Study No. 166

IMPACT STUDY OF THE NATIONAL HORTICULTURE MISSION SCHEME IN WEST BENGAL

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PREFACE

The present study entitled as "*Impact Study of the National Horticulture Mission Scheme*" was undertaken at the instance of the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, Krishi Bhavan, New Delhi as a coordinated study, where the task of coordination has been entrusted with the ADRT Centre, Bangalore. This report has been an individual centre's final report on the study concerned prepared by our centre, AERC, Visva-Bharati, Santiniketan.

The Approach Paper to the Eleventh Five Year Plan prepared by the Planning Commission, suggested a road map for 9% per annum growth for the economy as a whole, and an agricultural growth target of 4% per annum during the plan period. Now, agriculture is not only an important driver of macro-economic performance, it is an essential element of the strategy to make growth more inclusive. At this juncture, it is considered that horticulture is the key driver for higher value addition and where output must grow at about 6% per annum for overall agricultural growth to reach 4%. However, data on fruits & vegetables production is scanty, and available evidence suggests sharp deceleration in recent years. In fact, the National Horticultural Board data shows slowing down of growth from 5.5% per annum during the 1990s to 2.5% during 2000-01 to 2005-06.

It is here that, the National Horticulture Mission (NHM) plays a crucial role in promoting growth in horticulture since its introduction in 2005-06, and thereby helps in augmenting growth in Indian agriculture. The main objective of the National Horticulture Mission is to promote holistic growth of the horticulture sector through area-based regionally differentiated cluster approach for the development of horticultural crops having comparative advantage. As the programme has entered into its fifth year, it would be necessary to analyze the impact of the programme vis-à-vis objectives of the NHM scheme for horticultural crops like pineapple and mandarin oranges in terms of area expansion, increase in production and productivity.

The study is based on both secondary and primary data. As far as secondary data is concerned, on the one hand, the study has extensively used various published databases at the state and as well as at the national levels from authentic sources like Bureau of Applied Economics & Statistics, Department of Horticulture, Govt. of West Bengal, Directorate of Census Operations, National Horticulture Board, etc., as also data sources like CMIE (Centre for Monitoring Indian Economy). The published references, books and articles consulted for the study have been duly acknowledged in bibliography.

In case of primary data, two districts from West Bengal, namely Jalpaiguri and Darjeeling have been selected for the two crops pineapple and mandarin oranges respectively, based upon the suggestions from the Department of Horticulture, Govt. of West Bengal. It should be noted here that the sample districts have been changed in consultation with the State Horticulture Department, as has been decided in the Directors' Meet. In fact in West Bengal, mandarin orange is grown only in the district of Darjeeling, whereas Jalpaiguri stands amongst the top pineapple growing districts in the state falling under the pineapple cluster in West Bengal. From each selected district, namely Jalpaiguri and Darjeeling, a total number of 50 sample beneficiary households have been selected for obtaining detailed information through primary survey with pre-tested rigorous questionnaire as prepared by the coordinating center.

The scheme of chapters in this study has been designed so as to maintain the logical development of facts and findings, and to fulfil the particular objectives of the study. In particular- *Chapter 1* introduces us with the very objectives and methodology of the present study, while *Chapter 2* tries to analyze the trends and characteristics area, production and productivity of the horticultural crops in the state. *Chapter 3* essentially tries to enumerate the characteristics of s households with cropping pattern and production structure. *Chapter 4* tries to bring out the production structure and resour under the selected horticultural crops, viz. pineapple and mandarin oranges, while *Chapter 5* attempts to describe the imp NHM on the expansion of horticultural crops. Lastly, *Chapter 6* draws the concluding remarks from the facts and findings emerged from the study, and attempts to suggest policy recommendations accordingly.

The study team associated with the present study consisted of Mr. Kali Sankar Chattopadhyay and Mr. Debajit Roy under the active supervision of the undersigned. Extensive support has also been obtained from Mr. Munshi Abdul Khaleque in typing the manuscripts. The secretarial assistance was received from Mr. D. Mondal, Mr. P. Das, Mr. A. R. Patra, Mr. P. Hazra, and Mr. N Maji and Mr. Deb Shankar Das. Also, Mr. S. Sadhu assisted in office maintenance works. I offer my deepest thanks to all of them.

On behalf of this centre, the undersigned takes the opportunity to thank the coordinating center for their painstaking work on coordination of this immensely important study across the individual centers, especially for organizing the entire study design with detailed chapterization and table formats.

I take this opportunity to thank Mr. Ringobert Thompson (DHO, Darjeeling), Mr. Ramju Rai (Darjeeling), Mr. Amitabha Mitra (KPS, Rajganj) and Mr. Rupam Dutta (Field Consultant, Kamakhyaguri), who proactively supported our study team to carry out the study by providing immensely valuable assistance. I would also like to express my heartiest thanks to all the sample pineapple and orange growers interviewed in this study, who patiently answered all the tedious questions asked while conducting the primary data survey at the cost of their boredom and valuable time.

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CHAPTER 1
INTRODUCTION

1.1: Introduction

At the outset of the present study, it remains more than necessary to briefly describe the very term *horticulture*. Traditionally, horticulture involves four areas of study namely, Pomology (fruit culture), Olericulture (vegetable culture) Floriculture (culture of ornamental crops), and Post Harvest Technology (management of produce after harvest). However, over the years the scope of the above field has been expanded to include other crops like mushroom, bamboo, plantation crops like tea, coffee, and rubber. Bee keeping, one of the tools to improve the productivity of horticultural crops through enhanced pollination, is also considered as a horticultural activity. In view of the above developments, horticulture can now be redefined as the '*science of growing and management of fruits, vegetables including tubers, ornamental, medicinal and aromatic crops, spices, plantation crops their processing, value addition and marketing*'.

The concept of horticulture can be traced back to the ancient times with notable literary references to the laying and maintenance of gardens as well as to the emergence of a special class of experts in garden-craft with state patronage. Great epics like Ramayana, Kamasutra etc., give an account of flowering gardens, fruits and fruit culture. Various methods of propagation of plants, such as by-fruits and seeds, roots, cuttings, grafting, apical portions, etc. were known to the ancient Indians. Therefore, there seems to no doubt in the fact that the science of horticulture was of a high order in ancient India.

At present, however, the horticulture assumes ever more importance. In fact, India is at the crossroads of economic development. A paradigm shift of economic condition is clearly visible with the advent of new economic policies since the mid-1990s. India is fast emerging as one of the economic majors in the world economy. With growing influence of economic power, India is rapidly establishing herself from a state of a developing nation to a developed one. Notwithstanding her credible achievement Indian agriculture continues to be an important factor for sustainable development and poverty alleviation. The agriculture sector contributes almost 18 percent of the total gross domestic product and provides employment for more than half of Indian's work force (about 50 % of male and about 68 % of female). The growth of other sectors and the overall economy depend on the performance of the agricultural sector to a significant extent. Even today agriculture sector is the main source of livelihood and food security for a greater part of population in India.

A paradigm shift of Indian economy vis-à-vis Indian agriculture has given a tremendous impetus in the core of the Indian economic scenario. Indian agriculture has moved from subsistence farming to intensive and technology-based cultivation. Besides traditional agriculture, crop diversification with the adoption of modern technologies has boosted up the existing sentiments, and now agriculture is often being considered as an emerging industry. Although it is the beginning, yet it is the call of the hour today. However, several bottlenecks including modernizing the extension system, better and effective management of natural resources, effective crop diversification and the infrastructural development of agricultural marketing, etc. have raised the brows of the planners causing sectoral growth limping behind to that estimated earlier. Owing to these facts, the 10th Plan target growth of 4% per annum could not be achieved. The vision for the 11th five year plan (FYP) envisages '(a) a faster growth for the economy (b) broad-based growth in term of sectoral coverage, and (c) inclusive growth in the sense of sizeable income gains for the population in the lower income docile.' For agriculture, the approach paper targets a growth rate 4 % per annum. Obviously it is a challenge to Indian agriculture as over the last decade (1995 – 96 to 2005 -06) it has grown only at about 2% per annum. It should be noted however that over the same period viz. 1995 – 96 to 2004 -05, the non-agriculture sector grew on an average of 7 % per annum.

From the approach paper for the XIth five-year plan '*Agriculture Sector Study: Critical Issues and Strategic Options',* we can observe the sector-wise sluggish growth of Indian agriculture. It is evident from Table – 1.1.1 that among the different sectors (viz. Livestock, Fisheries, Horticulture and Crop), the crop sector has been the slowest growing sector.

On the other hand, as has been represented in Table 1.1.2, the faster growing sectors (viz. Livestock, Fisheries and Horticulture) contribute about 50 % of agricultural GDP. The paper envisages "*if the crop sector (which include cereals, pulses, oilseeds and other field crops) growth rate can be boosted to 2 % per annum to match the growth in population, the livestock, fisheries and horticulture sectors would have to grow at 6 % per annum to achieve the target growth of 4 % per annum*."

Again, from the projected growth rates for different agricultural commodities (as has been shown in Table – 1.1.3), food grains are projected to grow at par with the rate of population growth. The projection is consistent with the findings that the income elasticity of food grains is estimated to zero or close to zero. Moreover, it has been noted that '*milk, meat, eggs, fruits and vegetables will grow at higher growth rates between 2.5 to 4 % per annum'.* As such, according to those projections of the Planning Commission- *'even the non-crop sector will face serious demand constrains if it goes beyond 3-4 % per annum.*'

At such a crucial juncture, the Government of India has initiated several programmes and missions to check the downward trend in agricultural production and to find sustainable solutions. It is here that the scheme of National Horticulture Mission plays a crucial role in promoting growth in horticulture, and thereby helps augment growth in Indian agriculture.

The National Horticulture Mission (NHM) is a centrally sponsored scheme in principle approved from implementation up to the end of XI five-year plan. The scheme has been implemented in all the States and Union Territories of India except the North Eastern States, Himachal Pradesh, Jammu & Kashmir and Uttaranchal, with effect from 2005-06, to promote holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushroom, spices, flowers, aromatic plants, cashew and cocoa ensuring forward and backward linkages with the active participation of all the stake holders. For proper implementation of the scheme, an amount of Rs.630.00 crore was allotted during 2005-06. Annual allocation during 2006-07 and 2007-08 was Rs.1000.00 crore and Rs.1150.00 crore respectively. During 2008-09 the outlay for the scheme was Rs.1100.00 crore. At present the scheme is being implemented in 18 states and 2 union Territories covering

344 districts of the country for the development of the potential crops. In this centrally sponsored scheme during the Tenth Plan, Government of India provided 100% assistance to the state Governments. During the XI Plan, the assistance from the Government of India would be 85 % with 15 % contribution by the State Governments.

The National Horticulture Mission is the single largest program within the Ministry of Agriculture and all horticultural programs account for about 30% of the total outlay of Department of Agriculture and Cooperation. The mission mandate is comprehensive – from R&D to production strategies to post-harvest management. Institutionally, it is open to collaborations with a variety of partners – including the private sector and cooperatives. The mission adopts a cluster approach and promotes specific commodities in specific regions. Subsidy is extended to farmers for adopting the crop and for greenhouses, organic certification and training. Subsidies are also offered to other private agents for creating nurseries, seed production, seed infrastructure, and post-harvest infrastructure. Financial assistance is also given to research institutions for horticulture related research.

According to the operational guidelines of National Horticulture Mission (NHM), the main objectives of the mission are:

- *To provide holistic growth of the horticulture sector through an area based regionally differentiated strategies which include research, technology promotion, extensions, post harvest management, processing and marketing in consonance with comparative advantage of each state/ region and its diverse agro- climatic feature;*
- *To enhance horticulture production to improve nutritional security and income support to farm households;*
- *To establish convergence and synergy among multiple on-going and planned programme for horticulture development;*
- *To promote, develop and disseminate technologies through a blend of traditional wisdom and modern scientific knowledge; and*
- *To create opportunities for employment generation for skilled and unskilled persons, especially unemployed youth.*

In order to achieve the above objectives the following strategies are adopted:

- *Ensure an end to end holistic approach covering production, post harvest management, processing and marketing to assure appropriate returns to growers / producers;*
- *Promote R&D technologies for production, post harvest management and processing;*
- *Enhance acreage, coverage and productivity through :*
  - *a. Diversification from traditional crop to plantations, orchards, vineyards, flower and vegetables gardens;and*
  - *b. Extension of appropriate technology to the farmers for high-tech horticulture cultivation and precision farming.*
- *Assist setting up post harvest facilities such as pack house, ripening chamber, cold storages, controlled atmosphere(CA) storages etc. Processing units for value addition and marketing infrastructure;*
- *Adopt a coordinated approach and promotion partnership, convergence and synergy among R&D, processing and marketing agency in public as well as private sector at the National, Regional, State and Sub-State levels;*
- *Where appropriate and feasible, promote National Dairy Development Board (NDDB) model of co-operatives to ensure support and adequate returns to farmers; and*
- *Promote capacity building and Human Resource Development at all levels.*

Presently, horticulture development programmes of the Department of Agriculture and co-operation are being implemented through a number of schemes (viz. National Horticulture Board (NHM) Programmes, Coconut Development Programmes, Technology Mission for Integrated Development of Horticulture in North Eastern States (TMNE), Sikkim, Jammu & Kashmir, Himachal Pradesh and Uttarakhand, Development of Commercial Horticulture and Capital Investment Subsidy Scheme of the National Horticulture Board, Human Resource Development (HRD) in Horticulture, Integrated Development of Horticulture in Tribal and Hilly Areas and Horticulture Programme under the Macro Management Scheme. Of these, the schemes on HRD and Tribal Area Programmes under Macro Management have been assimilated under the National Horticulture Mission.

As the mission emphasises demand and need based approach in each segment, technology plays an important role in different interventions. It is presumed that technologies such as Information Communication Technology (ICT), Remote Sensing and Geographic Information System could be used for planning and monitoring purposes including identification of sites for creating infrastructural facilities for post-harvest management, markets and production forecasts.

1.2: Background of Horticultural Crops in India

Horticulture is considered to be the most dynamic sector from an Indian as well as International point of view. In India, the overall development of horticulture sector is considered as a 'Golden Revolution'.

Horticultural development had not been a priority in India until the recent years, as it was identified by the Government of India as a promising emerging sector for agricultural diversification only in the mid-1980s. In the period 1948-80, the main focus of the country was on cereals. There had not been much planned efforts made for horticultural development, except for some technical support and development efforts for specific commodities. During the period of 1980-92 we can observe a phase of consolidation of institutional supports and planned processes for the development of horticulture. It was in the post 1993 period that a focused attention was given to horticulture development through an enhancement of plan allocation and knowledge-based technology. It should be noted however that despite the decade of 1990s being called a 'golden revolution' in horticultural production, the productivity of horticultural crops has increased only marginally from 7.5 tonnes per hectare in 1991-92 to 8.4 tonnes per hectare in 2004-05.

However, some perceptible changes during last three-and-a-half decades have made noticeable impact on

agricultural growth and overall development patterns of the economy. Cereal yields have gone down drastically, and at the same time, consumer preferences have shifted away from cereals and moved towards high-value agricultural produce. It was argued that horticulture could be promoted as a means of agro-diversification for a second Green Revolution, providing the much-needed impetus to the growth of agricultural sector through increase in trade, income and employment. Horticultural crops can provide a better alternative for diversification of Indian agriculture in view of higher returns available from them. Horticulture sector helps in improving productivity of land, generating employment, improving economic conditions of the farmers and entrepreneurs, enhancing exports and foreign exchange earnings, and above all, providing nutritional security to the people.

With the focused attention given to horticulture, there has been spectacular change in terms of adoption of new technologies, production and availability of horticulture products. India today is the second largest producer of fruits and vegetables in the world, contributing 11.84% and 13.36% of the total world production of fruits and vegetables respectively. In fact, India has made a fairly good progress on the horticulture map of the world. During 2008-09, area under horticultural crops was 20.66 million hectares and production was 214.72 million tonnes (Table 1.2.1). In fact, while area under horticulture increased by 24.5% during the period 2001-02 to 2008-09, production increased by 47.3% over the same period. While the highest increase in area (57.5%) and production (84.5%) can be observed for flowers, those for fruits and vegetables are also impressive. The availability of flowers has increased significantly in all major cities in the country. At the same time, India has a good opportunity of growing medicinal and aromatic plants and available data suggest that it has been growing very fast over the last few years. It should be noted here that though India is the largest producer, consumer and exporter of spices, the area under spices over the said period declined by 18.4%, while production still increased by 10.1%. Nevertheless, while vegetables and fruits are the two largest contributors to both area and production of horticulture in India, there has been a change in the relative share in favour of the fruits.

The value of output of agricultural products was Rs.406247 crore in 2000-01, which has increased to Rs.653819 crore in 2007-08. The percentage share of the value of output of horticultural crops in total value of output from agriculture is showing an upward trend with minor variation during the years and increased from 27.24% in 2000-01 to 29.84% in 2007-08, which underscores the growing importance of horticulture.

At present horticulture contributes about 30 per cent of GDP in agriculture and about a half of export share in agriculture. In fact, it has identified that India has a vast potential for production and exports of horticulture and floricultural products as being a low-cost producer of fruits and vegetables in the world arena. It is one of the world's biggest producers of horticultural products growing nearly 11 percent of all the world's vegetables and 15 percent of all fruits. In particular, India's production costs are less than half of those in other parts of the world. Despite these advantages, India's share in the global market is remarkably insignificant - it accounts for only 1.7 percent of the global trade in vegetables and 0.5 percent in fruits. In particular, the value of export of horticultural products during 2008-09 was Rs.67691.5 million. The export value of floriculture & seeds was to the tune of Rs.4888.1 million, and for 'fresh fruits & vegetables' and 'processed fruits & vegetables' to the tune of Rs.36591.6 million and Rs.26211.9 million respectively during 2008-09.

Available state-wise data (Table 1.2.2) reveals that while Maharashtra has the highest contribution (23.48%) in terms area in 2008-09, Andhra Pradesh has the highest contribution in terms of production of horticultural crops (16.66%). Over the last two decades (1991-92 to 2008-09), while Maharashtra witnessed the highest increase in area (459.27%), Tamilnadu on the other had registered the highest increase in production (254.38%) of horticultural crops. West Bengal, the concerned state for this study, contributes 3.33% of area and 4.05% of production in the nation. Also, the relative share of West Bengal in area under horticulture has been on the decline- from 3.87% in 1991-92 to 3.68% in 2001-02, and as mentioned 3.33% in 2008-09. At present during 2008-09, West Bengal ranks 11th in terms of area and 8th in terms of production.

Nevertheless, it should be noted here that the Indian horticulture sector is facing severe constrains such as low crop productivity, limited irrigation facilities and underdeveloped infrastructure support like cold storages, markets, roads, transportation facilities, etc. There are heavy post-harvest and handling losses, resulting in low productivity per unit area and high cost of production. However, on the other hand, India's long growing-season, diverse soil and climatic conditions comprising several agro-ecological regions provide ample opportunity to grow a variety of horticulture crops. Thus, efforts are needed in the direction to capitalize on our strengths and remove constrains to meet the goal of moving towards a higher horticultural growth in India.

1.3: Background of Horticultural Crops in West Bengal

West Bengal's six agro-climatic zones offer an extensive and diversified variety of environs for the development of temperate, sub-tropical and tropical horticulture produce to cater to the horticultural market round the year. Though horticultural cultivation is an age-old practice in West Bengal, the establishment of a Research Station, on a small 25-acre farm at Krishnanagar, Nadia, in 1934 marked the beginning of scientific horticultural activities in the state. Horticulture thereafter grew through research and development programmes over the years.

The state is a leading producer of a wide range of horticulture items. It produces significant quantities of traditional vegetables like brinjal (aubrgines), tomato, cabbage, cauliflower, cucurbits and lady's finger. It also produces non-traditional vegetables like broccoli, gherkins, baby corn, brussels sprouts, celery etc. Among fruits, the major ones are pineapple, leeches, guava. banana, mango and sapota. The state is the largest producer of pineapple and second largest producer of leeches. The state also grows coconut, cashew nut, arecanut, betel vine and various spices in abundance. Besides this, the state enjoys favourable agro-climatic conditions and abundant water supply to grow a variety of high-value, exotic flowers. Historically, the Darjeeling hills have played a pioneering role in the development of floriculture in India. In fact, nurseries at Kalimpong in the Darjeeling district were among the first to export floriculture products from India to the USA, UK and other European countries. Tuberose. Rose, Chrysanthemum, Gladiolus, Marigold, Jasmine,

Sunflower, Gerbera, Gypsophila. Balsam, China rose, Cosmos, Orchid and Lily are some of the major ornamentals grown in the state. West Bengal has the scope for commercialization of flora, especially in North Bengal and in some parts of South Bengal. The state also has immense possibilities in medicinal plants and herbs. Out of the 145 different medicinal plants grown in the state, the State Medicinal Plant Board has stressed upon cultivation of 32 medicinal plants, which are in demand in both domestic and international markets. Favourable agro-climatic conditions, high growth rate of agriculture, fertile soil, low cost of cultivation, large pool of educated farm labour at competitive rates, and the entrepreneurial spirit of the small farmers are identified as the growth incentives in the sector. Successful land reforms, democratic decentralisation of the panchayat system, state support for agricultural inputs, state-wide extension services network, state research and development initiatives are undertaken by the state government for the growth of the sector.

