 months after planting, according to researchers.

The fruit bunch is cylindrical in shape and has a shelf life of 12-15 days after harvest, which makes it hardy for long distance transportation, according to the researchers.

This may be popularised so as to increase the yield and income of the farmers.

12. Increased productivity in Mango-Canopy management in young trees improves mango productivity

To increase the yield and quality of fruits, farmers should take up 'High Density Mango Production' and follow the canopy management system in young trees.

Unlike the conventional method, where only 100 plants are cultivated on one hectare, around 400 plants can be cultivated under the high-density method in a hectare as the space between trees is five metres as against 10 metres in normal methods. The yield is around 12 tonnes when compared to five tonnes in conventional method. By adoption of 'High Density Mango Production' the State is expected to enhance its productivity in the coming years.

13 Development of Floriculture

"Floriculture, after all, is an industry and has to be managed in a planned, methodical manner." The best part of floriculture is that it is not dependent on weather and it ensures produce and guaranteed income.

Hosur, an hour drive from Bangalore, is fast emerging as the floriculture hub of India on the back of raising cut rose exports from this region. Around 8 million stems of cut roses produced in Hosur in Krishnagiri district are exported to Europe, Japan, Singapore, Saudi Arabia and other South East Asian countries every year. The district accounts for around 30 per cent of the total Rs.500 crores of foreign exchange fetched through cut flower exports from the country.

The flower, immediately after it is picked from the plant, should be placed in cold storage. But there is inadequate cold storage facility resulting in farmers being compelled to sell the product to middlemen after they pick flowers. Hence necessary linkages have to be provided with adequate cold storage facilities to develop this industry.

14. Need for a sustainable development strategy

In NHM, it has to be seen as to how much of its benefits are percolating to farmers across geographical regions and income levels. It is cautioned that any unplanned major shift towards horticulture should not happen at the cost of wheat and rice cultivation as this would lead to a

shortage of food grains. Hence, very careful sustainable development strategies are to be planned so that food shortage will not occur due to the development of Horticulture.

15. Rejuvenation/Protection, Resource Procurement through NHM

Many of the fruit orchards, especially those in the traditional areas, like Salem, were more than 40 years of age, resulting in low productivity. The senile orchards needed to be rejuvenated with latest high yielding varieties by adopting advanced technologies.

16. Need for strengthening supply chain management

The enormous losses of fruits produced in the country are mainly because of the lack of proper infrastructure for storage and transportation under controlled conditions. Of late, Supply Chain Management (SCM) is gaining importance due to globalization.

Several factors are driving emphasis on supply chain management and the following three are identified as most important, 1. The cost and availability of information resources between entities in the supply chain allow easy linkages that eliminate time delays in the network. 2. The level of competition in both domestic and international markets requires organizations to be fat, agile and flexible. 3. Customer expectations and requirements are becoming much more stringent so as to satisfy the consumers. The supply chain management system should operate with the two main objectives namely timeliness and quality.

17. Setting up of Agriculture Terminal Market Complex

The State Government in line with the scheme, has planned for a Agriculture Terminal Market Complex (TMC) and foundation was laid for the same at Perunthurai in Erode District (adjoining District) which would reduce post harvest loss of farm goods from 30 per cent to 10 per cent and would benefit around 1,00,000 farms across seven districts.

According to Agriculture Department officials the facility was the first-of-its-kind in the country being promoted in public-private partnership, and would spread across 47.9 acre land. Of the total cost, the National Horticulture Mission would give Rs.28 crores and the Agriculture Marketing Department Rs.1 crore. The share of ryots would be Rs.3 crores. The main aim of the TMC was to mobilize flowers, vegetables and fruits from 20 collection centres. Of the total collection, 70 per cent would be perishable and the rest non-perishable commodities. It will also have cold storage units.

Apart from selling the goods on the spot, it will also sell through e-business. A minimum commission of three per cent would be charged on the goods being sold. Those goods that could

not be sold through the collection centres could be brought to the cold storage unit of the TMC. According to the price quoted by traders, the goods would be sold later. The TMC would also store the farm goods in the unit. Establishment of such TMC across the state would invariably benefit the farmers.

Under the National Horticulture Mission (NHM), a new scheme of Terminal Market Complex has been approved by the government to link farmers to markets by shortening the supply chain of perishables with the provision of state-of-the-art technology for infrastructure which includes cold chain logistics.

18. Cold chain development

The focus needs to be on areas of reducing post harvest losses, building supply chains, and developing linkages of farming to the processing industries. India should augment cold chain facilities and container handling facilities at major ports as also at air cargo complexes for targeting global markets.

19. Trading of Mangoes goes online-a One India- One Market concept.

Farmers in Krishnagiri are now getting fair prices for their mangoes, and are able to market their produce world wide at the click of a mouse, thanks to the on line spot trading introduced by Safal National Exchange (SNX) for Tothapuri mangoes in Krishnagiri district. SNX based in Bangalore and a joint venture between National Dairy Development Board and Multi-commodity Exchange of India (MCX) is conducting on the spot electronic trading of mangoes in Krishnagiri and Pochampalli. Dharmapuri and Krishnagiri mangoes growers could sell around 2000 tonnes of fresh mangoes at a premium price. This advanced marketing system and channel may be extended to other horticulture crops as well.

20. Need for EuropGAP Certification

A progressive mango grower from Thalavadi belonging to the Tamil Nadu Mango growers federation, got their gardens (180 acres each) certified under EuropGAP certification, which enabled him to increase the export of fresh mangoes to the Gulf and Europe.

NHM has helped Krishnagiri boost its already formidable name as a producer of Alphonso, Banglora, and other exportable varieties of mangoes.

The Department of Horticulture should take measures to motivate the mango growers to get their gardens certified under EuropGAP so as to enable them to increase the exports.

21. Export from the State and suggestion for increased export

- a) Information of production estimates is required at a district level and at quarterly level.
- b) Price discovery mechanism has to be improved

The farmers' associations in Tamil Nadu in general and the project area in particular are planning to brand the produce as TAN MANGO/BANANA and market the same in the domestic and international markets (on the lines of Mahagrape and Mahabanana in Maharashtra).

This should be encouraged at National and State level with adequate support and incentives.

22. Lack of adequate post harvest infrastructure

There is a clear need to increase the focus on post harvest infrastructure, especially pack houses, cold stores, refrigerated vans and market infrastructure. They have to be provided at the project site considering the special nature of exportable fruits and flower markets.

23. The marketing channels are not well developed.

This has to be done by the local, regional and national Governments on a wider scale throughout the country. Newer, modern marketing practices may be ushered in, with the encouragement and support of the Government and even international funding organizations.

24. Strategies for Improving Marketing

It is understood from the study that the farmers must have support in marketing their horticultural products and the strategies for improving marketing could be the following:

- The substantial gap between farmers' share in consumers' prices has to be narrowed;
- A number of marketing practices can be encouraged but with focus on regulated marketing; Farmer –Consolidator – Trader – Commission Agent -Wholesaler – Retailer – Consumer; Markets regulated by marketing committees;
- A model of transparency cold chains and linkage with farmers may well be adopted;
- There is need to provide infrastructure for local markets and help set up NDDB type markets; and
- Different markets in one location may continue to provide competition.