The state has already made its mark in production of rice, pineapple and vegetables in the country. The state produces 0.25 million tons of fruit and over 10 million tons of vegetables. West Bengal is also the ideal destination for Pineapple processing units. On an average, the state accounts for 23 per cent of national pineapple production. The state is also the second largest producer of potato and leeches. The varieties of leeches grown in the state are Bombai and Muzaffarpur, which are considered among the best varieties across the world in terms of taste and flavour. Thus West Bengal no doubt has the opportunity to export and tap the world market.

However, there has been a rapid change in cropping pattern bringing about changes in area and production in agriculture. It has been observed that West Bengal has been moving steadily from traditional cultivation to diversified cropping over the years. In fact, the area under vegetable, fruits and oilseeds has increased significantly in the recent years. Considerable amount of spice, coconut and fruits like licchi, banana, sapota, guava, orange are being produced for commercial cultivation, processing and export. In a detailed analysis of the performance of West Bengal, it can be observed that West Bengal has made considerable development in horticulture. Various programmes are being implemented to sustain a rate of growth of total production of 4 percent and beyond, with an aspirant zeal to rise both production and productivity of agriculture to around 5.5 percent per annum.

However, data for area under selected fruit crops in West Bengal (Table 1.3.1) during the period 1997-98 to 2008-09 shows that the area under fruits production in the state increased for about 73.35% over the period concerned. Mango claims the major share in area under fruits with a share of 42.30%, with an increase of 54.04% in area over the period. The highest increase in area over the period concerned can be observed for sapota (151.32%), guava (146.73%), banana (146.53%) and litchi (141.50%). On the other hand, the lowest increase has been registered by pineapple (4.49%) and mandarin oranges (7.47%). As such, it can be seen that the relative importance of mandarin oranges and pineapple in the state have been on the decrease in terms of growth of area under selected major fruits. This has been especially true for the last two years (viz. 2007-08and 2008-09), which shows that while area under pineapple sharply decreased from the previous year (2006-07) that for mandarin oranges remained the same.

Comparing available data on production of selected fruit crops in West Bengal during the same period, viz. 1997-98 to 2008-09 (Table 1.3.2), it can be observed that the highest contributions in fruits production in the state have been from banana (34.37%), mango (19.78%), papaya (11.32%) and pineapple (10.23%), while the lowest contribution to production has been from mandarin oranges (1.31%). In fact, while the highest increase in production over the period can be witnessed for banana (354.15%), sapota (333.50%), litchi (325.14%) and jackfruit (305.57%), the lowest increase in production can be traced to mandarin oranges (9.10%) and pineapple (15.02%).

It is thus clear that while almost all fruits crops in the state have registered a tremendous increase in area and production over the last decade, mandarin oranges and pineapple, the concerned fruit crops for the present study, appear to lag behind other to a considerable extent both in terms of increase in area and production.

However, the district wise area and production of fruits in West Bengal (Table 1.3.3) reveals that while districts Malda and Murshidabad are the largest contributors in area under horticulture in West Bengal, the districts Nadia and North 24 Parganas are the largest contributors in terms of production. The districts Darjeeling and Jalpaiguri, the concerned districts for the study, ranks 5^{th} and 6^{th} respectively in terms of production and 7^{th} and 8^{th} respectively in terms of area under horticulture.

It again comes out that contribution of Jalpaiguri district in terms of area under horticulture declined noticeably over the period 2002-03 to 2007-08 from 6.95% percent to 4.85%, while that for district Darjeeling also declined from 6.89% to 5.7% over the same period. This in turn reveals a declining importance of the districts Darjeeling and Jalpaiguri in horticultural development in the state. In case of production, however, the contribution of Jalpaiguri district marginally increased from 7.09% in 2002-03 to 7.3% in 2007-08, while there has been significant decrease in the contribution of district Darjeeling from 9.72% to 7.50% over the same period.

Moving away towards a crop-specific analysis for one of the concerned crops for the study, viz. pineapple, data for area production and productivity for pineapple at the national level reveals that though the area and production of pineapple increased by 8.81% and 13.44% respectively over the period 2001-02 to 2008-09 (Table 1.3.4), the relative importance in terms of both area and production of pineapple to total fruit area and production in India have been on the decrease. In particular, while the share of pineapple in total fruits area decreased from 1.9% to 1.4%, its share in total fruits production declined from 2.7% to 2.0% over the said period. However, productivity of pineapple at the national level increased only marginally from 15.3 mt/ha to 16.0 mt/ha during the concerned period.

A state-wise analysis of area, production and productivity reveals that West Bengal, the concerned state for the study, serves to be the largest producer of pineapple in the country with a share of 11.4% of area and 21.17% of production (Table 1.3.5) in India. However, area under pineapple cultivation in the state exhibited a similar pattern as has been observed at the national level. In fact, there has been steady decline in both area and production of pineapple in West Bengal, though productivity of pineapple increased from 27.8 mt/ha to 29.7mt/ha over the period 2006-07 to 2008-09.

Again, available district-wise data on area and production of pineapple in West Bengal reveals that the

leading districts in terms of pineapple area and production area Darjeeling, Uttar Dinajpur and Jalpaiguri (Table 1.3.6). In fact, there has been a marked increase in the percentage share of Jalpaiguri to total pineapple area in West Bengal from 13.18 percent in 2003-04 to 16.78 percent in 2007-08. In terms of production, contribution of the district was 18.24 percent in the year 2003-04, which increased marginally to 19.11 percent in 2007-08.

In case of mandarin oranges, the other horticultural crop selected for the study, we observe that while area under mandarin orange increase by 45.35% during the period 2000-01 to 2008-09, production increased merely by 15.53% in contrast (Table 1.3.7). This is particularly because of the fact that productivity of mandarin oranges at the national level in registered a decline by 20.24% over the same period.

A state-wise data on area, production and productivity of mandarin oranges revela that while Maharashtra is the largest contributor to area and production of mandarin oranges with a share of 51.33% and 39.41% respectively (Table 1.3.8). West Bengal in this context ranks 7th both in terms of area and production of mandarin oranges contributing 1.52% of area and 2.23% of production of the national total. It should be noted however that the area under mandarin orange cultivation in West Bengal remained the same during 2006-07 to 2008-09. This in turn has lead to a gradual shrinkage in the percentage share of West Bengal in area under orange cultivation from 1.88 percent in 2006-07 to 1.52 percent in 2008-09, especially when there has been an increase in area under mandarin oranges in the tune of 24% over the period 2006-07 to 2008-09 at the national level. The production of mandarin oranges in West Bengal over the same period remained static, though at the national level it increase by about 20% during the period mentioned. This in turn has led to the reduction in the share of production for West Bengal from 2.68% in 2006-07 to 2.23% in 2008-09.

In case of district-wise production of mandarin oranges in West Bengal, it can be observed that district Darjeeling contributes the lion's share of area and production of orange cultivation in West Bengal, accounting for 98.4% of area and 98.7 of production (Table 1.3.9). In particular, Apart from district Darjeeling, the district Jalpaiguri is the only other mandarin orange producing district in the state, though with only 1.6% of area and 1.3% of production. Over the period 2003-04 to 2007-08, it can be observed that the area under mandarin orange production in district Darjeeling has increased by 6.4%, while production increased by 10.1%.

1.4: Main Objectives of the Study

As has been stated earlier, the prime objective of the National Horticulture Mission is to promote holistic growth of the horticulture sector through area based regionally differentiated cluster approach for development of horticulture crops having comparative advantage. It is here that the main objectives of the present study are –

1. to assess the impact in terms of increase in area, production and productivity of indentified horticulture crops covered under National Horticulture Mission, keeping 2004-05 as the base year in the state in general and for the indentified crops (Pineapple and Mandarin Orange) in particular;
2. to examine the extent to which the scheme has helped in creating employment opportunities and enhancement of income of the farmers;
3. to suggesting measures in improving the implementation strategy.

1.5: Database, Methodology and Study Area

Under the present evaluation study, two crops viz. pineapple and mandarin orange were earmarked for Agro-Economic Research Centre, Visva-Bharati. The present study is essentially based on intensive sample survey through participatory discussion and canvassing of the structured questionnaire among the beneficiaries of the scheme concerned of the selected districts. The study is mainly based on primary data. In order to get the primary data, a complete list of beneficiary farmers with general background is covered under the study. Detailed information on various aspects including socio-economic categories of farmers, area under horticulture crops, area covered under National Horticulture Mission, source and type of irrigation, quantity of concerned fruit produced and its suitability for food processing, preservation, relative costs and economics of production have been collected from the beneficiary farmers through intensive field investigation in the study region. .

As the study is based on regionally differentiated cluster approach, the present evaluator consulted with the Directorate of the State Horticulture Department. Subsequently, with the suggestions received from the State Horticulture Board of West Bengal two districts namely Jalpaiguri and Darjeeling are selected for evaluating the crops pineapple and mandarin oranges respectively.

In order to canvass the structured questionnaire among beneficiary farmers, two villages, keeping into account of the cropping pattern, have been selected from each district. The villages are selected in a manner taking one village near the periphery of the district headquarters or accessible market and one village from a distant place to realise the effect of distance factor in economics of production. From the selected district, lists of total number of beneficiaries are collected from the office of the District Horticulture Officer. Subsequently, from each selected village 25 beneficiaries have been selected for detailed household survey, as also the block/district level officials have been consulted. It should be noted here that owing to extremely scattered distribution of the beneficiaries of the scheme NHM, we had to incorporate the adjacent localities of the villages resided by the beneficiary farmers to select 25 beneficiary farmers, especially in the hilly regions of Darjeeling.

In Jalpaiguri, two blocks namely Rajgaunj and Kumargram have been selected for the study considering the proximity and distance factor with the district head-quarters, as also taking into account of the state of functioning of the NHM scheme. In Kumargram block, two villages namely Khayerdanga and Majher-dabri falling under Khoardanga Gram Panchayat have been selected for the study. In case of Rajgaunj Block, two villages Sannyasikanta and Beldangi falling under Rajgaunj Gram Panchayat have been selected for the study.

In case of Darjeeling, two Blocks i.e. Bijanbari and Kurseong have been selected for the study, considering

the proximity and distance factors with the district head quarters, as also the functioning of the NHM. In Bijanbari block two villages namely Mineral Spring and Godamdhura have been selected falling under Dawabari Tehsil. In case of Kurseong block the villages namely Baro Sittong, Gumbagaon and Rolok Busti (all in a close proximity) have been selected, owing to extremely scattered distribution of beneficiary farmers under the NHM scheme.

For each of the 2 selected crops (i.e. pineapple and mandarin orange), 50 beneficiary farmers have been selected from over 2 administrative blocks (25 beneficiary from each of the blocks), thereby making a sample-size of 100 beneficiaries in total (2 crops * 2 blocks * 25 beneficiaries). The beneficiary farmers have been selected by purposive random sampling technique (without replacement) for the present evaluation study. While selecting the beneficiary farmers, special attention was given so that the sample pool represent all sections of the society viz. small and marginal farmers, SC/ST, OBC farmers and women folk to the extent possible. At the same time, efforts have been made to keep parity with the study design as has been formulated by the coordinating centre.

Before we proceed further with the study, it remains customary to briefly describe the study area where the present study has been carried out. In particular, the important characteristic features of the districts covered under survey, viz. Jalpaiguri and Darjeeling have summarily presented here as follows.-

A) Jalpaiguri District

The Jalpaiguri district, a visually beautiful, ethnically diverse and culturally rich district, lies at the foot-hills of the Himalayas. The district was formed on 1st January 1869 by amalgamating Duars with Jalpaiguri parganas and some thanas of Rangpur District. The total geographical area of the district is 6227 sq.km. The location of the District is such that it shares its international frontiers with Bhutan in the North and with Bangladesh in the South, which makes it rich in international exposures. The district has an average length of 144 km. from East to West and an average breadth of 40 km. from North to South. The main rivers are Teesta, Torsa, Jaldhaka, Raidak and Sankosh. It is the largest District in North Bengal and ranks fourth among the district in West Bengal. However, Jalpaiguri is one of the thinly populated districts in the State with a population density of 546 per sq.km. The district ranks in the fourth lowest population density in the state. A brief profile of the district Jalpaiguri has been presented here in Table 1.5.1.

B) Darjeeling District

Darjeeling district, the northernmost district of the Jalpaiguri division, roughly resembles an inverted wedge with its base resting on Sikkim, its shares international boundaries with Nepal, Bhutan and the Jalpaiguri district of West Bengal. The hilly areas of Darjeeling stand unique from environmental eco-perceptions. The relief various from 100 meters above sea to the mighty Kanchenjunga, more than 8600 meters above sea-level. The Darjeeling hill area is formed of comparatively recent rock structure that has a direct bearing on landslides. The causes of the landslides vary from one locality to another. Heavy monsoon precipitation is however a very common cause of these disasters. More over soils of Darjeeling hill areas are extremely varied, depending on elevation, degree of slope, vegetative cover and obviously geolithology. The natural system of erosion in the hill gets more complicated when man interferes. A brief profile of the district Darjeeling has been presented here in Table 1.5.2.

1.6: An Overview

Before we move on to a more detailed analysis of the impact of national Horticulture Mission, we may present a brief overview of the study for the convenience of the readers. The study has been designed in a manner so as to maintain the logical development of facts and findings to arrive at appropriate policy recommendations. In fact, the *first chapter* introduces us with the state of horticulture in India with special reference to West Bengal, while at the same time it spells out the specific objectives of the present study and the methodology adopted to carry it out. The *second chapter* presents a detailed description of the status of horticulture in West Bengal. In particular, it makes an attempt to analyse the state and growth of area, production and productivity of the selected horticultural crops – viz. pineapple and mandarin oranges in West Bengal over the years. The *third chapter* deals with the findings of the study, spelling out the household characteristics, cropping pattern and the production structure of the sample beneficiary households. The *fourth chapter* of the present study makes an attempt to analyse the production structure and the resource-use pattern under the selected horticultural crops, including aspects like marketing and processing activities for the same. The *fifth chapter* tries to evaluate the impact of the National Horticulture Mission on the expansion of selected horticultural crops in the state, focussing upon the aspects like growth in area and yield of the selected crops. At the same time, it tries to evaluate the impact of the NHM scheme through measures like subsidy provision, capacity building programmes, etc., as also incorporates the perception of the beneficiary households about the NHM scheme. Lastly, the *sixth chapter* of the study draws the concluding remarks of the study and attempts to make appropriate policy recommendations based on the findings of the study.

Table 1.1.1
Growth Rate of Output of Different Sub-sectors of Agriculture: 1993/94 Prices

Period	Crop	Livestock	Fisheries	Horticulture
1980-81 to 1989-90	2.71	4.84	5.93	2.42
1990-91 to 1996-97	3.22	4.12	7.41	5.92
1996-97 to 2003-04	0.61	3.76	4.28	3.66

Source: Report of the Steering Committee on Agriculture and Allied Sectors for Formulation of the 11th Five Year Plan, April 15, 2007, Planning Commission, New Delhi.

Table 1.1.2
Output Share of Different Sub-sectors in Agriculture GDP

Sub Sector	Output share %
Crops	46
Horticulture	21
Livestock	25
Fisheries	4
Forestry/logging	4

Source: Report of the Steering Committee on Agriculture and Allied Sectors for Formulation of the 11th Five Year plan, April15, 2007, Planning Commission, New Delhi

Table 1.1.3
Projected Growth Rate and Demand for Various Food Commodities towards 2011-12

Commodity	Growth Rate
Food-grains	2.11
Milk and Milk Products	3.18
Meat	4.65
Eggs	4.62
Fish	4.58
Oilseeds	2.94
Vegetables	2.51
Fresh Fruits	3.46
Sugar and Gur	1.88

Source: Report of the Steering Committee on Agriculture and Allied Sectors for Formulation of the 11th Five Year plan, Planning Commission, New Delhi

Table 1.2.1
Indian Horticulture Production at Glance (1991-92 and 2001-02 to 2008-09)

Year	Fruits		Vegetables		Flowers		Nuts		Aroma & medi		Plantation Crops		Spice		Mush-room	Honey	Grand Total	
	A	P	A	P	A	P (Loose)	A	P	A	P	A	P	A	P	P	P	A	P
1991-92	2874	28632	5593	58532	NA	NA	NA	NA	NA	NA	2298	7498	2005	1900	NA	NA	12770	96562
2001-02	4010	43001	6156	88622	106	535	117	114	NA	NA	2984	9697	3220	3765	40	10	16592	145785
2002-03	3788	45203	6092	84815	70	735	117	114	NA	NA	2984	9697	3220	3765	40	10	16270	144380
2003-04	4661	45942	6082	88334	101	580	106	121	NA	NA	3102	13161	5155	5113	40	10	19208	153302
2004-05	5049	50867	6744	101246	118	659	106	121	131	159	3147	9835	3150	4001	40	10	18445	166939
2005-06	5324	55356	7213	111399	129	654	130	149	262	202	3283	11263	2366	3705	35	52	18707	182816
2006-07	5554	59563	7581	114993	144	880	132	150	324	178	3207	12007	2448	3953	37	51	19383	191813
2007-08	5857	65587	7848	128449	166	868	132	177	397	396	3190	11300	2617	4357	37	65	20207	211234
2008-09	6101	68466	7981	129077	167	987	136	173	430	430	3217	11336	2629	4145	37	65	20662	214716

Source: Indian Horticulture Database, Various Issues
A= Area (in 000'ha.), P =Production (in 000'mt.), Note: Totals may slightly differ due to rounding of figures

Table No. 1.2.2
State-Wise Area, Production and Productivity of Fruits

States/UTs	Area (in 000'ha)					Production (in 000'mt)					Productivity (in mt/ha)				
	1991-92	2001-02	2006-07	2007-08	2008-09	1991-92	2001-02	2006-07	2007-08	2008-09	1991-92	2001-02	2006-07	2007-08	2008-09
Andhra Pradesh	313.1	575.8	818.0	889.4	935.9	4008.2	6157.4	10496.0	12214.4	11407.0	12.8	10.7	12.8	13.7	12.2
Maharashtra	256.1	582.8	1394.9	1432.3	1432.3	3518.4	8840.6	10324.5	11047.6	10924.8	13.7	15.2	7.4	7.7	7.6
Tamilnadu	136.2	227.5	278.4	292.5	318.6	2316.1	3432.4	6240.9	7530.1	8207.7	17.0	19.1	22.4	25.7	25.8
Gujrat	84.5	149.0	288.3	306.9	316.8	1828.9	2346.9	5344.4	5849.7	5822.3	21.6	15.7	18.5	19.1	18.4
Karnataka	209.3	257.1	278.3	299.9	315.4	3191.8	4028.9	4735.7	5000.6	5269.8	15.2	15.7	17.0	16.7	16.7
Uttar Pradesh	303.2	288.3	308.5	315.8	346.3	2449.8	2282.8	3439.9	3932.6	4439.6	8.1	7.9	11.2	12.5	12.8
Bihar	266.9	272.3	279.5	286.3	290.7	2799.2	2877.0	3426.5	3252.4	3722.8	10.5	10.6	12.3	11.4	12.8
West Bengal	111.3	147.6	187.1	194.4	203.2	1131.7	1985.5	2640.7	2766.6	2775.6	10.2	13.5	14.1	14.2	13.7
Kerala	236.3	234.5	316.9	323.3	320.8	1101.3	1772.5	2526.7	2579.8	2558.9	4.7	7.6	8.0	8.0	8.0
Madhya Pradesh	64.7	46.6	47.7	46.6	92.4	1245.0	1143.8	1225.7	1237.1	2372.5	19.2	24.6	25.7	26.5	25.7
Assam	72.3	110.8	118.5	122.7	105.2	886.4	1335.1	1392.3	1410.7	1574.8	12.3	12.0	11.7	11.5	15.0
Jammu & Kashmir	119.1	142.2	171.5	194.9	205.1	700.8	1000.9	1321.5	1435.8	1538.1	5.9	7.0	7.7	7.4	7.5
Orissa	136.3	225.0	255.7	265.2	285.8	978.0	1362.9	1424.9	1275.1	1532.8	7.2	6.1	5.6	4.8	5.4
Punjab	72.7	37.5	57.3	61.6	64.8	663.8	531.7	830.6	1055.5	1182.9	9.1	14.2	14.5	17.1	18.3
Chhattis Garh	-	14.4	90.7	107.7	111.7	-	203.1	609.6	915.1	965.7	-	14.1	6.7	8.5	8.6
Uttarakhand	150.5	197.5	167.8	171.3	171.7	428.7	376.1	695.9	717.8	725.3	2.8	1.9	4.1	4.2	4.2
Himachal Pradesh	157.2	223.0	197.4	202.4	193.3	339.9	263.4	369.1	713.0	624.7	2.2	1.2	1.9	3.5	3.2
Rajasthan	22.8	22.1	27.5	41.6	30.6	113.6	200.7	401.9	421.8	484.7	5.0	9.1	14.6	10.1	15.8
Tripura	44.9	28.3	33.2	33.9	36.5	319.1	452.1	525.5	525.7	477.2	7.1	16.0	15.8	15.5	13.1
Jharkhand	-	31.5	33.0	37.6	72.0	-	321.1	382.0	382.0	395.9	-	10.2	11.6	10.2	5.5
Manipur	19.8	26.1	33.9	39.1	42.4	43.0	134.0	229.1	273.7	341.9	2.2	5.1	6.8	7.0	8.1
Meghalaya	24.2	24.0	28.5	28.5	32.9	218.1	186.9	234.3	235.3	294.8	9.0	7.8	8.2	4.3	8.9
Haryana	13.9	31.3	30.3	33.5	37.6	110.0	235.2	241.9	240.4	263.9	7.9	7.5	8.0	7.2	7.0
Nagaland	5.2	25.0	10.3	11.8	18.2	9.2	302.0	31.910	53.0	151.3	1.8	12.1	3.1	4.5	8.3
Mizoram	9.3	19.0	20.5	33.3	34.1	34.8	63.4	179.8	203.4	123.1	3.7	3.3	8.8	6.1	3.6
Arunachal Pradesh	20.2	41.6	54.6	57.6	57.6	47.3	124.9	107.9	108.0	108.0	2.3	3.0	2.0	1.9	1.9
Goa	11.0	10.7	10.8	11.0	11.9	84.2	64.7	87.540	97.8	88.1	7.7	6.0	8.1	8.9	7.4
Pondicherry	1.0	1.1	1.7	1.7	1.2	19.7	24.0	51.993	52.0	27.9	19.7	21.8	31.1	13.1	22.3
Andaman & Nicobar	3.3	3.7	2.8	3.0	3.0	12.9	16.7	20.840	22.5	24.9	3.9	4.5	7.5	7.6	8.3
Dadra & Nagar Haveli	0.7	0.7	0.7	1.8	1.8	7.1	7.1	7.100	19.7	19.7	10.1	10.1	10.1	10.7	10.7
Sikkim	7.7	12.3	9.0	9.3	10.5	18.8	10.3	13.410	13.9	15.7	2.4	0.8	1.5	1.5	1.5
Lakshadip	0.30	0.30	0.30	0.35	0.35	0.50	1.10	1.13	1.24	1.24	1.67	3.67	3.77	3.54	3.54
Chandigarh	0.10	0.10	0.10	0.10	0.10	1.90	1.10	1.10	1.10	1.10	19.00	11.00	11.00	11.00	11.00
Delhi	0.10	0.10	0.06	0.06	0.06	0.70	1.10	0.99	0.99	0.99	7.00	10.00	17.95	17.95	17.95
Daman & Diu	0.30	0.40	0.02	0.02	0.02	3.10	3.40	0.02	0.02	0.02	10.33	8.50	1.35	1.35	1.35
TOTAL	2874.5	4010.2	5553.7	5857.2	6100.9	28632.0	43000.9	59563.3	65586.8	68465.5	10.0	10.7	10.7	11.2	11.2

Source: Indian Horticulture Database; Various Issues

Table 1.3.1
Area under Selected Fruit Crops in West Bengal ('000 hectares)

Fruit Crops	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
1. Mango	55.81	59.31	60.00	62.51	65.40	66.4	67.8	69.13	70.09	78.23	80.90	85.97
2. Banana	16.16	18.66	18.81	18.90	20.60	22.0	25.7	26.64	27.80	31.69	37.37	39.84
3. Pineapple	9.14	9.65	10.30	10.35	11.50	11.8	11.8	12.85	13.38	13.40	9.53	9.55
4. Papaya	5.54	6.04	6.60	6.73	7.21	8.1	8.5	8.71	9.51	9.90	10.69	10.85
5. Guava	5.05	6.05	6.75	6.81	7.35	8.3	9.0	9.37	9.88	10.82	11.86	12.46
6. Jackfruit	8.50	8.82	9.10	9.11	9.63	9.6	10.4	10.61	10.88	11.43	11.43	11.30
7. Litchi	3.47	3.67	3.88	4.20	5.85	6.3	6.6	7.16	8.05	8.09	8.11	8.38
8. Mandarin Oranges	3.48	3.58	3.52	3.52	3.68	3.7	3.5	3.52	3.55	3.74	3.74	3.74
9. Other Citrus	3.95	4.35	4.65	4.80	5.30	5.6	6.1	6.27	6.48	7.06	7.21	7.36
10. Sapota	1.52	1.82	2.20	2.25	3.25	3.4	3.7	3.93	4.17	4.20	3.88	3.82
11. Others	4.63	6.05	4.43	4.52	7.80	7.0	7.8	8.10	8.90	8.57	9.53	9.98
Total	117.25	128.00	130.24	133.70	147.57	152.2	160.9	166.29	172.69	187.13	194.25	203.25

Source: Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 1.3.2
Production of Selected Fruit Crops in West Bengal ('000 hectares)

Fruit Crops	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
1. Mango	502.27	339.37	560.00	380.25	585.00	228.8	405.9	460.75	513.34	549.76	623.35	548.92
2. Banana	210.08	301.24	331.40	335.20	368.90	452.6	502.1	512.52	544.87	802.07	892.25	954.08
3. Pineapple	246.78	283.92	280.16	279.45	322.00	340.7	342.6	349.85	379.16	372.09	283.18	283.85
4. Papaya	177.12	199.15	217.90	220.50	241.92	254.0	245.7	253.14	263.65	276.92	308.62	314.32
5. Guava	61.10	97.20	106.00	112.20	121.27	126.9	133.8	140.89	152.99	148.96	162.21	170.46
6. Jackfruit	46.87	98.82	104.10	104.25	112.87	136.0	143.5	148.38	160.10	185.32	190.67	190.09
7. Litchi	19.09	36.02	37.63	42.60	61.43	63.9	55.7	69.91	74.92	77.24	77.76	81.16
8. Mandarin Oranges	33.41	35.00	34.11	33.20	34.91	35.3	33.1	32.27	32.51	36.44	36.45	36.45
9. Other Citrus	21.73	49.10	40.96	42.35	46.76	50.0	48.8	50.07	54.46	61.00	62.00	62.95
10. Sapota	9.91	22.78	27.20	27.50	39.72	40.7	43.3	45.39	49.02	51.35	43.40	42.96
11. Others	45.28	73.40	76.67	79.58	50.72	56.6	61.6	65.11	76.58	79.38	86.78	90.36
Total	1373.64	1536.00	1816.13	1657.08	1985.50	1785.6	2016.1	2128.28	2301.70	2640.53	2766.67	2775.60

Source: 1. Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues); 2. Statistical Handbook 2009, Govt. of WB

Table 1.3.3
District-wise Area & Production of Fruits in West Bengal

Districts	2002-03		2003-04		2004-05		2005-06		2006-07		2007-08	
	Area (‘000 ha)	Prod. (‘000 tonnes)	Area (‘000 ha)	Prod. (‘000 tonnes)	Area (‘000 ha)	Prod. (‘000 tonnes)	Area (‘000 ha)	Prod. (‘000 tonnes)	Area (‘000 ha)	Prod. (‘000 tonnes)	Area (‘000 ha)	Prod. (‘000 tonnes)
Burdwan	6.03	61.81	7.20	69.73	7.39	71.96	7.24	89.17	7.60	71.84	7.64	72.50
Birbhum	2.89	39.26	3.35	37.73	3.50	39.69	3.66	42.35	3.94	52.53	4.05	55.43
Bankura	2.07	27.30	3.55	34.25	3.62	36.81	3.42	39.14	3.63	43.83	4.72	46.60
Midnapur (E)	7.50	127.90	7.83	137.47	8.12	144.38	8.31	123.47	8.18	129.56	8.64	133.12
Midnapur (W)	3.31	46.47	3.82	60.31	3.93	65.35	4.85	70.52	11.43	82.77	11.39	90.65
Howrah	3.00	43.19	3.14	46.51	3.24	47.85	2.80	48.10	2.48	36.66	2.16	20.87
Hooghly	11.91	140.56	12.23	148.93	12.37	161.87	11.69	151.15	11.89	158.26	12.02	163.02
24 Parganas (N)	15.26	215.83	16.98	244.89	17.17	249.83	17.98	271.26	18.23	268.78	19.59	344.84
24 Parganas (S)	6.80	104.77	7.20	120.09	7.47	125.00	8.10	143.10	8.29	142.28	8.93	153.60
Nadia	8.28	95.23	10.56	161.66	12.15	169.42	13.24	203.80	14.78	428.35	18.29	468.53
Murshidabad	18.45	110.43	19.75	211.57	19.66	192.78	21.62	233.95	23.99	250.46	24.59	266.92
Uttar Dinajpur	6.11	89.10	7.00	107.93	7.28	113.49	8.01	131.85	8.19	142.85	8.41	127.69
Dakshin-Dinajpur	5.61	90.22	3.75	38.09	3.81	38.98	3.77	43.68	4.58	41.48	4.65	44.28
Malda	27.12	102.72	27.70	128.53	28.18	189.54	28.56	196.51	28.78	236.93	29.16	240.44
Jalpaiguri	10.59	126.61	9.22	198.02	10.19	202.08	10.21	210.03	10.56	221.77	9.41	202.19
Darjeeling	10.50	173.65	10.46	171.65	10.89	176.75	11.11	188.60	11.59	205.04	11.09	207.61
Cooch Behar	4.16	61.84	4.46	65.12	4.56	67.07	5.15	76.97	5.35	88.75	5.48	90.29
Purulia	2.55	28.71	2.70	33.60	2.76	35.43	2.97	38.05	3.64	38.39	4.03	38.09
West Bengal	152.20	1785.60	160.90	2016.08	166.29	2128.28	172.69	2301.70	187.13	2640.53	194.25	2766.67

Source: Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 1.3.4
All India Area, Production & Productivity of Pineapple

Year	Area (‘000 ha)	% of Total Fruit Area	Production (‘000 mt)	% of Total Production	Productivity (mt/ha)
1991-92	57.1	2.0	768.5	2.7	13.5
2001-02	77.2	1.9	1182.1	2.7	15.3
2002-03	79.8	2.1	1171.7	2.6	14.7
2003-04	80.9	1.7	1234.2	2.7	15.3
2004-05	82.8	1.7	1278.9	2.6	15.4
2005-06	82.4	1.5	1262.6	2.3	15.3
2006-07	87.0	1.6	1362.0	2.3	15.7
2007-08	80.0	1.4	1245.0	1.9	15.6
2008-09	84.0	1.4	1341.0	2.0	16.0

Source: National Horticulture Database 2009; Ministry of Agriculture, G.O.I.

Table 1.3.5
State-wise Area, Production & Productivity of Pineapple

State	2006-07			2007-08			2008-09		
	Area (‘000 ha)	Production (‘000 mt)	Productivity (mt/ha)	Area (‘000 ha)	Production (‘000 mt)	Productivity (mt/ha)	Area (‘000 ha)	Production (‘000 mt)	Productivity (mt/ha)
West Bengal	13.4	372.1	27.8	9.5	283.2	29.8	9.6	283.9	29.7
Assam	12.4	191.9	15.5	12.7	195.7	15.4	12.9	225.1	17.5
Karnataka	3.2	190.5	59.5	2.9	177.4	61.7	3.0	186.3	61.7
Bihar	4.5	121.1	26.9	4.6	126.8	27.6	4.7	119.5	25.5
Meghalaya	9.6	85.0	8.9	9.6	85.3	8.9	10.8	106.8	9.9
Kerala	12.5	102.4	8.2	12.5	102.4	8.2	12.5	102.4	8.2
Tripura	6.2	115.8	18.7	6.3	116.9	18.6	6.3	101.2	16.1
Manipur	12.0	100.7	8.4	8.5	72.4	8.5	8.6	78.5	9.1
Nagaland	2.0	5.0	2.4	2.2	10.0	4.5	3.7	57.5	15.5
Arunachalpradesh	8.3	37.8	4.6	9.3	37.8	4.1	9.3	37.8	4.1
Others	2.4	39.9	16.9	1.9	36.6	19.1	2.4	41.9	17.3
Total	86.5	1362.2	15.7	80.0	1244.6	15.5	83.7	1340.8	16.0

Source: Indian Horticulture Database 2009; Ministry of Agriculture; G.O.I

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Table 1.3.6
District-wise Area & Production of Pineapple in West Bengal

Districts	2003-04		2004-05		2005-06		2006-07		2007-08	
	Area ('000 ha)	Prod. ('000 tonnes)	Area ('000 ha)	Prod. ('000 tonnes)	Area ('000 ha)	Prod. ('000 tonnes)	Area ('000 ha)	Prod. ('000 tonnes)	Area ('000 ha)	Prod. ('000 tonnes)
Burdwan	0.16	5.34	0.17	5.38	0.19	5.74	0.06	1.55	0.05	0.95
Birbhum	0.05	1.40	0.05	1.45	0.07	1.69	0.07	1.59	0.01	0.09
Bankura	0.05	1.60	0.06	1.90	0.06	1.50	0.05	1.31	0.04	0.60
Midnapur (E)	0.30	8.43	0.31	9.00	0.30	8.56	0.22	4.51	0.24	4.98
Midnapur (W)	0.48	11.53	0.50	12.50	0.39	11.00	0.28	4.60	0.07	0.23
Howrah	0.23	6.52	0.24	6.60	0.25	7.16	0.05	1.13	0.01	0.10
Hooghly	0.29	8.32	0.30	8.75	0.28	7.03	0.06	1.76	0.05	0.97
24 Parganas (N)	0.78	17.90	0.68	18.50	0.70	20.20	0.70	18.85	0.09	1.93
24 Parganas (S)	0.34	9.69	0.35	9.79	0.40	11.25	0.42	11.43	0.40	11.13
Nadia	0.55	15.62	0.55	16.00	0.56	16.16	0.12	3.10	0.02	0.60
Murshidabad	0.40	10.40	0.11	2.95	0.13	2.86	0.15	3.92	0.05	0.92
Uttar Dinajpur	2.44	70.20	2.54	74.24	2.70	79.36	3.26	91.13	2.60	70.00
Dakshin-Dinajpur	0.15	3.20	0.15	3.28	0.17	4.62	0.07	1.76	0.04	0.96
Malda	0.10	2.70	0.15	3.30	0.16	3.80	0.06	1.65	-	0.02
Jalpaiguri	1.55	62.50	2.41	63.52	2.60	73.14	3.01	89.33	1.60	54.13
Darjeeling	3.60	99.20	3.98	104.03	4.10	115.99	4.45	124.93	3.95	126.40
Cooch Behar	0.25	7.00	0.26	7.58	0.28	8.00	0.33	8.45	0.27	8.48
Purulia	0.04	1.04	0.04	1.08	0.04	1.10	0.04	1.09	0.04	0.69
West Bengal	11.76	342.59	12.85	349.85	13.38	379.16	13.40	372.09	9.53	283.18

Source: Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 1.3.7
All India Area, Production & Productivity of Orange (Mandarin)

Year	Area (‘000 ha)	% of Total Fruit Area	Production (‘000 mt)	% of Total Fruit Production	Productivity (mt/ha)
1993-94	119.1	3.7	1057.8	2.8	8.9
1994-95	130.7	3.0	708.5	1.8	5.4
1995-96	133.8	4.0	1161.7	2.8	8.7
1996-97	163.4	4.6	1720.1	4.3	10.5
1997-98	165.4	4.5	1472.4	3.4	8.9
1998-99	165.1	4.4	1674.0	3.8	10.1
1999-00	198.9	5.2	1657.7	3.6	8.3
2000-01	168.9	4.4	1414.3	3.3	8.4
2001-02	198.9	5.0	1660.1	3.9	8.3
2002-03	142.8	3.8	1136.6	2.5	8.0
2003-04	183.4	3.9	1244.1	2.7	6.8
2004-05	183.6	3.7	1235.7	2.5	6.7
2005-06	210.8	4.0	1298.8	2.3	6.2
2006-07	198.4	3.6	1357.5	2.3	6.8
2007-08	218.1	3.7	1461.7	2.2	6.7
2008-09	245.5	4.0	1634.0	2.4	6.7

Source: Indian Horticulture Database 2009, Ministry of Agriculture, G.O.I

Table 1.3.8
State-wise Area, production & Productivity of Oranges (Mandarin)

State	200607			200708			2008-09		
	Area ('000 ha)	Production ('000 mt)	Pdy. (mt/ha)	Area ('000 ha)	Production ('000 mt)	Pdy. (mt/ha)	Area ('000 ha)	Production ('000 mt)	Pdy. (mt/ha)
Maharashtra	122.29	723.69	5.9	125.65	796.06	6.3	126.00	644.00	5.1
Madhyapradesh	16.24	260.00	16.0	16.56	264.94	16.0	31.47	503.58	16.0
Rajasthan	7.09	102.28	14.4	7.60	96.00	12.6	8.29	157.46	19.0
Assam	8.04	88.14	11.0	8.20	89.92	11.0	8.50	93.39	11.0
Meghalaya	8.27	34.74	4.2	8.31	34.85	4.2	10.06	43.10	4.3
Karnataka	1.73	15.83	9.1	1.79	35.48	19.8	1.84	36.55	19.8
West Bengal	3.74	36.44	9.7	3.74	36.45	9.7	3.74	36.45	9.7
Manipur	2.78	21.62	7.8	3.84	28.38	7.4	4.14	31.97	7.7
Others	28.17	74.74	2.7	42.44	79.65	1.9	51.45	87.45	1.7
Total	198.35	1357.48	6.8	218.13	1461.74	6.7	245.49	1633.95	6.7

Source: Indian Horticulture Database, 2009; Ministry of Agriculture, G.O.I

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Table 1.3.9
District-wise Area & Production of Mandarin Orange in West Bengal

Districts	2003-04		2004-05		2005-06		2006-07		2007-08	
	Area ('000 ha)	Prod. ('000 tonnes)	Area ('000 ha)	Prod. ('000 tonnes)	Area ('000 ha)	Prod. ('000 tonnes)	Area ('000 ha)	Prod. ('000 tonnes)	Area ('000 ha)	Prod. ('000 tonnes)
Burdwan	-	-	-	-	-	-	-	-	-	-
Birbhum	-	-	-	-	-	-	-	-	-	-
Bankura	-	-	-	-	-	-	-	-	-	-
Midnapur (E)	-	-	-	-	-	-	-	-	-	-
Midnapur (W)	-	-	-	-	-	-	-	-	-	-
Howrah	-	-	-	-	-	-	-	-	-	-
Hooghly	-	-	-	-	-	-	-	-	-	-
24 Parganas (N)	-	-	-	-	-	-	-	-	-	-
24 Parganas (S)	-	-	-	-	-	-	-	-	-	-
Nadia	-	-	-	-	-	-	-	-	-	-
Murshidabad	-	-	-	-	-	-	-	-	-	-
Uttar Dinajpur	-	-	-	-	-	-	-	-	-	-
Dakshin-Dinajpur	-	-	-	-	-	-	-	-	-	-
Malda	-	-	-	-	-	-	-	-	-	-
Jalpaiguri	0.05	0.37	0.05	0.38	0.06	0.40	0.06	0.46	0.06	0.47
Darjeeling	3.46	32.69	3.47	31.89	3.49	32.11	3.68	35.98	3.68	35.98
Cooch Behar	-	-	-	-	-	-	-	-	-	-
Purulia	-	-	-	-	-	-	-	-	-	-
West Bengal	3.51	33.06	3.52	32.27	3.55	32.51	3.74	36.44	3.74	36.45

Source: Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 1.5.1
Area Profile of Jalpaiguri District of West Bengal

Number of Households	688,139	Average Household Size(per Household)	5.0
Population-Total	3,401,173	Proportion of Urban Population (%)	17.8
Population-Rural	2794291	Sex Ratio	942
Population-Urban	606882	Sex Ratio(0-6 Year)	69
Population(0-6Years)	521,287	Sex Ratio (SC)	942
SC Population	1,248,577	Sex Ratio (ST)	979
ST Population	641,688	Proportion of SC (%)	37.0
Literates	1,810,083	Proportion of ST (%)	19.0
Illiterates	1,591,090	Literacy Rate (%)	63.0
Total Workers	1,303,136	Work Participation Rate (%)	38.0
Main Worker	1,025,433	% of Main Workers	30.0
Marginal Worker	277,703	% of Marginal Worker	8.0
Non Worker	2,098037	% of non Workers	62.0
CL (Main+Marginal)	269,944	Proportion of CL (%)	21.0
Al (Main+Marginal)	230,163	Proportion of AL (%)	18.0
HHI (Main+Marginal)	26,839	Proportion of HHI (%)	2.0
OW (Main+Marginal)	776,190	Proportion of OW (%)	60.0

Source: Website, Directorate of Census Operations, 2011

Table 1.5.2
Area Profile of Darjeeling District of West Bengal

Number of Households	318,737	Average Household Size(per Household)	5.0
Population-Total	1,609,172	Proportion of Urban Population (%)	32.3
Population-Rural	1088740	Sex Ratio	937
Population-Urban	520432	Sex Ratio(0-6 Year)	962
Population(0-6Years)	204,643	Sex Ratio (SC)	949
SC Population	258,881	Sex Ratio (ST)	996
ST Population	204,167	Proportion of SC (%)	16.0
Literates	1,008,288	Proportion of ST (%)	13.0
Illiterates	600,884	Literacy Rate (%)	72.0
Total Workers	569,442	Work Participation Rate (%)	35.0
Main Worker	478,851	% of Main Workers	30.0
Marginal Worker	90,591	% of Marginal Worker	6.0
Non Worker	1,039,730	% of non Workers	65.0
CL (Main+Marginal)	88,194	Proportion of CL (%)	15.0
Al (Main+Marginal)	58,350	Proportion of AL (%)	10.0
HHI (Main+Marginal)	15,852	Proportion of HHI (%)	3.0
OW (Main+Marginal)	407,046	Proportion of OW (%)	71.0

Source: Website, Directorate of Census Operations, 201

CHAPTER 2

AREA, PRODUCTION AND PRODUCTIVITY OF HORTICULTURAL CROPS IN THE STATE

2.1: Status of Horticulture Crops in the State

There has been no doubt in the fact that diversification of crops has made a big impetus both in agricultural production and productivity in West Bengal agriculture. Horticulture has over the years gained increasing importance in the state as compared to the traditional field crops, especially cereals. It is here that the present chapter makes an attempt to examine the state of area, production and productivity of horticulture in the state. For the purpose, we have considered two different points of time viz. (a) Triennium Ending Year (TE) 2004-05 and (b) Triennium Ending Year (TE) 2007-08, with due respect to availability of secondary data on horticulture in the state.

An analysis of data on geographical, cultivable and horticulture area in West Bengal reveals that the percentage share of cultivable area (6.47%) to total geographical area during TE 2007-08 for the state marginally declined as compared to that during TE 2004-05 (6.59 %) (Table 2.1.1). In sharp contrast to this, in case of area under fruits we observe 15% increases over the same period. In particular, during TE 2004-05 percentage share of area under fruits was 2.73% to total cultivable area, which increased to 3.2% during TE 2007-08. The vegetable sector also exhibits a similar trend, as the area under vegetables increased from 867.72 thousand hectares to 901.96 thousand hectares during the period concerned. In fact, area under horticulture registered an increase of 5.75% over the period. This in turn shows that while the proportion of cultivable area in relation to total geographical area in West Bengal has gone down, the horticulture sectors is fast acquiring importance in the state with increase in relative share in cultivable area over the years.

It should be noted here that the increasing importance of horticulture in the crop-mix of West Bengal agriculture, as substantiated by increase share of horticulture in total cultivable area, also holds true for the districts selected for the present study. In particular, while the relative share of horticulture in cultivable area shows an increase of 2.77% over the period, district Darjeeling registered an even a greater increase of 3.43% over the said period.

2.2: Growth of Horticultural Crops in the State

Before we make an attempt to briefly elaborate the growth of horticultural crops in West Bengal, it must be noted at the outset that the analysis has been severely constrained by extremely poor and scattered availability of data on horticultural production in the state. In fact, time series data for various constituents of horticultural sector is not available with any of the major secondary data sources, including state government publications.

Nevertheless, an analysis of the triennium ending averages area and production of horticultural cops in the state (Table2.2.1) reveals that both fruits and vegetables signify a steady growth in terms of area and production since 1991-92 onwards to 2009-10. Considering triennium ending (TE) values, data on area and production of fruits, vegetable, flowers, spices, etc. show a rapid increase over the period. On a comparative basis, it comes out that while the production of fruits grew from 377.23 th.tonnes in 1991-92 to 2798.71 th.tonnes in 2009-10 (an increase of more than 6 times), the production of vegetables grew from 1560 th.tonnes in 1991-92 to 22355.86 th.tonne in 2009-10 registering an increase of more than 13 times. In fact in the last decade alone, viz. 2000-01 to 2009-10, total area under horticulture grew from 1043.47 thousand hectares in 2000-01 to 1678.70 thousand hectares (an increase of more than 60 percent), while total horticultural production grew from 11772.83 thousand hectares in 2000-01 to 25857.56 thousand hectares in 2009-10 (an increase of about 120 percent).

In a comparison of area and production among the fruits, vegetables and flowers during 2003-04 to 2009-10, we find a steady increase in all these sectors over the said period. In case of fruits and vegetables, the increase in area stands at 32% & 45% respectively in 2009-10 over 2003-04, while the increase in production has been in the tune of 54% & 111% respectively. The percentage share area under fruits in 2009-10 to total horticultural area stands at 12 percent, whereas the share of vegetables stands at 78 percent. Thus fruits and vegetables together contribute to 90 percent of area under horticulture in the state. In case of production, the share of fruits and vegetables stands at 11 percent and 86 percent respectively, together contributing to about 97 percent of total horticultural production in the state. It comes out that vegetables and fruits are the major contributors to horticulture in West Bengal, both in terms of area and production, while other horticulture crops, viz. flowers, spices, plantation crops, etc. have much lower contributions. Nevertheless, floriculture is gaining increasing importance in the state, as revealed by a rapid increase in area and production. In particular, while area under floriculture almost doubled during the period 2000-01 to 2009-10, production of loose and cut flowers increased by 963% and 450% respectively.

A detailed analysis of the trend growth rates in area and yield of horticultural crops in West Bengal using a semi-log time trend analysis reveals that horticulture has been growing at an impressive rate over the last few decades (Table 2.2.2). In particular, while the trend rate of growth of area stands at 6.56% in the period 2000-01 to 2009-10, that for production comes out to be 11.07% over the same period. The higher trend rate of growth can be attributed especially to an impressive growth in area and production of vegetables, which claims a major share in area and production of horticultural in the state. In case of fruits, the trend growth rate in area and production stand at 4.93% and 6.45% respectively.

Again, growth rates based on annual averages for the period 2004-05 to 2009-10 reveals that while area under horticulture grew at a pace of 7.83% p.a. over the period, the growth of production was much higher at 15.62% p.a. This too has been caused as a result of high growth rate in the area and production of vegetables, which grew at 9.61% p.a. and 18.14% p.a. respectively. The corresponding growth rates in the fruits sub-sector stand at 4.63% p.a. for area under fruits and 6.16% p.a. for production of fruits.

It comes out that horticulture in West Bengal has exhibited an impressive growth in area and production, as has been substantiated by a semi-log time-trend analysis and growth rates based on annual averages. This has been

especially because of a high growth rate achieved in the vegetables sub-sector, whereas area under fruits also contributed to a significant extent. At the same time, floriculture also exhibits an impressive growth in area and production with increasing importance in the horticulture map of West Bengal.

2.3: District-Wise Growth of Horticultural Crops

While making an attempt to analyze district-wise growth of horticultural crops in West Bengal, it should be noted that non-availability of data acts as a major constraint in such analysis. In particular, district-wise time series data on horticultural crops like flowers, plantation, spices, etc. are not available for the entire time period concerned, viz. 2004-05 to 2009-10. In fact, data relating only to fruits and vegetables are available at the district levels for the period. This in turn makes our analysis confined to district-wise growth of fruits and vegetables only. Here, we have tried to analyze a district-wise growth of fruits and vegetables by means of comparing to particular points of time, viz. triennium ending average of 2004-05 and triennium ending average of 2007-08, as have been presented in Table 2.3.1 and 2.3.2 respectively.

As such, a comparison of triennium ending averages of 2007-08 against that of 2004-05 readily shows that area and production of fruits has grown much faster than that of vegetables for the state. In particular, while area and production of fruits grew by 15.58% and 30% respectively, that for vegetables grew by 3.95% and 11% respectively. In fact, a comparatively higher percentile increase in area and production of fruits has been true for a majority of the districts concerned. In particular, while the highest percentile growth in area under fruits can be observed for district Midnapore (West) with an increase of about 150% during the period TE 2004-05 to TE 2007-08, the highest percentile growth in fruits production can be observed for district Nadia with an increase of about 158%. In case of the selected districts for the present study, it can be observed that area and production of fruits in district Darjeeling (6.03% and 15.17% respectively) recorded a higher percentile increase as compared to area and production of vegetables (2.15% and 9.30% respectively). However, in case of district Jalpaiguri, the increase in area under fruits only grew by 0.60% over the concerned period, though production of fruits grew by 20.37%.

A district-wise analysis of contributions made by fruits in total horticultural production reveals that that whiles the share of area under fruits to total horticulture area stands at 17% percent in TE 2007-08 for the state, which for district Darjeeling stands as high as about 34%. This in turn substantiates the fact that fruits cultivation in Darjeeling is a major horticultural activity as compared to the other districts, except for district Malda (35%). This is especially true considering the fact that fruits production in Darjeeling accounts for as much as 45.74% of horticultural production in the district, followed by district Uttar Dinajpur (26.5%).

It needs to be noted here that contribution of area and production of fruits to state total recorded a decline in both the districts selected for the study, viz. Darjeeling and Jalpaiguri. This in turn indicates that growth in area and production of fruits in the selected districts has been much slower than that at the state level. As such, it may not be wrong to observe that the selected districts for the study failed to keep up with the growth spurt in the fruits cultivation in West Bengal to some extent. In particular, a more detailed analysis of average annual growth rate in area, production and productivity of horticultural crops during TE 2004-05 to TE 2007-08 in the state (Table 2.3.3) reveals that while area under fruits grew at an average annual growth rate of 2% in district Darjeeling, that for district Jalpaiguri stands much lower at 0.25% per annum. Production of fruits in these districts grew at 4.83% p.a. and 6.83% p.a. over the concerned period as compared to 9.14% p.a. for the state total.

2.4: Area, Production & Rate of Growth of Pineapple and Mandarin Orange

An attempt to examine the area, production and growth rate of selected individual fruit crops, viz., pineapple and mandarin orange over time remains of immense significance for the present study. However, such an attempt is severely restricted by non-availability of time-series data on area and production of the selected fruit crops for the study.

Considering triennium ending averages, a comparison of available data on pineapple reveals that area under pineapple cultivation in the state increased from 8.87 thousand hectare during TE 1993-94 to a maximum of 13.21 thousand hectare during TE 2006-07, from where there has been a sudden decline in area in the following years. The data on production of pineapple also yield a similar picture, showing a sudden decline in production of pineapple in the state since TE 2006-07. In fact, area and production of pineapple have increased by 11.75% and 15.82% respectively over a period of 10 years, viz. TE 1999-00 to TE 2008-09. As such, the annual average rate of growth in area and production of pineapple comes out to be 1.31% p.a. and 1.76% p.a. respectively.

On the other hand, in case of mandarin orange there has been a steady increase both in area and production from TE 1999-2000 to TE 2008-09, though the magnitude of increase is even lower than pineapple. In particular, the increase in area over the 10 years period comes out to be 5.95% and that for production stands at 6.67%. The annual average growth rates thus stands at 0.66% p.a. and 0.74% p.a. respectively for area and production.

Needless to say, in view of the growth spurt especially in the fruits sub-sector in West Bengal, the growth in both pineapple and mandarin orange thus come out to be quite low. This in turn indicates that the selected fruit crops for the study, viz. pineapple and especially mandarin orange, have failed to keep up with the growth spurt in the fruits sector in the state, at least to some extent.

A more detailed analysis of growth rate in area and yield rate of pineapple and mandarin oranges in the state (Table 2.4.2) shows that there has been a sharp decline in the area under pineapple cultivation in West Bengal at an annual average rate of – 6.32% p.a. over the period 2004-05 to 2008-09, the period concerned for the present study. However, the yield rate of pineapple increased at an annual average rate of 2.16% p.a. In case of mandarin oranges, we can see that the annual average rate of growth of area and yield rate over the period 2004-05 to 2008-09 come out to be 1.56% p.a. and 1.58% p.a. respectively.

Under such circumstances, a semi-log time trend analysis for growth in area and production of the selected fruit crops brings out a scenario of deep concern. It is found that both pineapple and mandarin oranges grew at extremely poor trend growth rates during the period 2000-01 to 2008-09. In particular, while the trend growth rates in area and production of pineapple come out to be 0.99% p.a. and 1.01% p.a.

respectively, those for mandarin orange stand at 1.01% and 1.00% respectively over the concerned period. This again confirms that the growth in area and production of pineapple and mandarin orange lag far behind the growth of horticulture, especially of fruits in West Bengal.

2.5: District wise Area, Production and Growth of Pineapple and Mandarin Orange

A district-wise analysis of area, production and growth of pineapple and mandarin orange, viz. the crops selected for the present study, reveals that district Darjeeling lies well ahead of district Jalpaiguri both in terms of area and production for both the crops. It comes out that district Darjeeling is the largest producer of both pineapple and mandarin oranges in West Bengal, followed by district Jalpaiguri, the second largest producer for both the crops (Table2.5.1). In particular, in case of pineapple, district Darjeeling claimed a share of 30.45% and 29.23% respectively of area and production of pineapple in relation to state totals during TE 2004-05. The relative share of district Jalpaiguri, on the other hand, was 19.09% and 21.93% respectively. In case of mandarin oranges, district Darjeeling accounts for almost 98.86 percent of total production in West Bengal during TE 2004-05, while district Jalpaiguri turns out to be the only district other than Darjeeling to produce mandarin oranges.

During TE 2007-08, the percentage share in both area and production of pineapple for district Darjeeling to state total increased further to 34.46% and 29.23% respectively for area and production. In district Jalpaiguri, the relative share of area under pineapple cultivation to state total increased only marginally, from 19.09% to 19.83% over the period TE 2004-05 to TE 2007-08, though there has been a marginal decline of 1% in the share of production to state total, from 21.94% to 20.94%. It should be noted here that district Jalpaiguri lost its 2nd highest position in terms of production of pineapple to district Uttar Dinajpur over the period TE 2004-05 to TE 2007-08, and slipped down to the 3rd highest pineapple producing district in the state.

On the other hand, in case of mandarin orange, the percentage contribution of area and production state's total for both of these districts remained the almost same. In fact, while the share of district Darjeeling in area and production of mandarin orange to state total decreased marginally, that for district Jalpaiguri increased marginally only.

Under such circumstances, a comparative analysis of annual average growth rates in area and production of pineapple and mandarin orange between TE 2004-05 and TE 2007-08 reveals that while area under pineapple in district Jalpaiguri grew at an annual average rate of growth of 2.18% during the period, production figures exhibited a negative growth of –0.93%, especially owing to a negative growth in the yield rate of pineapple of –2.61%. On the other hand, while area under mandarin oranges grew at an annual average rate of growth of 0.86%, production grew comparatively faster at 1.54% p.a. owing to a growth in the yield rate of 0.64% p.a.

However, considering the high growth rates achieved by the fruits sector in West Bengal, the performance of the selected districts does not appear impressive at all. In particular, while there has been a sluggish growth of area, production and productivity of mandarin oranges in district Darjeeling, there has been a negative growth for pineapple production and productivity in Jalpaiguri with insignificant growth in area under the crop.

2.6: Summary of the Chapter

There has been no doubt in the fact that horticulture has over the years gained increasing importance in the state as compared to the traditional field crops. It is here that the present chapter makes an attempt to examine the state of area, production and productivity of horticulture in the state.

It has been observed that while the proportion of cultivable area in relation to total geographical area in West Bengal has gone down, the horticulture sectors is fast acquiring importance in the state with increase in the relative share in cultivable area over the years. The increasing importance of horticulture in the crop-mix of West Bengal agriculture also holds true for the districts selected for the present study, viz. Darjeeling and Jalpaiguri.

Again, the triennium ending averages area and production of horticultural cops at the state-level reveals that both fruits and vegetables signify a steady growth in terms of area and production since 1991-92 onwards to 2009-10. It comes out that vegetables and fruits are the major contributors to West Bengal horticulture, both in terms of area and production, while other horticulture crops (viz. flowers, spices, plantation crops, etc.) have much lower contributions.

An analysis of semi-log time trend growth rates for area and yield of horticultural crops in West Bengal reveals that horticulture has been growing at an impressive rate over the last few decades, driven mainly by high growth rates achieved in area and production of vegetables, and to some extent, fruits also. Growth rates based on annual averages for the period 2004-05 to 2009-10 also supports the above findings.

However, a district-wise analysis of growth of horticultural crops in the state shows that growth rates in area and production of fruits in the selected districts for the study, viz. Darjeeling and Jalpaiguri, have been much slower than those at the state level. This in turn reveals that the districts selected for the study failed to keep up with the growth spurt in the fruits cultivation in West Bengal, at least to some extent.

Again, the area, production and growth rates of the selected fruit crops for the study, viz. pineapple and mandarin orange, come out to be quite low as compared to the growth of area and production of fruits sub-sector in West Bengal. In particular, a semi-log tie trend analysis for growth in area and production of the selected fruit crops brings out that both pineapple and mandarin oranges grew at extremely poor trend growth rates during the last decade, and lag far behind the growth of horticulture in the state.

In case of a district-wise analysis of area, production and growth of pineapple and mandarin orange, it has been observed that the performance of the selected districts for the study does not appear impressive at all. In particular, while there has been a sluggish growth of area, production and productivity of mandarin oranges in district Darjeeling, there has been a negative growth for pineapple production and productivity in Jalpaiguri with insignificant growth in area under the crop.

Table 2.1.1
District-wise Geographical, Cultivable and Horticultural Crop Area in West Bengal (Area in '000 Ha.)

Districts	Geographical Area (Sq. Km.)*	Cultivable Area TE 2004-05	Cultivable Area TE 2007-08	Area under Fruits TE 2004-05	Area under Fruits TE 2007-08	Area under Veg. TE 2004-05	Area under Veg. TE 2007-08	Area under Horticulture Crop TE 2004-05	Area under Horticulture Crop TE 2007-08	% of Horticultural Area to Cultivable Area in TE 2004-05	% of Horticultural Area to Cultivable Area in TE 2007-08	% Change in Horticultural Area in (Culumn10) over 9)
1	2	3	4	5	6	7	8	9=5+7	10= 6+8	11	12	13
Burdwan	7024.00	488.28	474.67	6.87	7.49	52.33	57.07	59.20	64.56	12.12	13.60	9.05
Birbhum	4545.00	344.88	339.03	3.25	3.88	44.33	48.07	47.58	51.95	13.80	15.32	9.18
Bankura	6882.00	397.97	389.79	3.08	3.92	53.59	51.21	56.67	55.13	14.24	14.14	-2.72
Midnapur (E)	4295.00	305.07	299.57	7.82	8.38	49.90	47.90	57.72	56.28	18.92	18.79	-2.49
Midnapur (W)	9786.00	595.81	597.59	3.69	9.22	47.11	44.94	50.80	54.16	8.53	9.06	6.61
Howrah	1467.00	92.64	71.37	3.13	2.48	15.97	13.32	19.10	15.80	20.62	22.14	-17.28
Hooghly	3149.00	228.46	223.63	12.17	11.87	52.84	52.89	65.01	64.76	28.46	28.96	-0.38
24 Parganas (N)	4094.00	271.76	265.87	16.47	18.60	63.91	66.78	80.38	85.38	29.58	32.11	6.22
24 Parganas (S)	9960.00	397.87	385.29	7.16	8.44	59.96	66.35	67.12	74.79	16.87	19.41	11.43
Nadia	3927.00	314.08	302.48	10.33	15.44	78.17	80.53	88.50	95.97	28.18	31.73	8.44
Murshidabad	5324.00	410.06	403.62	19.29	23.40	69.97	80.61	89.26	104.01	21.77	25.77	16.52
Uttar Dinajpur	3140.00	280.99	279.62	6.80	8.20	29.60	32.95	36.40	41.15	12.95	14.72	13.05
Dakshin-Dinajpur	2219.00	194.83	190.32	4.39	4.33	43.23	46.05	47.62	50.38	24.44	26.47	5.80
Malda	3733.00	285.21	282.82	27.67	28.83	50.31	53.49	77.98	82.32	27.34	29.11	5.57
Jalpaiguri	6227.00	361.32	356.84	10.00	10.06	50.65	52.27	60.65	62.33	16.79	17.47	2.77
Darjeeling	3149.00	165.37	162.75	10.62	11.26	21.43	21.89	32.05	33.15	19.38	20.37	3.43
Cooch Behar	3387.00	267.45	259.39	4.39	5.33	49.66	51.69	54.05	57.02	20.21	21.98	5.49
Purulia	6259.00	448.75	444.57	2.67	3.55	34.77	33.92	37.44	37.47	8.34	8.43	0.08
West Bengal	88752.00	5850.82	5745.88	159.80	184.69	867.72	901.96	1027.52	1086.65	17.56	18.91	5.75

Source: Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 2.2.1
Area and Production of Horticultural Crops in the State (TE Averages)
(Area in '000 Ha & Production in '000 Tonne)

Year	Fruits		Vegetables		Flowers			Spices		Plantation Crops		Total	
	Area	Production	Area	Production	Area	Production (Loose)	Production (Cut)	Area	Production	Area	Production	Area	Production
1980-81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1981-82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1982-83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.60	23.73	0.00	0.00	30.60	23.73
1983-84	21.17	0.00	115.23	0.00	0.00	0.00	0.00	35.27	30.43	0.00	0.00	171.67	30.43
1984-85	0.00	0.00	164.17	0.00	0.00	0.00	0.00	41.57	39.20	0.00	0.00	226.90	39.20
1985-86	0.00	0.00	359.97	0.00	0.00	0.00	0.00	49.40	47.87	0.00	0.00	468.53	47.87
1986-87	0.00	0.00	465.43	0.00	0.00	0.00	0.00	52.87	50.17	0.00	0.00	594.40	50.17
1987-88	114.23	0.00	594.07	0.00	0.00	0.00	0.00	56.80	52.10	0.00	0.00	765.10	52.10
1988-89	114.47	0.00	642.30	0.00	0.00	0.00	0.00	60.07	55.57	0.00	0.00	816.83	55.57
1989-90	114.37	0.00	672.80	0.00	0.00	0.00	0.00	64.07	61.60	0.00	0.00	851.23	61.60
1990-91	117.53	0.00	744.30	0.00	0.00	0.00	0.00	67.17	67.17	0.00	0.00	929.00	67.17
1991-92	116.40	377.23	652.27	1560.00	0.00	0.00	0.00	69.93	73.07	0.00	0.00	838.60	2010.30
1992-93	123.03	760.30	585.07	3485.63	0.00	0.00	0.00	73.93	79.30	0.00	0.00	782.03	4325.23
1993-94	126.60	1246.33	492.77	5105.13	0.00	0.00	0.00	76.93	83.70	0.00	0.00	696.30	6435.17
1994-95	126.90	1275.57	504.10	5325.13	0.00	0.00	0.00	79.43	88.37	0.00	0.00	710.43	6689.07
1995-96	120.80	1320.00	490.10	5196.50	0.00	0.00	0.00	81.83	92.50	0.00	0.00	692.73	6609.00
1996-97	114.73	1179.00	610.57	8133.93	0.00	0.00	0.00	84.80	97.43	0.00	0.00	810.10	9410.37
1997-98	116.42	1230.41	703.90	9433.93	4.57	5.90	17.71	89.30	103.37	0.00	0.00	914.19	10791.32
1998-99	120.55	1314.91	800.57	10903.60	8.07	5.90	37.04	92.10	105.53	0.00	0.00	1021.29	12366.98
1999-00	125.16	1575.26	792.13	9657.18	12.48	10.78	55.97	93.93	106.70	0.00	0.00	1023.71	11405.88

Continued .....

Continued…. Table 2.2.1

Year	Fruits		Vegetables		Flowers			Spices		Plantation Crops		Total	
	Area	Production	Area	Production	Area	Production (Loose)	Production (Cut)	Area	Production	Area	Production	Area	Production
2000-01	130.65	1669.74	811.38	9953.92	7.91	4.88	38.26	93.53	106.03	0.00	0.00	1043.47	11772.83
2001-02	137.17	1819.57	836.34	10104.90	4.41	4.88	18.93	92.73	107.33	0.00	0.00	1070.65	12055.61
2002-03	144.49	1809.39	843.46	10339.71	0.00	0.00	0.00	89.23	107.17	0.00	0.00	1077.18	12256.27
2003-04	153.56	1929.07	854.16	10602.61	4.62	11.30	23.40	58.40	71.00	0.00	0.00	1070.74	12637.37
2004-05	159.80	1976.66	852.01	10871.49	10.27	25.87	52.59	27.60	34.60	0.00	0.00	1049.68	12961.22
2005-06	166.63	2148.69	990.85	13665.91	16.23	39.97	83.75	0.00	0.00	14.77	87.29	1188.47	16025.61
2006-07	175.36	2356.89	1141.46	15739.61	17.81	43.24	103.57	26.33	38.10	29.80	182.99	1390.76	18464.40
2007-08	184.73	2569.67	1289.69	19538.67	21.30	44.80	139.98	52.67	76.23	45.67	275.44	1594.05	22644.78
2008-09	194.92	2727.63	1316.14	20767.02	22.36	48.04	179.59	84.62	139.03	47.90	280.65	1665.93	24141.97
2009-10	202.00	2798.71	1313.13	22355.86	23.47	51.86	210.27	90.25	163.73	49.86	277.12	1678.70	25857.56

Source:
1.Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)for 1997-98 to 2006-07
2. National Horticulture Board Website for Data from 2005-06 to 2009-10,
3. Statistical Intelligence Service, 2007; CMIE for Data from 1980-81 to 1996-97(to 2002-03 for Spices)

Table 2.2.2
Growth rate in Area and Yield Rate of Horticultural Crops in the State (%)

Period	Fruits		Vegetables		Commercial Flowers			Spices		Plantation		Total	
	Area	Yield	Area	Yield	Area	Yield (Loose)	Yield (Cut)	Area	Yield	Area	Yield	Area	Yield
1980-81 to 1990-91*	6.36 (5.21)	0.00	14.31 (3.96)	0.00	0.00	0.00	0.00	9.76 (9.78)	12.80 (8.27)	0.00	0.00	12.48 (5.16)	12.80 (8.27)
1990-91 to 2000-01*	0.58 (0.80)	5.63 (3.94)	5.05 (2.50)	14.04 (4.70)	0.00	0.00	0.00	3.11 (9.45)	3.99 (8.34)	0.00	0.00	4.32 (2.79)	12.47 (5.08)
2000-01 to 2009-10*	4.93 (25.07)	6.45 (10.19)	6.84 (5.66)	11.62 (6.99)	6.32 (4.61)	9.26 (12.04)	14.89 (6.35)	-0.06 (-0.06)	5.57 (3.25)	0.00	0.00	6.56 (6.83)	11.07 (7.74)
2000-01-2004-05**	5.64	7.06	1.30	2.22	5.74	15.95	9.00	0.74	5.84	0.00	0.00	2.79	3.44
2004-05-2005-06**	3.85	8.15	43.28	71.97	5.55	-3.27	6.74	2.24	3.39	5.43	-3.07	32.63	59.27
2004-05-2006-07**	6.10	11.44	24.35	31.04	4.76	0.03	22.72	-7.85	-6.87	3.62	3.28	18.41	26.20
2004-05-2007-08**	5.36	9.21	16.27	31.04	18.94	3.61	32.41	-5.23	-4.55	4.26	1.06	12.68	26.48
2004-05-2008-09**	5.16	6.99	12.40	23.55	8.43	4.57	26.28	1.41	12.76	4.97	0.81	10.01	20.20
2004-05-2009-10**	4.63	6.16	9.61	18.14	7.57	4.87	21.91	1.13	10.21	3.98	0.57	7.83	15.62

Note: A few missing values have been replaced using linear trend at point while calculating growth.
* The growth rates for the decennial period are based on semi log time trend and the figures in parentheses are respective ‘t’ values.
** Growth rates are bases on annual averages.

Table 2.3.1
Area & Production of Horticultural Crops in District Level in West Bengal for TE 2004-05
(Area in '000 Ha & Production in '000 Tonnes)

Districts	FRUITS		VEGETABLES		FLOWERS			SPICES		PLANTATION CROPS		TOTAL	
	Area	Production	Area	Production	Area	Production (Loose)	Production (Cut)	Area	Production	Area	Production	Area	Production
Burdwan	6.87	67.83	52.33	554.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59.20	622.33
Birbhum	3.25	38.89	44.33	511.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47.58	549.89
Bankura	3.08	32.79	53.59	753.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.67	785.89
Midnapur (E)	7.82	136.58	49.90	507.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.71	643.61
Midnapur (W)	3.69	57.38	47.11	587.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.79	645.15
Howrah	3.13	45.85	15.97	183.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.09	229.36
Hooghly	12.17	150.45	52.84	604.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.01	755.23
24 Parganas (N)	16.47	236.85	63.91	796.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.38	1033.16
24 Parganas (S)	7.16	116.62	59.96	752.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	67.12	868.62
Nadia	10.33	142.10	78.17	1014.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	88.50	1156.19
Murshidabad	19.29	171.59	69.97	1038.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.26	1210.13
Uttar Dinajpur	6.80	103.51	29.60	319.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.39	422.62
Dakshin-Dinajpur	4.39	55.76	43.23	522.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47.62	578.20
Malda	27.67	140.26	50.31	619.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.97	759.52
Jalpaiguri	10.00	175.57	50.65	666.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60.65	841.68
Darjeeling	10.62	174.02	21.43	217.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.04	391.53
Cooch Behar	4.39	64.68	49.66	775.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.05	840.18
Purulia	2.67	32.58	34.77	445.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.44	478.15
West Bengal	159.80	1976.65	867.72	10871.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1027.51	12848.13

Source: Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 2.3.2
Area & Production of Horticultural Crops in District Level in West Bengal for TE 2007-08
(Area in '000 Ha & Production in '000 Tonnes)

Districts	FRUITS		VEGETABLES		FLOWERS			SPICES		PLANTATION CROPS		TOTAL	
	Area	Production	Area	Production	Area	Production (Loose)	Production (Cut)	Area	Production	Area	Production	Area	Production
Burdwan	7.49	77.84	57.07	656.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.57	734.42
Birbhum	3.88	50.10	48.07	573.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.95	624.03
Bankura	3.92	43.19	51.21	835.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55.13	878.69
Midnapur (E)	8.38	128.72	47.90	430.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.28	559.15
Midnapur (W)	9.22	81.31	44.94	626.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.16	707.32
Howrah	2.48	35.21	13.32	155.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.80	190.81
Hooghly	11.87	157.48	52.89	627.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.76	784.97
24 Parganas (N)	18.60	294.96	66.78	875.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	85.38	1170.42
24 Parganas (S)	8.44	146.33	66.35	846.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74.79	992.34
Nadia	15.44	366.89	80.53	1143.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	95.97	1510.75
Murshidabad	23.40	250.44	80.61	1221.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	104.01	1472.17
Uttar Dinajpur	8.20	134.13	32.95	372.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.15	506.37
Dakshin-Dinajpur	4.33	43.15	46.05	547.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.39	591.13
Malda	28.83	224.63	53.49	684.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	82.33	908.90
Jalpaiguri	10.06	211.33	52.27	789.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	62.33	1001.06
Darjeeling	11.26	200.42	21.89	237.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.15	438.15
Cooch Behar	5.33	85.34	51.69	930.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.02	1015.80
Purulia	3.55	38.18	33.92	511.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.47	550.07
West Bengal	184.69	2569.63	901.96	12066.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1086.65	14636.52

Source: Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 2.3.3
Average Annual Growth Rate in Area, Production & Productivity of Horticultural Crops at Districts Level in West Bengal from TE 2004-05 to TE 2007-08 (Percent Per Annum)

Districts	Fruits			Vegetables			Total		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
Burdwan	2.94	4.86	1.81	2.94	5.80	2.78	2.94	5.68	2.66
Birbhum	6.16	8.90	2.32	2.74	3.97	1.27	2.98	4.32	1.36
Bankura	8.56	9.63	0.53	-1.47	3.52	4.85	-0.89	3.79	4.58
Midnapur (E)	2.34	-1.96	-4.17	-1.34	-5.29	-3.78	-0.83	-4.57	-3.62
Midnapur (W)	37.08	12.33	-13.23	-1.51	2.16	3.45	2.28	3.14	0.78
Howrah	-7.33	-7.90	-1.56	-5.85	-5.33	0.52	-6.10	-5.88	0.11
Hooghly	-0.84	1.54	2.41	0.03	1.26	1.20	-0.13	1.31	1.42
24 Parganas (N)	4.15	7.65	3.27	1.48	3.23	1.72	2.03	4.26	2.16
24 Parganas (S)	5.65	7.88	2.16	3.43	4.02	0.53	3.67	4.55	0.81
Nadia	14.34	37.55	20.06	1.00	4.11	3.04	2.74	9.36	6.35
Murshidabad	6.66	13.68	6.92	4.83	5.58	0.68	5.23	6.76	1.45
Uttar Dinajpur	6.49	9.10	2.52	3.67	5.35	1.70	4.21	6.24	1.95
Dakshin-Dinajpur	0.09	-6.91	-6.02	2.14	1.61	-0.45	1.92	0.75	-1.06
Malda	1.39	17.18	3.10	2.08	3.42	-9.26	1.83	6.20	4.28
Jalpaiguri	0.25	6.58	6.03	1.07	5.84	4.62	0.93	5.97	4.87
Darjeeling	2.00	4.83	2.79	0.72	3.03	2.30	1.15	3.82	2.66
Cooch Behar	6.63	9.69	2.83	1.35	6.34	4.99	1.80	6.60	4.77
Purulia	9.98	5.47	-3.36	-0.77	4.76	5.35	0.08	4.80	4.55
West Bengal	4.95	9.14	4.00	1.30	3.54	2.20	1.88	4.44	2.50

Note: Growth Rate are annual averages
Source: Derived from Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 2.4.1
Area & Production of Pineapple & Mandarin Orange in West Bengal

Year	Pineapple		Orange (Mandarin)	
	Area ('000 ha)	Production ('000 tonnes)	Area ('000 ha)	Production ('000 tonnes)
TE 1980-81	0.00	0.00	0.00	0.00
TE 1981-82	0.00	0.00	0.00	0.00
TE 1982-83	0.00	0.00	0.00	0.00
TE 1983-84	0.00	0.00	0.00	0.00
TE 1984-85	0.00	0.00	0.00	0.00
TE 1985-86	0.00	0.00	0.00	0.00
TE 1986-87	0.00	0.00	0.00	0.00
TE 1987-88	0.00	0.00	0.00	0.00
TE 1988-89	0.00	0.00	0.00	0.00
TE 1989-90	0.00	0.00	0.00	0.00
TE 1990-91	0.00	0.00	0.00	0.00
TE 1991-92	0.00	0.00	0.00	0.00
TE 1992-93	0.00	0.00	0.00	0.00
TE 1993-94	8.87	219.60	0.00	0.00
TE 1994-95	8.93	224.93	0.00	0.00
TE 1995-96	9.00	228.30	0.00	0.00
TE 1996-97	9.07	232.00	0.00	0.00
TE 1997-98	9.11	238.66	0.00	0.00
TE 1998-99	9.30	255.77	0.00	0.00
TE 1999-00	9.70	270.29	3.53	34.17
TE 2000-01	10.10	281.18	3.54	34.10
TE 2001-02	10.72	293.87	3.57	34.07
TE 2002-03	11.22	314.05	3.63	34.47
TE 2003-04	11.70	335.10	3.63	34.44
TE 2004-05	12.15	344.38	3.57	33.56
TE 2005-06	12.68	357.20	3.52	32.63
TE 2006-07	13.21	367.03	3.60	33.74
TE 2007-08	12.10	344.81	3.68	35.13
TE 2008-09	10.84	313.06	3.74	36.45

1.Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)for 1997-98 to 2007-08
2. Indian Horticulture Database, 2009 for 2008-09
3. Statistical Intelligence Service, 2007; CMIE for Data from 1980-81 to 1996-97

Table 2.4.2
Growth Rate in Area and Yield Rate of Selected Horticultural Crops in the State

Period	Pineapple		Mandarin Orange	
	Area	Yield	Area	Yield
1980-81 to 1990-91*	n.a.	n.a.	n.a.	n.a.
1990-91 to 2000-01*	n.a.	n.a.	n.a.	n.a.
2000-01 to 2008-09*	0.99 (-0.45)	1.01 (1.90)	1.01 (1.55)	1.00 (1.22)
2000-01-2004-05**	4.83	0.17	0.00	-0.56
2004-05-2005-06**	4.12	4.08	0.85	-0.11
2004-05-2006-07**	2.14	1.00	3.13	3.14
2004-05-2007-08**	-8.61	3.05	2.08	2.10
2004-05-2008-09**	-6.32	2.16	1.56	1.58
2004-05-2009-10**	n.a.	n.a.	n.a.	n.a.

Note: *The growth rate for the decennial period are based on semi log time trend and the figures in parentheses are respective 't' values
** Growth rates are bases on annual averages.

Table 2.5.1
Area & Production of Selected Horticultural Crops at District Levels in West Bengal for TE 2004-05 (Area in '000 HA & Production in '000 Tonnes)

Districts	Pineapple		Oranges (Mandarin)	
	Area	Production	Area	Production
	TE 2004-05	TE2004-05	TE 2004-05	TE2004-05
Burdwan	0.13	4.07	0.00	0.00
Birbhum	0.03	0.95	0.00	0.00
Bankura	0.04	1.17	0.00	0.00
Midnapur (E)	0.27	6.58	0.00	0.00
Midnapur (W)	0.35	8.63	0.00	0.00
Howrah	0.18	4.84	0.00	0.00
Hooghly	0.22	6.35	0.00	0.00
24 Parganas (N)	0.54	13.59	0.00	0.00
24 Parganas (S)	0.26	7.38	0.00	0.00
Nadia	0.38	10.96	0.00	0.00
Murshidabad	0.17	4.45	0.00	0.00
Uttar Dinajpur	2.36	66.88	0.00	0.00
Dakshin-Dinajpur	0.78	21.24	0.00	0.00
Malda	0.08	2.00	0.00	0.00
Jalpaiguri	2.32	75.54	0.05	0.38
Darjeeling	3.70	100.68	3.53	33.18
Cooch Behar	0.29	8.38	0.00	0.00
Purulia	0.03	0.71	0.00	0.00
West Bengal	12.15	344.38	3.58	33.56

Source: Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 2.5.2
Area & Production of Selected Horticultural Crops at District Levels in West Bengal for TE 2007-08 (Area in '000 HA & Production in '000 Tonnes)

Districts	Pineapple		Oranges (Mandarin)	
	Area	Production	Area	Production
	TE 2007-08	TE2007-08	TE 2007-08	TE2007-08
Burdwan	0.10	2.75	0.00	0.00
Birbhum	0.05	1.12	0.00	0.00
Bankura	0.05	1.14	0.00	0.00
Midnapur (E)	0.25	6.02	0.00	0.00
Midnapur (W)	0.25	5.28	0.00	0.00
Howrah	0.10	2.80	0.00	0.00
Hooghly	0.13	3.25	0.00	0.00
24 Parganas (N)	0.50	13.66	0.00	0.00
24 Parganas (S)	0.41	11.27	0.00	0.00
Nadia	0.23	6.62	0.00	0.00
Murshidabad	0.11	2.57	0.00	0.00
Uttar Dinajpur	2.85	80.16	0.00	0.00
Dakshin-Dinajpur	0.09	2.45	0.00	0.00
Malda	0.07	1.82	0.00	0.00
Jalpaiguri	2.40	72.20	0.06	0.44
Darjeeling	4.17	122.44	3.62	34.69
Cooch Behar	0.29	8.31	0.00	0.00
Purulia	0.04	0.96	0.00	0.00
West Bengal	12.10	344.81	3.68	35.13

Source: Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

Table 2.5.3
Average Annual Growth Rate in Area, Production & Productivity of Pineapple & Oranges (Mandarin) at Districts Level in West Bengal from TE 2004-05 to TE 2007-08
(Percent Per Annum)

Districts	Pineapple			Oranges (Mandarin)		
	Area	Production	Productivity	Area	Production	Productivity
Burdwan	-4.82	-7.73	-5.45	n.a.	n.a.	n.a.
Birbhum	20.24	11.58	3.16	n.a.	n.a.	n.a.
Bankura	14.26	3.15	4.20	n.a.	n.a.	n.a.
Midnapur (E)	-1.63	-0.52	1.78	n.a.	n.a.	n.a.
Midnapur (W)	-7.37	-9.36	-11.32	n.a.	n.a.	n.a.
Howrah	-10.58	-10.16	-7.37	n.a.	n.a.	n.a.
Hooghly	-11.88	-15.02	-3.49	n.a.	n.a.	n.a.
24 Parganas (N)	0.15	3.90	0.75	n.a.	n.a.	n.a.
24 Parganas (S)	16.53	16.17	0.01	n.a.	n.a.	n.a.
Nadia	-8.22	-8.17	0.93	n.a.	n.a.	n.a.
Murshidabad	-9.65	-13.14	10.20	n.a.	n.a.	n.a.
Uttar Dinajpur	6.57	6.39	-0.11	n.a.	n.a.	n.a.
Dakshin-Dinajpur	-41.74	-39.86	2.42	n.a.	n.a.	n.a.
Malda	4.57	5.04	6.37	n.a.	n.a.	n.a.
Jalpaiguri	2.18	-0.93	-2.61	6.27	5.62	-0.61
Darjeeling	4.12	6.75	2.64	0.86	1.54	0.64
Cooch Behar	0.35	-0.02	-0.03	n.a.	n.a.	n.a.
Purulia	16.67	13.84	13.84	n.a.	n.a.	n.a.
West Bengal	0.06	0.14	0.28	0.94	1.59	0.61

Note: Growth Rate are annual averages
Source: Derived from Statistical Abstract, Directorate of Agriculture, Government of West Bengal (Various Issues)

CHAPTER 3

HOUSEHOLD CHARACTERISTICS, CROPPING PATTERN AND PRODUCTION STRUCTURE

3.1: Socio-economic Characteristics of the Selected Farmers

The socio-economic profiling of the sample households (Table 3.1) provides us with some important observations. It can be observed that the average size of farm households under the present study comes out be 4.77 for all the 100 households taken together. The average number of earners stands at 1.60 earning members per family. In case of gender classification, we observe that gender distribution is highly skewed towards male members. In particular, taking all samples belonging to different size-classes together, there are about 747 females per thousand of male members in the sample size.

If we consider the age-group of 16 to 60 years as the working age-group, we find that almost 67.92 percent of household members belong to this age-group. The ratio of literates among the household members stands quite high at 80.50 percent, though most of them (56.25 percent of the literates) are contained only to primary education levels. Interestingly enough, the marginal group appears to enjoy a distinct edge in consideration of higher education than other size classes, as most of members with higher educational achievements come from marginal households. A distribution of the sample households according castes reveals the predominance of General Castes (43.00 percent), followed by Schedule Castes (36.00 percent), and Other Backward Castes (15.00 percent).

In case of decision making in farming activities, it has been seen that in 95.00 percent of the households, decisions relating to farm management is taken by the male members of the family. Nevertheless, it comes out that about 88.59 percent of the working members consider agriculture as their primary occupation, while members considering other occupations like business, service and wage-earners as their primary occupation are proportionately quite low. At the same time, it can be observed that persons involved in voluntary or involuntary migration stands extremely low, as less than half a percent of household members are involved in migration.

Hence, the observations on the socio-economic characteristics typically resemble an agriculture dominated economy. Though the incidence of high literacy rate deserves due appreciation, but gender inequalities in favour of the male members surely serves to be a cause of deep concern. At the same time, the dominance of male members in decisions relating to farming practices needs to be studied in much greater details for its possible impact of farming output and farming society at large.

3.2: Characteristics of Operational Holding

An analysis of the characteristics features of operational holding of the sample farmer households (Table 3.2) reveal that the amount of cultivable waste land among all the size groups stands only negligible. In case of non cultivable waste, however, the marginal farmers on an average have 0.22 acres of land which can't be converted for use of agricultural purposes. Leasing-in and leasing out of land turn out to be confined only to the marginal farms, where the average leased-in land comes out to be 0.47 acres and the average leased-out land turns out to be 0.02 acres only for the marginal farms.

It should be noted here that though the smaller size-classes are constrained by less of operational area (as revealed by the figures relating to average net operated area for the size-classes), the smallness of farm-size has been compensated to some extent by higher cropping intensity for the smaller size-classes. In particular, while the cropping intensity for the marginal farms stand at 133.33 percent, which for the small and medium farms stands at 108.10 percent and 100.00 percent respectively. Thus it turns out that the smaller farms attempt hard to compensate for their smallness of size by cultivating their land more intensely than the larger farms.

3.3: Sources of Irrigation

Regarding the sources of irrigation, it has been observed that the selected farmers for the present study are almost completely dependent on monsoon, i.e. almost completely rainfed. In fact, only about 5 percent of cultivable area under the marginal farms has provision for irrigation though sources like tanks. Irrigation from any other sources like canal or tube well (diesel/electric) is completely absent in the study region, especially owing to the topography of the study area. It should be noted however that average annual precipitation in the selected districts is much higher than the state average, which in turn compensate for the near absence of irrigation for the sample farms.

3.4: Sources and Purpose of Credit

There is no doubt in the fact that agricultural credit serves to be a key input in the process of production and agricultural growth. After years of development of institutional banking practices, Indian agriculture is still overwhelmingly served by non-institutional informal credit sources, which exploit the opportunities that arise from starvation for agricultural credit by the resource-poor farmers. Here institutional source of credit refer to loans provided by formal sources like banks (commercial banks, co-operative banks, land development banks, etc.) only, while the non-institutional sources refers to informal lenders such as commission agents, traders, merchants, landlords, friends & relatives, etc.

It is here that the present study finds that borrowing from various sources (both institutional and non-institutional) serves to be a common practice of the selected farmers in the study region (Table 3.4). This has been examined here from two different angles, viz. availability of credit per household and availability of credit per acre from different sources of credit.

In case of Rs. Per household, the medium farmers, followed by small farmers, borrow a large amount from the institutional sources. The corresponding figures are Rs.28,666.67 and Rs.15,035.72 respectively. The marginal farmers on the way borrow a comparatively large amount from the non-institutional sources viz. commission agents, traders, money lenders, friends, etc. The non-availability of institutional loans to the marginal farmers has been clearly reflected here, which serves to be a matter of deep concern. .

In case of per acre availability of institutional credit, there is no such significant variation among the size-

classes, though the figure for the small farms (Rs.4,687.15) is marginally higher than sample average (Rs.4,240.04). Interestingly, it can be observed that the marginal farmers borrow a relatively higher amount from the non-institutional sources than institutional sources like banks etc.

An examination of credit taken by purpose of credit (Table 3.5), viz. productive and non-productive purposes, reveals that a major part of the loans taken are spent in productive activities like farming. However, while the larger farms use proportionately higher amounts of loans in agricultural purposes, the marginal and small farmers are found to spend a proportionately higher amount of borrowing in non-productive uses like daily consumption and social ceremonies. This has been especially true for the marginal farms, which reflects their compulsion to access informal credit to meet day-to-day requirements driven by financial distress.

3.5: Assets Holding of the Selected Farmers

While considering the ownership of productive assets by the farmer households (Table 3.6), it has been observed that livestock occupies the prime position among all animate and inanimate assets among all size classes. It has been observed that the average total value of assets is much higher for the small farms in terms of value of assets per household. Hence, it comes out that the small farms have a distinct edge over the marginal and medium farmers in owning productive assets per household. The marginal farms, on the other hand, have the least value of assets per household as compared to the small and medium farms.

However, an analysis of ownership of productive assets in terms of per acre value of assets brings out a different picture. It has been observed that in terms of value of assets per unit of land, the medium farmers have the lowest average asset values per acre. As compared to this, the marginal farms turn out to have considerable higher asset value per acre than the medium farms.

On the whole, it comes out that the farmers in the survey area are accustomed to farming practices with traditional instruments. This has been reflected from the fact that modern machines and equipments for mechanized agriculture is almost completely absent in the study area. However, one should also consider the topography of the study area for reasoning out the possibility of possessing farm equipments like tractors, tillers, combine harvesters etc. Nevertheless, the near absence of modern equipments among all size classes of farms in the study area unarguably reflects financial constraints of the farmers to a great extent.

3.6: Structure of Tenancy

While examining the structure of tenancy among the sample farms (Table 3.7), it is interesting to find that none of the sample farmer households have leased-out their land partly or fully to other fellow farmers. However, in case of leasing-in of land, primary information obtained through filed investigation reveals that only about 1.77 percent of gross cropped area has been leased-in on the contracts of fixed rent in cash, particularly by marginal farmers only. Even within the marginal farms, this contributes to only about 2.57 percent of gross cropped area, and hence stands negligible.

3.7: Area under HYV and Organic Farming

While examining the area under high yielding varieties of seeds and the area under organic farming among all the size-classes of selected farmers (Table3.8), it comes out that adoption of HYV seeds is extremely poor. In particular, while about one-thirds (33.35 percent) percent of kharif crops (like paddy, maize, etc.) have been cultivated with HYV seeds, that for horticultural crops stand even lower at 17.74 percent only. Application of HYV seeds has been completely absent in case of rabi crops. A crop-wise analysis (not shown in the table) reveals that this phenomenon is particularly because of the fact that while cultivation of pineapple is almost completely carried out with the application of HYV seeds, cultivation of mandarin oranges on the other hand is completely dependent of the available local varieties. Again, in kharif and rabi cultivation, the lower usage of HYV seeds results from the fact that the particular weather and soil quality of the study region is more suitable for the local varieties than the high yielding ones. Again, a farm size-wise analysis shows that there exists a considerable difference in the adoption of high yielding varieties across the size-classes. In particular, the highest HYV adoption ratio can be observed for the small farms (72.74 percent), followed by the large farms (64.52 percent). The HYV adoption ratio for the marginal, however, comes out to be extremely low with only 31.87 percent of gross cropped area being cultivated with HYV seeds.

In case of the extent of adoption of organic farming practices (Table 3.9), it is found that the organic farming practices in mainly confined to the marginal farms in almost all crop seasons. In particular, as much as 62.49 percent area cultivated by the marginal farms falls under organic farming practices, while that for the small farms comes to be 10.28 percent. The percentage area under organic cultivation for the medium farms is completely absent. In this context, it should be taken into account that the higher ratio of marginal farms under organic farming may not be a voluntary choice for scientific organic cultivation by the marginal farms, but can also be a choice by default as being unable to use inorganic inputs owing to severe financial constraints. However, such intricate division of organic farming into scientific organic practices and default organic practices remains beyond the purview of the present study. It should also be noted here that cultivation of mandarin oranges in the study region does not use chemical fertilizers and chemical pesticides, and hence they automatically fall under organic cultivation practices by default.

3.8: Cropping Pattern of the Selected Farmers

Data relating to the cropping pattern of the selected farms (Table 3.10) reveals that there exists considerable variation in the cropping pattern in the study area. In particular, while 39.02 percent of gross cropped area is cultivated in the kharif season, about 11.39 percent is cultivated in the rabi season. The rest of the gross cropped area (about 49.59 percent) falls under horticultural crops. In kahrif season, most of the area is covered under paddy, followed by maize, while potato and ginger serve to be the prime crops grown in rabi season. In case horticulture, mandarin orange covers about 39.66 percent

of area under horticulture, while pineapple covers about 35.76 percent. Cultivation of tea also contributes significantly with a share of 20.29 percent of area under horticultural crops.

Interestingly enough, it comes that the cropping pattern also tends to vary among the size-classes concerned. In particular, the cropping patter of the marginal farms appears to be more diversified with significant presence in all crops grown. On the other hand, while the small farms tend to concentrate more in kharif cultivation, the medium farm are more concentrated on horticultural crops as compared to the kharif or rabi crops.

3.9: Production, Cost and Returns by Farm Size

An analysis of value of value of output, costs and net returns among the various size-classes of farmers belonging to the study area (Table 3.11) bring out that the average value of output for all crops taken together tends to increase sharply with the increase in size of farms. Not only in terms of value of output per households, but also the value of output per acre of land shows an increasing pattern over the size-classes. This particular pattern also holds true in case of costs of production (both material costs and labour cost, which sharply increases with the increase in size. Most importantly, it can be observed that net returns (in terms of farm business income) per acre of land also tends to increase with the increase in size, which clearly reflects that the higher size-classes are more successful at least in farm business operations, if not in generating observed income (profit).

On the other hand, the non-farm income of the sample farms households appear to decrease over an increase in farm-size, which reflects that the larger farms are less involved in non-farm activities. The smaller farms, driven by acute financial distress, are often compelled to opt for alternative sources of income to compensate for their smallness of size. On the whole, it comes out that the larger farms have considerable financial edge over its smaller counterparts with much higher total income (farm income & non-farm income taken together) per household.

3.10: Summary of the Chapter

A socio-economic profile of the sample farming households reveals that almost all sections of the society are fairly covered under the present study. It has been observed that the study area represents a picture of highly marginalized farming economy. It has been observed that the average literacy rate and literary achievement in the study region stands quite high, though most of the literates are confined to primary education levels only. Importantly enough, it has been observed that agriculture comes out as the single major primary occupation for the workforce in the study area, more than 88 percent of the workforce. At the same time, it is highly encouraging to find that there is a complete absence of voluntary/involuntary migration among the members of the sample farmer households.

A detailed examination of specific characteristics of operational holding among the sample farmer households in the study regions reveals that in a highly marginalized economy like the one in the present study, the smallness of farm-size has been compensated to some extent by higher cropping intensity for the smaller size-classes. In particular, while the cropping intensity for the marginal farms stand at 133.33 percent, which for the small and medium farms stands at 108.10 percent and 100.00 percent respectively. Thus it turns out that the smaller farms attempt hard to compensate for their smallness of size by cultivating their land more intensely than the larger farms.

Regarding sources of irrigation, it has been found that the study area is primarily a rainfed area, and there are thin possibilities of alternative sources of irrigation owing to various factors like topography of the region. In fact, only a negligible proportion of land is irrigated with sources like tanks.

An investigation into the sources and purpose of loans made by the sample farmer households in the study area reveals that the farmers are heavily indebted with both institutional and non-institutional loans. However, apart from loans made from formals sources, the informal lenders like commission agents, traders/merchants, etc. act as major sources of credit for the resource-poor marginal farms. Thankfully enough, a major part of these formal and informal borrowing has been intended as crop loans / production loans. Apart from the crop loans, the marginal farmers appear to access for informal sources of credit to meet requirements of various social ceremonies / activities.

In case of ownership of productive assets by the farmer households, it has been observed that livestock occupies the prime position among all animate and inanimate farm assets. Importantly, the general backwardness in the study area is clearly reflected in the fact that modern implements like tractor, trolly, tiller, combined harvester, etc. have not been found among the sample farmer households belonging to the study area. In fact, if we exclude the livestock assets, then the ownership of material farm assets and implements surely would count only to a sorry figure.

In case of structure of tenancy, it has been found that while none of sample farmer households leased-out land even partly, only a few marginal farmer households lease-in insignificant proportion of land for cultivation under tenancy contracts involving fixed rent to be paid in cash only.

Again, it has been observed that the use of HYV seeds is extremely low in the study area in general. This is particularly because of the fact that local varieties come out be more suitable for the weather and soil condition in case of certain crops like mandarin oranges. In sharp contrast, pineapple production in the study area is almost completely covered under HYV seeds.

The predominant form of cropping system in the study area turns out to be a completely organic farming (by default) system, with the use of organic manure instead of chemical fertilizers under purely traditional cultivation practices, especially in case of mandarin orange production. In sharp contrast to this, only a negligible amount of land under pineapple cultivation has been purely under organic farming practices (scientific).

An analysis of the cropping pattern of the sample farmer households reveals that as much as 49.6 percent of total gross cropped area falls under horticultural crops, which is followed by the kharif crops and rabi crops. At the same time, the cropping pattern also tends to vary among the size-classes concerned. In particular, the cropping patter of the marginal farms appears to be more diversified with significant presence in all crops grown. On the other hand, while the small farms tend to concentrate more in kharif cultivation, the medium farm are more concentrated on horticultural crops as compared to the kharif or rabi crops.

An analysis of value of output, costs and net returns as derived from aggregate of all crops reveals that net returns (in terms of farm business income) per acre of land tends to increase with the increase in size, which clearly reflects that the higher size-classes are more successful at least in farm business operations, if not in generating observed income (profit). On the other hand, the non-farm income of the sample farms households appear to decrease over an increase in farm-size, which reflects that driven by acute financial distress, the smaller farms are often compelled to opt for alternative sources of income to compensate for their smallness of size. On the whole, it comes out that the larger farms enjoy considerable financial advantage over its smaller counterparts with much higher total income per household.

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

Characteristics		Marginal	Small	Medium	Large	Total
No of HH		83	14	3	0	100
Household size (numbers)		394	69	14	0	477
Average numbers of earners		1.56	1.93	1.33	0.00	1.60
Gender (% of members)	Male	221 (56.09)	45 (65.22)	7 (50.00)	0 (0.00)	273 (57.23)
	Female	173 (43.91)	24 (34.78)	7 (50.00)	0 (0.00)	204 (42.77)
Age group of the members (%)	<16	84 (21.31)	17 (24.64)	5 (35.71)	0 (0.00)	106 (22.22)
	16-60	268 (68.02)	49 (71.01)	7 (50.00)	0 (0.00)	324 (67.92)
	>60	42 (10.66)	3 (4.35)	2 (14.29)	0 (0.00)	47 (9.85)
Identity of Respondent (%)	Head	80 (96.39)	14 (100.00)	3 (100.00)	0 (0.00)	97 (97.00)
	Others	3 (3.61)	0 (0.00)	0 (0.00)	0 (0.00)	3 (3.00)
Education status of the members (%)	Illiterate	65 (16.50)	23 (33.33)	5 (35.71)	0 (0.00)	93 (19.50)
	Primary	168 (42.64)	39 (56.52)	9 (64.29)	0 (0.00)	216 (45.28)
	Middle	120 (30.46)	6 (8.70)	0 (0.00)	0 (0.00)	126 (26.42)
	High School	31 (7.87)	2 (2.90)	0 (0.00)	0 (0.00)	33 (6.92)
	Under Graduate	8 (2.03)	0 (0.00)	0 (0.00)	0 (0.00)	8 (1.68)
	Graduate	1 (0.25)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.21)
Caste (% of households)	SC	28 (33.73)	6 (42.86)	2 (66.67)	0 (0.00)	36 (36.00)
	ST	6 (7.23)	0 (0.00)	0 (0.00)	0 (0.00)	6 (6.00)
	OBC	12 (14.46)	3 (21.43)	0 (0.00)	0 (0.00)	15 (15.00)
	General	37 (44.58)	5 (35.71)	1 (33.33)	0 (0.00)	43 (43.00)
Decision maker (% of hh)	Male	78 (93.98)	14 (100.00)	3 (100.00)	0 (0.00)	95 (95.00)
	Female	5 (6.02)	0 (0.00)	0 (0.00)	0 (0.00)	5 (5.00)
Main occupation (% of working members)	Farming	107 (39.92)	22 (44.90)	3 (42.85)	0 (0.00)	132 (40.74)
	Self business	7 (2.61)	3 (6.12)	1 (14.29)	0 (0.00)	11 (3.40)
	Salaried/pensioners	3 (1.12)	1 (2.04)	0 (0.00)	0 (0.00)	4 (1.23)
	Wage earners	2 (0.75)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.62)
Involved in migration during year 2009 (% of members)		0 (0.00)	2 (2.90)	0 (0.00)	0 (0.00)	2 (0.42)

Sample size = 100
Source: Field Survey

Table 3.2
Characteristics of Operational Holdings (acres per household)

Farm size	Owned land	Cultivable waste	Non cultivable	Leased- in	Leased -out	NOA	GCA	Cropping intensity
	(1)	(1b)	(1c)	(2)	(3)	(4)	(5)	(6)
Marginal	1.61	0.03	0.22	0.47	0.02	1.38	1.84	133.33
Small	3.32	0.04	0.08	0.00	0.00	3.21	3.47	108.10
Medium	6.93	0.04	0.07	0.00	0.00	6.82	6.82	100.00
Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.01	0.03	0.19	0.39	0.19	1.80	2.22	123.33

Sample size = 100
Source: Field Survey

Table 3.3
Source of Irrigation of Net Operated Area (%)

Farm size	Only canal	Canal + tubewell	Only electric tubwell	Only diesel tubwell	Tanks and others	Rainfed area	Total operated area
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Marginal	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	6.01 (5.22)	108.92 (94.77)	114.93 (100.00)
Small	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	44.91 (100.00)	44.91 (100.00)
Medium	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	20.46 (100.00)	20.46 (100.00)
Large	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Total	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	6.01 (3.33)	174.29 (96.67)	180.30 (100.00)

Sample size = 100
Source: Field Survey

Table 3.4
Details of Source of Credit by the Selected Households

Farm size	Institutional loan by banks	Commission agents	Trad/ML/Landlord	Friends/relatives	Govt. programmes	Others
	(1+2+3)	(6)	(5+7)	(8)	(4)	(9)
(Rs. per household)						
Marginal	5874.10	566.35	1387.35	625.30	0.00	0.00
Small	15035.72	0.00	571.42	357.15	0.00	0.00
Medium	28666.67	0.00	0.00	0.00	0.00	0.00
Large	0.00	0.00	0.00	0.00	0.00	0.00
All	7840.50	470.00	1231.50	569.00	0.00	0.00
(Rs. per acre)						
Marginal	4064.24	408.23	977.23	437.02	0.00	0.00
Small	4687.15	0.00	178.13	111.34	0.00	0.00
Medium	4203.32	0.00	0.00	0.00	0.00	0.00
Large	0.00	0.00	0.00	0.00	0.00	0.00
Total	4240.04	260.39	668.34	306.88	0.00	0.00

Sample size = 100
Source: Field Survey

Table 3.5
Details of Purpose of Credit by the Selected Households

Farm size	Productive uses		Non productive uses		
	Agriculture	Animal husbandry	Daily consumption	Social ceremonies	Others
(Rs. per household)					
Marginal	5211.45	0.00	807.83	2433.73	0.00
Small	15035.71	0.00	928.57	0.00	0.00
Medium	28666.67	0.00	0.00	0.00	0.00
Large	0.00	0.00	0.00	0.00	0.00
Total	7290.50	0.00	800.50	2020.00	0.00

Sample size = 100
Source: Field Survey

Table 3.6
Ownership of Productive Assets

Asset Description		Rs. Per household					Rs per acre of GCA				
		Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
Tractor		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trolley		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harrow		309.58	632.50	390.00	0.00	357.20	168.49	182.09	57.18	0.00	161.20
Tiller		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plank		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Threshing machine		394.28	1651.79	1266.67	0.00	596.50	214.59	475.53	185.73	0.00	269.19
Combine harvester		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other reaper (specify)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pumpset diesel		389.16	0.00	0.00	0.00	323.00	211.80	0.00	0.00	0.00	145.76
Pumpset electric	Submersible	27.11	0.00	0.00	0.00	22.50	14.75	0.00	0.00	0.00	10.15
	Non submers	83.13	552.86	0.00	0.00	146.40	45.25	159.16	0.00	0.00	66.07
Bullock cart		381.93	557.14	0.00	0.00	395.00	207.87	160.39	0.00	0.00	178.26
Fodder Chaffer	Manual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Power driven	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spray Pump		138.92	506.79	363.33	0.00	197.15	75.61	145.90	53.27	0.00	88.97
Storage Bin		0.00	2114.29	2790.00	0.00	379.70	0.00	608.68	409.09	0.00	171.35
Poultry Sheds		673.01	231.07	816.67	0.00	615.45	366.30	66.52	119.75	0.00	277.74
Dairy Sheds		771.08	2196.43	1000.00	0.00	977.50	419.67	632.33	146.63	0.00	441.13
Animals	Cows	6289.76	12627.14	7266.67	0.00	7206.30	3423.28	3635.20	1065.49	0.00	3252.09
	Buffaloes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Calves	509.64	442.86	0.00	0.00	485.00	277.38	127.49	0.00	0.00	218.87
Any Other (i)		271.14	123.21	400.00	0.00	254.30	147.57	35.47	58.65	0.00	114.76
Any Other (ii)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		10238.73	21636.07	14293.33	0.00	11956.00	5572.56	6228.77	2095.80	0.00	5395.55

Sample size = 100
Source: Field Survey

Table 3.7
Nature of Tenancy in Leasing-in Land (%)

Farm size	Share cropping	Fixed rent in cash	Fixed rent in kind	Both cash and kind	Against labour	Other
Marginal	0 (0.00)	3.92 (2.57)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Small	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Medium	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Large	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Total	0 (0.00)	3.92 (1.77)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)

Sample size = 100; figures in parenthesis indicate percentage to GCA
Source: Field Survey

Table 3.8
Percentage of Area under HYV Seeds

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops during 2008					
Maize	8.73 (5.72)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	8.73 (3.94)
Millet	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Paddy	36.35 (23.84)	23.55 (48.43)	5.28 (25.81)	0.00 (0.00)	65.18 (29.41)
Rabi crops during 2008					
Chillie	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Ginger	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Potato	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Turmeric	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Horticultural crops during 2008-09					
Pineapple	19.56 (12.83)	11.82 (24.31)	7.92 (38.71)	0.00 (0.00)	39.30 (17.74)
Mandarin Orange	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Broom Stick	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Tea	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Gross cropped area	152.50 (100.00)	48.63 (100.00)	20.46 (100.00)	0.00 (0.00)	221.59 (100.00)

Sample size = 100
Source: Field Survey

Table 3.9
Percentage of Area under Organic Farming

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops during 2008					
Maize	13.10 (8.59)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	13.10 (5.91)
Millet	3.24 (2.12)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	3.24 (1.46)
Paddy	6.14 (4.03)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	6.14 (2.77)
Rabi crops during 2008					
Chillie	1.20 (0.79)	0.10 (0.21)	0.00 (0.00)	0.00 (0.00)	1.30 (0.59)
Ginger	9.99 (6.55)	1.00 (2.06)	0.00 (0.00)	0.00 (0.00)	10.99 (4.96)
Potato	11.15 (7.31)	0.40 (0.82)	0.00 (0.00)	0.00 (0.00)	11.55 (5.21)
Turmeric	1.12 (0.73)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.12 (0.51)
Horticultural crops during 2008-09					
Pineapple	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Mandarin Orange	41.09 (26.94)	2.50 (5.14)	0.00 (0.00)	0.00 (0.00)	43.59 (19.67)
Broom Stick	4.71 (3.09)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	4.71 (2.13)
Tea	3.55 (2.33)	1.00 (2.06)	0.00 (0.00)	0.00 (0.00)	4.55 (2.05)
Gross cropped area	152.50 (100.0)	48.63 (100.0)	20.46 (100.0)	0.00 (0.0)	221.59 (100.0)

Sample size = 100
Source: Field Survey

Table 3.10
Cropping Pattern of Selected Farmers (Percentage of GCA)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops during 2008					
Maize	15.08 (9.89)	1.90 (3.91)	0.00 (0.00)	0.00 (0.00)	16.98 (7.66)
Millet	3.24 (2.12)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	3.24 (1.46)
Paddy	37.41 (24.53)	23.55 (48.43)	5.28 (25.81)	0.00 (0.00)	66.24 (29.89)
Rabi crops during 2008					
Chillie	1.20 (0.79)	0.10 (0.21)	0.00 (0.00)	0.00 (0.00)	1.30 (0.59)
Ginger	10.26 (6.73)	1.00 (2.06)	0.00 (0.00)	0.00 (0.00)	11.26 (5.08)
Potato	11.15 (7.31)	0.40 (0.82)	0.00 (0.00)	0.00 (0.00)	11.55 (5.21)
Turmeric	1.12 (0.73)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.12 (0.51)
Horticultural crops during 2008-09					
Pineapple	19.56 (12.83)	11.82 (24.31)	7.92 (38.71)	0.00 (0.00)	39.30 (17.74)
Mandarin Orange	41.09 (26.94)	2.50 (5.14)	0.00 (0.00)	0.00 (0.00)	43.59 (19.67)
Broom Stick	4.71 (3.09)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	4.71 (2.13)
Tea	7.68 (5.04)	7.36 (15.13)	7.26 (35.48)	0.00 (0.00)	22.30 (10.06)
Gross cropped area	152.50 (100.00)	48.63 (100.00)	20.46 (100.00)	0.00 (0.00)	221.59 (100.00)

Sample size = 100
Source: Field Survey

Table 3.11
Value of Output, Cost and Net Returns for the Survey Year –
Aggregate of All Crops (Rs) over Net Operated Area

Size-class	Value of output (main + by-product)		Cost of production per acre		Net returns (Farm business income)		Non-farm income per household	Total income per household
	Per household	Per acre	Material cost	Labour cost	Per household	Per Acre		
Marginal	45472.92	32839.58	12120.84	7867.643	19014.35	12764.14	20394.26	39408.61
Small	115391.90	35971.65	13560.81	8781.041	45604.76	13611.34	19375.71	64980.47
Medium	317732.78	46588.38	19425.05	10731.12	113710.48	16432.2	9973.33	123683.80
Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	63429.38	35179.91	13308.38	8420.098	25577.89	13391.41	19939.04	45516.93

Sample size = 100
Note: Labour cost includes the imputed value of family labour
Source: Field Survey

CHAPTER 4

PRODUCTION STRUCTURE AND RESOURCE USE UNDER HORTICULTURAL CROPS

4.1: An Introduction to the Crops Selected for the Study

A) Pineapple

Pineapple (Ananas comosus) is one of the commercially important fruit crops of India, though its origin can be traced back to the American continent, probably Brazil and Paraguay, from where the cultivation of pineapple gradually spread to other tropical parts of the world. In fact, the Portuguese introduced pineapple cultivation to India in 1548 AD. The annual world production of pineapple is estimated at 14.6 million tonnes, while India stands out to be the fifth largest producer of pineapple with an annual output of about 1.2 million tonnes (8.2 percent of world production. Other leading producers are Thailand, Philippines, Brazil, China, Nigeria, Mexico, Indonesia, Colombia and USA.

Pineapple serves as a good source of vitamins like A, B, C and also calcium, magnesium, potassium and iron, as also a natural source of bromelin, a digestive enzyme. Pineapple can be consumed fresh or in the form of juice, jam, squash and syrup, among which the canned slices and juices constitute about 70 percent of the production.

Pineapple is an excellent material to be preserved in different forms. The world production of pineapple is primary used in the used by canning industry, whereas the trade in fresh fruits is extremely confined. In fact, about 97 percent of the world output is utilized by processing industry, as it stands important next only to peaches for the canning industry. In sharp contrast to the global scenario, about 90 percent of pineapple produced in India is consumed in fresh, while only 10 percent of production is used for processing activities and canning.

Pineapple is suitable for cultivation in humid topics, and it grows well as long as the temperatures are not extreme, both in the coastal regions and interior parts. In particular, the optimum temperature required for successful cultivation is 22°-32° C. While in the one hand, high temperature at night is deleterious for the growth of the plant, on the other hand, a difference of at least 4° C between the day and night temperature is desirable. Pineapple can be grown up to 1,000 meters above mean sea level, only if the area is frost-free. The rainfall requirement ranges between 100-150 cm., while Sandy loam soil with pH between 5.0-6.0 is ideal for the growth of the plants.

In India, cultivation of pineapple is primarily confined to high rainfall and humid coastal regions in the peninsular India and hilly areas of North-Eastern region of the country, though it can also been grown commercially in the interior plains with medium rainfall and supplementary irrigation facilities. The major pineapple growing states in India include West Bengal, Karnataka, Nagaland, Assam, Meghalaya, Manipur, etc. The major varieties of pineapple grown include Kew, Queen, Mauritius in North-Eastern states and Giant Kew, Queen etc. in West Bengal.

B) Mandarin Orange

Mandarin orange (*Citrus reticulata*) is most common among citrus fruits grown in India. It occupies nearly 40% of the total area under citrus cultivation in India. The most important commercial citrus species in India are the mandarin (*Citrus reticulata*), sweet orange (*Citrus sinensis*) and acid lime (*Citrus aurantifolia*) sharing 41, 23 and 23 % respectively of all citrus fruits produced in the country.

In India, citrus is grown in 0.62 million ha. area with the total production of 4.79 million tonnes. The area under orange cultivation in India increased by 67% from 1.19 lakh ha. in 1991-92 to 1.99 lakh ha. in 2001-02 and the production increased by 57% (i.e. from 10.58 to 16.60 lakh tonnes). Oranges are mostly grown in the states of Maharashtra, Madhya Pradesh, Tamil Nadu, Assam, Orissa, West Bengal, Rajasthan, Nagaland, Mizoram, Arunachal Pradesh.

Orange is rich in vitamin C, A, B and phosphorus. Orange is consumed fresh or in the form of juice, jam, squash and syrup. It is the main source of peel oil, citric acid and cosmetics which have international market value.

Producers sell fruits to pre-harvest contractors and fetch unremunerative price. Mandarin growers receive better prices in local market in comparison to sale of fruits at orchards. Transportation cost of fruits and payment to commission agents has major share in market cost. Wide variations in prices were found in different local markets.

Producer's organizations and co-operative societies should be formed for marketing of mandarin fruits. Fruits should be harvested at proper maturity level. Precautions should be taken for avoiding injuries at the time of harvesting and transportation of fruits to the markets. There is need to develop alternative marketing channel involving co-operative societies to help the mandarin growers. Steps should be taken to link production, marketing and processing of Nagpur mandarin to avoid seasonal gluts in the markets. Careful harvesting and handling of harvested fruits to maintain their 'Sales appeal" and delicate flavour is of critical importance for mandarin orange considering its fragileness. Ways and means should be explored for providing cheap packing material and transport facilities. Advance marketing credit/loan facilities should be provided by the banks to the mandarin producers. In the absence of channelized system of marketing, crop insurance policy and minimum support price the citrus growers get meagre prices of mandarin fruits during the productive years. There is need to ensure remunerative price to the mandarin producer, reduction in marketing cost and also to ensure supply of orange at reasonable price to the consumer throughout the year.

Mandarins grow successfully in all frost free tropical and sub-tropical regions up to 1,500 m. above m.s.l. An annual rainfall of 100-120 cm. and temperature ranging from 10^0-35^0 C is suitable for cultivation of the crop. Mandarins can be grown in a wide variety of soils but medium or light loamy soils with slightly heavy sub-soil, well-drained with pH of 6.0-8.0 are ideal for cultivation.

Nagpur santra (mandarin) is chiefly grown in Satpura hills (Vidharba region) of Central India, hilly slopes of Darjeeling (West Bengal) and Coorg (Karnataka). In South India, Wynad, Nilgiri, Palney and Shevroy hills are the major mandarin growing belts while hills of Meghalaya (Khasi, Dusha, Garo, Jaintia), Mizoram, Tripura, Sikkim and Arunachal Pradesh have predominance in mandarins. In Assam, Brahmaputra valley and Dibrugarh districts are famous for mandarin production. The major mandarin orange producing states include Maharashtra, Madhya Pradesh, Tamil

Nadu, Rajasthan, Assam, Tripura etc., and West Bengal. The major verities grown are Ngapur Santra, Coorg Santra, Khasi Santra, Mudkhed, Shringar, Butwal, Dancy, Kara (Abohar), SZ-IN-COM, Darjeeling Mandarin, Sumithra mandarin, Seedless-182, Kinnow mandarin, etc.

4.2: Economics of Production, Cost and Resource Use in Horticulture

An analysis of the economics of production of the selected horticultural crops provides us with a deeper insight relating to impact of the National Horticulture Mission. It is here that the findings of the present study relating to the economics of production (with costs and returns) has been briefly described here for the selected horticultural crops, viz. pineapple and mandarin oranges. However, before we present our analysis, it remains customary to mention the methodology adopted in amortizing the fixed costs used in determining costs of production.

The annual fixed cost of orchard has been estimated by amortizing the capital cost on the orchard, i.e. the initial investment for plantation. The annualized fixed cost was arrived at by the amortized initial investment on the orchards, which included costs on account of labour and material investments for field preparation, plantation, pit digging, seedling, supporting materials and irrigation at the time of plantation.

The capital costs of the orchards were amortized over their entire life span, which are considered here to be 20 years for mandarin oranges and 3 years for pineapple. In this study, an interest rate of 5 per cent was considered to incorporate the rate of inflation in the cost components like labour, seedlings, etc.

The amortized cost was estimated with the help of following formula:

Amortized Cost of Orchard = $[(CI)\times(1+i)^{AL}\times i]/[(1+i)^{AL}-1]$ (1)
where, CI (Compounded Investment) = (II) × $(1+i)^{(dc-di)}$ (2)
where, *II* = initial investment
dc = year of data collection (2010)
di = year of plantation
AL = average life of plants
i = interest rate

and, Average life of Plant $= \sum_{i=1}^{n}(fi)(xi) + \sum_{i=1}^{n}(fi)$ over i

where, *f* = frequency of plants
x = age of plants (1,2,3,4….n)
i = ranges from zero to n, where n refers to the longest age of plant in the group.

In case of economics of pineapple production [Table 4.1(a)], it can be observed that total revenue accrued per acre of land from pineapple cultivation stands quite high at Rs.81,227/- per acre per annum on an average. However, the cost of production of pineapple also appears quite high at Rs. 55,820/- per acre on an average. Therefore, the net return from pineapple cultivation turns out to be Rs. 29,040/- per acre, excluding the fixed costs amortized over life time. Incorporating the fixed investments amortized over life time, net return from pineapple cultivation per acre of land stands at Rs.25,406/- on an average. However, it should be noted here that in case pineapple cultivation, the material investment contribute as much as three-fourths of the total costs incurred per acre. In particular, costs on account of manure and fertilizer accounts for as much as 49 percent of total cost per acre of land. Further, net returns from pineapple production come out to roughly decline with the increase in the size of farms.

In sharp contrast to pineapple cultivation, the costs of production and resource use in mandarin orange cultivation [Table 4.1(b)] appears completely different. In fact, the total revenue accrued per acre of land per annum from orange cultivation stands at Rs.18,444.01/- on an average. While the total costs of production stands at Rs.10,254.65/- per acre, costs on account of recurring labour application every year (variable labour costs) claims a share of 42.86 percent. Including the fixed costs amortized over life time, the net return per acre from mandarin orange cultivation turns out to be Rs.8,189.36/- on an average, which is much lower as compared to pineapple cultivation. It should be noted however that though the relative share of variable labour cost is much higher in case of orange production; in actual terms it is almost three-times per unit of land for pineapple cultivation.

4.3: Net Returns from Horticultural versus Non-Horticultural Crops

A comparison of net returns from horticultural crops and non-horticultural crops (Table 4.2) reveals that net return from horticultural crops like mandarin oranges and especially pineapple remain considerably higher than the traditional non-horticultural crops measured in terms of net monetary returns per acre of land. In fact, net return from pineapple stands almost four times the net return from traditional crops like paddy. As such, it can safely be said that horticulture appears as a more profitable cultivation practice in general as compared to traditional kharif crops. However, rabi crops like ginger, potato, turmeric and chilly also yield a higher return, though their cultivation is confined to tiny tracts of land, mostly as a backyard garden activity.

4.4: Use of Human Labour in Horticultural versus Non-Horticultural Crops

An analysis of the human labour application (crop-wise man-days per acre) reveals that the requirement of human labour in pineapple production is comparatively much higher than the use of human labour in case of mandarin oranges (Table 4.3.1). In particular, the use of human labour in pineapple cultivation is almost two-and-a-half times than that in case of mandarin oranges. A size-class wise comparison shows that average human labour application increases sharply with the increase in farm-size in case of both pineapple and mandarin orange production. It should be noted here that in this analysis, human labour application refers to both hired labour and family labour, converted at regional average wage rates.

A more detailed crop specific activities-wise analysis of use of human labour [Table 4.3.2 (a)] reveals that in case of pineapple cultivation, a major part of human labour has been expended in the application of fertilizer and manure to the field, followed by harvesting and collection, weeding and intercultural operations. In particular, while about 44.47 percent of recurring human labour application has been expended in the application fertilizers and manure to field, another 22.72 percent of recurring human labour application has been expended on harvesting and collection purposes. In total, the recurring human labour application in pineapple cultivation forms about 86 percent of total human labour application. On the other hand, human labour expended on fixed activities forms only 14 percent of total human labour application.

On the other hand, in case of mandarin oranges, the man-days required for manuring and fertilizer application is much less as compared to pineapple cultivation [Table 4.3.2 (b)]. Rather, the use of human labour in fixed activities like field preparation in terms of digging and pit making appears proportionately higher in case of mandarin orange cultivation as compared to the cultivation of pineapple. In particular, the share of labour expended on recurring activities comes out be about 31 percent against labour expended in recurring activities claiming a share of 69 percent.

4.5: Marketing Channels of Horticultural Crops

Marketing of output produced serves to be one of the most important aspects in case of horticultural crops. Unlike field crops like paddy, maize, etc., horticultural crops like pineapple and mandarin oranges are perishable in nature. This has been especially true in the study region as the variety of pineapple and mandarin oranges cultivated in the region are much better for consumption in raw instead of preserving in cans.

In case of pineapple [Table 4.4 (a)], we find that the pineapple produced by the sample farms is marketed through different marketing channels, which vary greatly over the size-classes. In fact, a major part of output produced by the marginal farms is channelled to the intermediaries at the farm gates, which acts as the predominant marketing channel for the marginal farms. On the other hand, a major part of the output produced by the larger farms is marketed to the wholesale market of the nearest town (Siliguri). This in turn reflects that while the larger farms are able to sell their output directly to the wholesale markets (and perceivably obtained relatively higher price of output), the smaller farms on the other hand are often compelled to sell their output at the farm-gate to the intermediaries. On the whole, the share of output sold at the wholesale market stands at about 55 percent, while that for intermediaries and local markets stand at 28 percent and 16.5 percent respectively. Only less than a percent of the output is sold to the village directly by the farmers. It remains extremely unfortunate to observe that the government agencies or the cooperative agencies do not have any role in marketing of output in the study region.

In case of the mandarin orange too [Table 4.4 (b)], it has been observed that there has been a complete absence of formal marketing channels like government agencies or cooperatives to the relief of the farmers. As such, most of the output produced by the marginal farms is sold to the intermediaries at the farm-gates, followed by the wholesale markets and local markets. On the whole, while about 41 percent of output produced is sold to the wholesale market, about 37 percent and 20 percent of output is sold to the intermediaries at the farm gates and in local markets respectively. Less than 2 percent of the output is sold to the village directly by the farmers.

4.6: On Farm Processing Activities in Horticultural Crops

In case of both pineapple and mandarin oranges, it has been found that none of the sample beneficiary farmers are involved in on-farm processing activities. However, it should be noted here that the variety of pineapple grown in the study region is best-suited for consumption in raw, though they can processed also. However, it should also be noted here that there has not been a single pineapple processing plant in the particular study region. In case of mandarin orange also we, the researchers, have not come across a single on-farm processing unit in the particular study region. At the same time, there is a complete absence of orange processing plants nearby. In fact, the variety grown (Darjeeling variety) is typically marketed in the wholesale market (either by the farmers themselves or through intermediaries) to be consumed mostly in raw.

4.7: Summary of the Chapter

There is no doubt in the fact that an analysis of the economics of production of the selected horticultural crops provides us with a deeper insight relating to the impact of the National Horticulture Mission. It is here that the findings on production structure and resource use of the selected horticultural crops reveal that in case of pineapple, total revenue accrued per acre of land stands quite high (as also the cost of production), thereby generating higher net returns. In sharp contrast to this, total revenue accrued per acre of land from mandarin orange cultivation comes out to be much less than pineapple cultivation (as also the costs of production).

Again, a comparison of net returns from horticultural crops and non-horticultural crops reveals that net return per unit of land from the selected horticultural crops (viz. pineapple and mandarin oranges) turns out to be much higher than the net returns from kharif crops like paddy, maize, etc. However, net return per unit of land from pineapple cultivation turns out to be more than double than that from mandarin oranges.

In case of human labour application per unit of land, it has been observed that the application of human labour (including family labour) remains much higher for pineapple cultivation as compared to traditional kharif crops like paddy. On the other hand, in case of mandarin oranges, it turns out that labour application per acre of land remains much lower as compared to other traditional kharif crops like paddy. However, a detailed analysis of use of human labour by activity reveals that in case of pineapple, application of fertilizer and manure to the field serves to be the highest labour absorbing activity (followed by harvesting and collection, weeding and intercultural operations). On the other hand, in case of mandarin oranges, comparatively higher has been expended on field preparation, especially during the year of plantation.

Now moving towards marketing of output, it is hard to find that in case of both pineapple and mandarin orange, there has been a complete absence of formal marketing channels like government agencies or cooperatives to the relief of the farmers. As such, most of the output is sold to the wholesale markets, followed by selling of output to the intermediaries at the farm-gates and to local markets. In fact, only a few larger farms are able to sell their product directly to the wholesale markets, while the smaller farms on the other hand are often compelled to sell their output at the farm-gate to intermediaries.

In case of both pineapple and mandarin oranges, it is extremely unfortunate to observe that none of the sample beneficiary farmers are involved in on-farm processing activities. In fact, there is a complete absence of pineapple or orange processing units/plants in the in the regions concerned. As such, the output is sold in raw, and non additional value is generated through processing activities.

Table 4.1 (a)
Net Returns Per Acre from Pineapple Cultivation (Rs per Acre per Annum)

Farm Size		Marginal	Small	Medium	Large	Total
Average Area Planted (acres)		0.58	0.91	2.64	0.00	0.79
Preparatory tillage		4644.60 (8.44)	4984.59 (8.89)	6487.38 (10.16)	0.00 (0.00)	4843.56 (8.68)
Manure & fertilizer		27349.84 (49.71)	26811.45 (47.81)	31027.26 (48.61)	0.00 (0.00)	27430.50 (49.14)
Transplanting & gap filling		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Irrigation, canal, electricity and diesel		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Weeding and Inter cultural operations		2417.79 (4.39)	2399.34 (4.28)	3105.16 (4.86)	0.00 (0.00)	2454.24 (4.40)
Topping / pruning		3928.09 (7.14)	3933.00 (7.01)	5931.81 (9.29)	0.00 (0.00)	4049.59 (7.25)
Plant protection, pesticides etc.		921.24 (1.67)	1181.28 (2.11)	1033.66 (1.62)	0.00 (0.00)	995.60 (1.78)
Repair, maintenance and depreciation@		1784.78 (3.24)	2622.69 (4.68)	682.17 (1.07)	0.00 (0.00)	1936.48 (3.47)
Harvesting and collection		2909.72 (5.29)	3422.06 (6.10)	4798.94 (7.52)	0.00 (0.00)	3156.28 (5.65)
Grading, storage, transport, packing		6818.82 (12.39)	6564.28 (11.71)	6151.27 (9.64)	0.00 (0.00)	6712.59 (12.03)
Market/mandi fee etc.		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Miscellaneous		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Interest on Working Capital#		691.45 (1.26)	445.62 (0.79)	353.79 (0.55)	0.00 (0.00)	607.27 (1.09)
Variable labour Costs		13428.54 (24.41)	14101.10 (25.15)	18214.53 (28.53)	0.00 (0.00)	13890.57 (24.88)
Variable Material Costs		38037.80 (69.13)	38263.20 (68.24)	41356.91 (64.78)	0.00 (0.00)	38295.55 (68.60)
Total Variable Cost		51466.34 (93.55)	52364.30 (93.38)	59571.44 (93.32)	0.00 (0.00)	52186.11 (93.49)
Fixed cost including planting material, field preparation cost, supporting material and irrigation setup ##	Material cost	2776.71 (5.05)	2894.51 (5.16)	3301.10 (5.17)	0.00 (0.00)	2838.80 (5.09)
	Labour cost	772.90 (1.40)	816.18 (1.46)	961.91 (1.51)	0.00 (0.00)	795.49 (1.43)
Total Cost		55015.95 (100.00)	56074.99 (100.00)	63834.44 (100.00)	0.00 (100.00)	55820.41 (100.00)
Total Revenue		80918.57	81933.83	81653.85	0.00	81226.66
Total Revenue - Total Cost		25902.63	25858.83	17819.41	0.00	25406.25
Total Revenue - Variable Cost		29452.24	29569.53	22082.42	0.00	29040.54
Output produced per acre (quintals)*		107.07	107.16	107.42	0.00	107.16

Source: Field Survey, *Sample Size = 50*
Note:
@ Repair, maintenance and depreciation is 10% discounted value of agricultural assets holdings including tractor & implements and tubewell motor etc. that is divided in proportionate to each crop sown during the year.
# Interest on working capital is interest paid on the loans/borrowing divided in proportionate to each crop sown during the year.
Amortized over the life time (3 years)
All variables are calculated on a yearly basis

Table 4.1 (b)
Net Returns Per Acre from Mandarin Orange Cultivation (Rs per Acre per Annum)

Farm Size		Marginal	Small	Medium	Large	Total
Average Area Planted (acres)		0.84	2.50	0.00	0.00	0.87
Preparatory tillage		1306.76 (12.73)	1335.60 (13.53)	0.00 (0.00)	0.00 (0.00)	1307.33 (12.75)
Manure & fertilizer		1983.67 (19.33)	2236.08 (22.65)	0.00 (0.00)	0.00 (0.00)	1988.72 (19.39)
Transplanting & gap filling		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Irrigation, canal, electricity and diesel		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Weeding and Inter cultural operations		814.71 (7.94)	1016.82 (10.30)	0.00 (0.00)	0.00 (0.00)	818.75 (7.98)
Topping / pruning		511.56 (4.98)	502.74 (5.09)	0.00 (0.00)	0.00 (0.00)	511.39 (4.99)
Plant protection, pesticides etc.		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Repair, maintenance and depreciation@		1158.82 (11.29)	715.55 (7.25)	0.00 (0.00)	0.00 (0.00)	1149.95 (11.21)
Harvesting and collection		822.11 (8.01)	824.88 (8.36)	0.00 (0.00)	0.00 (0.00)	822.16 (8.02)
Grading, storage, transport, packing		783.30 (7.63)	895.44 (9.07)	0.00 (0.00)	0.00 (0.00)	785.54 (7.66)
Market/mandi fee etc.		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Miscellaneous		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Interest on Working Capital#		803.02 (7.82)	0.00 ()	0.00 (0.00)	0.00 (0.00)	786.96 (7.67)
Variable Labour Cost		4380.86 (42.69)	5107.20 (51.73)	0.00 (0.00)	0.00 (0.00)	4395.39 (42.86)
Variable Material Costs		3803.08 (37.06)	2419.91 (24.51)	0.00 (0.00)	0.00 (0.00)	3775.42 (36.82)
Total Variable Cost		8183.94 (79.75)	7527.11 (76.24)	0.00 (0.00)	0.00 (0.00)	8170.80 (79.68)
Fixed cost including planting material, field preparation cost, supporting material and irrigation setup ##	Material cost	1488.37 (14.50)	1691.42 (17.13)	0.00 (0.00)	0.00 (0.00)	1492.43 (14.55)
	Labour cost	590.14 (5.75)	654.10 (6.63)	0.00 (0.00)	0.00 (0.00)	591.41 (5.77)
Total Cost		10262.45 (100.00)	9872.63 (100.00)	0.00 (100.00)	0.00 (100.00)	10254.65 (100.00)
Total Revenue		18452.38	18034.00	0.00	0.00	18444.01
Total Revenue - Total Cost		8189.93	8161.37	0.00	0.00	8189.36
Total Revenue - Variable Cost		10268.44	10506.89	0.00	0.00	10273.21
Output produced per acre (quintals)		9.83	9.60	0.00	0.00	9.83

Source: Field Survey, *Sample Size = 50*
Note:
@ Repair, maintenance and depreciation is 10% discounted value of agricultural assets holdings including tractor & implements and tubewell motor etc. that is divided in proportionate to each crop sown during the year.
# Interest on working capital is interest paid on the loans/borrowing divided in proportionate to each crop sown during the year.
Amortized over the life time (20 years)
* All variables are calculated on a yearly basis

Table 4.2
Net returns (gross value of output - total cost) from horticultural and non horticultural crops (crop wise Rs per acre)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops during 2008					
Maize	4454.10	7612.99	0.00	0.00	4813.06
Millet	4338.15	0.00	0.00	0.00	4338.15
Paddy	7040.30	6022.36	5861.31	0.00	6780.06
Rabi crops during 2008					
Chillie	9018.78	8950.00	0.00	0.00	9001.58
Ginger	8533.46	7672.00	0.00	0.00	8512.94
Potato	5989.04	6065.00	0.00	0.00	5990.76
Turmeric	5462.73	0.00	0.00	0.00	5462.73
Horticultural crops during 2008-09					
Pineapple	25902.62	25858.83	17819.41	0.00	25406.24
Mandarin Orange	8189.93	8161.37	0.00	0.00	8189.36
Broom Stick	3828.65	0.00	0.00	0.00	3828.65
Tea	15399.77	20748.94	21986.45	0.00	18229.05

Sample Size = 100
Source: Field Survey

Table 4.3.1
Use of human labour in crop production (crop wise man days per acre)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops during 2008					
Maize	54.27	61.28	0.00	0.00	80.05
Millet	63.88	0.00	0.00	0.00	80.88
Paddy	74.30	77.90	77.08	0.00	74.41
Rabi crops during 2008					
Chillie	66.00	63.47	0.00	0.00	65.37
Ginger	54.61	49.83	0.00	0.00	54.49
Potato	48.51	46.60	0.00	0.00	48.46
Turmeric	89.25	0.00	0.00	0.00	89.25
Horticultural crops during 2008-09					
Pineapple	134.29	141.01	182.15	0.00	138.90
Mandarin Orange	54.77	63.86	0.00	0.00	54.94
Broom Stick	32.89	0.00	0.00	0.00	32.89
Tea	51.74	55.22	62.28	0.00	54.90

Sample Size = 100
Note:
1. Labour days include family labour days,
2. Use of variable labour per year for horticultural crops,
3. The man days are calculated by dividing the labour cost by the wage rate prevailing in the village

Source: Field Survey

Table 4.3.2 (a)
Use of human Labour in Pineapple Cultivation by Activity (Man Days Per Acre)

Farm Size	Marginal	Small	Medium	Large	Total
Recurring activities undertaken every year#					
Preparatory tillage	11.10	12.47	17.10	0.00	11.82
Manure & fertilizer	61.30	60.15	74.07	0.00	61.77
Transplanting & gap filling	0.00	0.00	0.00	0.00	0.00
Irrigation, electricity and diesel	0.00	0.00	0.00	0.00	0.00
Weeding and inter cultural operations	21.67	20.81	25.50	0.00	21.67
Topping / pruning	8.82	9.90	13.49	0.00	9.38
Plant protection, pesticides etc.	2.30	3.46	4.00	0.00	2.70
Harvesting and collection	29.10	34.22	47.99	0.00	31.56
Grading, storage, transport, packing	0.00	0.00	0.00	0.00	0.00
Total Recurring Activities	134.29	141.01	182.15	0.00	138.90
Fixed activities undertaken during the plantation year##					
Planting material like seedling, nursery etc	12.30	12.61	14.89	0.00	12.54
Field preparation – digging, pit making, fencing etc	9.81	10.36	12.41	0.00	10.11
Supporting material – bamboo, iron angles, etc	0.00	0.00	0.00	0.00	0.00
Laying down of permanent irrigation	0.00	0.00	0.00	0.00	0.00
Total Fixed Activities	22.11	22.97	27.30	0.00	22.65
(C) Gross Total	156.40	163.98	209.45	0.00	161.55

Sample Size = 50
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.
Source: Field Survey

Table 4.3.2 (b)
Use of human Labour in Mandarin Orange Cultivation by Activities (Man Days Per Acre)

Farm Size	Marginal	Small	Medium	Large	Total
(A) Recurring activities undertaken every year#					
Preparatory tillage	9.97	11.03	0.00	0.00	9.99
Manure & fertilizer	16.83	18.90	0.00	0.00	16.87
Transplanting & gap filling	0.00	0.00	0.00	0.00	0.00
Irrigation, electricity and diesel	0.00	0.00	0.00	0.00	0.00
Weeding and inter cultural operations	8.34	11.03	0.00	0.00	8.39
Topping / pruning	4.34	4.73	0.00	0.00	4.34
Plant protection, pesticides etc.	0.00	0.00	0.00	0.00	0.00
Harvesting and collection	8.31	9.66	0.00	0.00	8.34
Grading, storage, transport, packing	6.98	8.51	0.00	0.00	7.01
Total Recurring Activities	54.77	63.86	0.00	0.00	54.94
(B) Fixed activities undertaken during the plantation year##					
Planting material like seedling, nursery etc	0.00	0.00	0.00	0.00	0.00
Field preparation - digging, pit making, fencing etc	24.48	26.93	0.00	0.00	24.53
Supporting material - bamboo, iron angles, etc	0.00	0.00	0.00	0.00	0.00
Laying down of permanent irrigation	0.00	0.00	0.00	0.00	0.00
Total Fixed Activities	24.48	26.93	0.00	0.00	24.53
(C) Gross Total	79.25	90.79	0.00	0.00	79.47

Sample Size = 50
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.
Source: Field Survey

Table 4.4 (a)
Marketing Channels through which Pineapple Output were Sold by the Selected Households (Percentage of Output)

	Wholesale market	Local market	Village directly	Coop-erative	Govt agencies	Intermediaries at farm gate	Merchant or pre arranged Contract	Others	Total
Marginal	29.33	26.11	1.16	0.00	0.00	43.40	0.00	0.00	100.0
Small	65.69	11.90	0.54	0.00	0.00	21.87	0.00	0.00	100.0
Medium	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.0
Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.0
Total	54.64	16.52	0.74	0.00	0.00	28.10	0.00	0.00	100.0

Sample Size = 50
Source: Field Survey

Table 4.4 (b)
Marketing Channels through which Mandarin Orange Output were Sold by the Selected Households (Percentage of Output)

	Wholesale market	Local market	Village directly	Coop-erative	Govt agencies	Intermediaries at farm gate	Merchant or pre arranged Contract	Others	Total
Marginal	37.26	21.55	2.08	0.00	0.00	39.11	0.00	0.00	100.0
Small	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.0
Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.0
Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.0
Total	40.80	20.33	1.96	0.00	0.00	36.90	0.00	0.00	100.0

Sample Size = 50
Source: Field Survey

CHAPTER 5
IMPACT OF NHM ON THE EXPANSION OF HORTICULTURAL CROPS

5.1: Impact of NHM on Area and Yield of Selected Horticultural Crops

National Horticulture Mission (NHM) in West Bengal was implemented with a holistic approach towards generation of employment and increase in income of the farmers in rural sector. In the earlier chapter, a vivid analysis of production and resource use of the selected crops viz. Pineapple and Mandarin Oranges in Jalpaiguri and Darjeeling district has been made as an attempt to evaluate the impact of the mission and its efficacy in the study area. It is here that in the present chapter, an analysis has been made of the subjective perceptions of the beneficiary farmers owing to implementation of this mission.

Here, a comparative analysis of area and productivity of pineapple and mandarin oranges has been made [Tables 5.1 (a) and 5.1 (b)], which provides provide us with some interesting revelations. In fact, we find that on an average the area cultivated under pineapple increased only marginally over the period 2004-05 to 2009-10, from 0.76 acres per household to 0.79 acres. But in case of mandarin oranges the average area steadily increased over the period and reached the maximum in 2009-10, from where it again dropped to some extent. The increase in area under mandarin orange cultivation is consistent for all the size-classes concerned. It should be noted here that these findings are in tune with the earlier findings made on secondary data on the selected fruit crops, as has been analyzed in the second chapter.

In case of yield rate for pineapple, we see marginal fluctuations in yield rate among all the categories of farmer households. In comparison to 2004-05, yield rate of pineapple among marginal farmers increased by 1.78 percent in 2009-10. The corresponding figures for small and medium farmers are 1.39 percent and 3.87 percent respectively. On the other hand, the yield rate of mandarin orange among the marginal farmers over the same period witnessed a quantum jump with an increase of 22.26 percent on an average. The increase in the yield rate was particularly prominent among the semi-medium farms, as compared to their smaller counterparts.

5.2: Rejuvenation/Protection, Resource Procurement through NHM

From the available field level data relating to the information on procurement of certified and non-certified input quantities [Table 5.2.1 (a)], it is interesting to find that the per acre coverage under certified input verities increased gradually over the period 2004-05 to 2009-10. It is on the basis of this fact that we can surmise that horticulture mission has made a dent in the method of farming operations among the farmers. This positive impact on the method of farming operations is primarily due to replacement of saplings in certain periods with improved/certified varieties of seeds and saplings. This dissemination of modern cultivation techniques with the improved varieties (as compare to the traditional ones) has to some extent influenced the cultivators in these areas. However, in case of mandarin oranges, it can be observed that the farmers primarily resort to traditional cultivation practices, and the use of certified inputs is extremely low. Nevertheless, distribution of sapling under NHM during 2008-09 has no doubt increased the choice in favour of certified inputs to some extent.

Hence, with the passage of time and with the implementation of NHM, it appears that the farmers gradually got accustomed of using certified inputs in place of the non-certified ones. Hence, there is a strong indication that the farmers are positively influenced with the extension programmes such as rejuvenation and protection supports under NHM, which has manifested itself with an increase in productivity of pineapple and mandarin oranges [Tables 5.2.2 (a) and 5.2.2 (b)]. In absolute figure, the marginal farmers have benefited the most due to rejuvenation and protection support of this scheme. For the marginal farms growing pineapple, the area expanded by rejuvenation (acres per household per crop) stands at 0.02 acres. The corresponding figure in case of mandarin oranges stands at 0.23 acres, which is much higher than the existing area rejuvenated under pineapple cultivation.

It is interesting to observe that the rejuvenation and protection supports have resulted into an increase in productivity for all the size-class of farmers concerned, especially in case of pineapple cultivation. In particular, increase in productivity has been the maximum for the medium farmers at about 3.29 quintals per acre over the period 2004-05 to 2009-10. The corresponding figure for the marginal and the small farmers stand at 1.95 and 1.76 quintals per acre respectively over the same period. In case of mandarin oranges, the enhancement in productivity comes out to be fairly insignificant for all the size-classes concerned.

Nevertheless, it is highly encouraging to note that there has been an impressive increase in the yield of mandarin oranges (to the magnitude of about 23.77 percent), especially owing to an increase in area under cultivation. In case of pineapple cultivation, the increase in yield has been quite low as compared to mandarin oranges, which is primarily due to insignificant increase in area under the crop.

5.3: NHM Reaching to the Households with Resource Provision

It needs to specified at the outset that the present study classifies the sources of NHM resource procurement of resources for pineapple and mandarin oranges into six broad categories- namely i) Department of Horticulture, ii) Private Nursery, iii) Open Market, vi) Fellow Farmers, v) Self owned, and vi) None (for those haven't procured saplings from any of the sources from (i) to (v). Note that NHM resources here refer to provision of saplings only, and not cash subsidies. Sources like contract farming has not been considered as such contracts do not operate in the study region concerned.

Among these categories, private nurseries appear to play an important role in case of provision of pineapple saplings, followed by the self-owned saplings and sapling obtained from fellow farmers [Table 5.3 (a)]. A size-class-wise analysis reveals that while the larger pineapple producers depend heavily on private nurseries, the smaller producers in contrast grow sapling by themselves to a much greater extent. The role of fellow farmers also appears significant in this respect. It is highly disturbing to note that provision of sapling from government agencies is completely absent in case of pineapple cultivation.

In case of mandarin oranges [Table 5.3 (b)], a majority of the saplings are purchased from open markets, while an even greater proportion of farmers have not opted for any of the sources mentioned here. However, 8.67 percent of farms have obtained sapling directly from the Department of Horticulture.

5.4: Subsidy Provision under NHM

The implementation of National Horticulture Mission with its basic conjecture of holistic approach assigns due importance on subsidy provision for the resource-poor farmers. As the present study is conducted only upon beneficiary households of the scheme, it is found that all the sample households have received subsidies in some form or the other (Table 5.4). In fact, while 56 percent of the households has received subsidy under area expansion programme, another 21 percent has received subsidy for rejuvenation programme. Apart from these two groups, the rest 23 percent has got subsidy under both the programmes. However, it comes out that the total value of subsidy provided under the present scheme through cash/sapling forms only 3.85 percent of the total investment required.

5.5: Capacity Building by NHM

It was presumed that the extension activities of the state and district horticultural officers with training and dissemination activities might have a positive impact on area expansion, rejuvenation and growing interest for enhancing horticultural cultivation among the farmers. In the fag-end of our discussion it will be revealed such dissemination and extension activities provided by the district horticulture and agriculture officials make only a sorry figure (Table 5.5). It is, however, revealed that about 44 percent of the households have obtained training either from government or non-government organizations. But the average number of days of training per households stands at merely 0.71 days (0.41 days by State Horticulture Department and 0.30 days by NGOs), even though the trainings were organized mostly nearby in the periphery of the villages.

In spite of the existence of numerous State-sponsored organizations, the survey finds that only the State Horticulture Department imparted training and provided extension services to the farmers. The role of State Agricultural Universities and Colleges, Krishi Vigyan Kendras, Kisan Call Centres, the Cooperatives and Local Bodies, and the Special Research Stations made a very negligible impact on cultivation of horticultural crops in the study area. Although the farmers were non-committal to divulge any fact about input dealers and private company representatives, they (the farmers) vehemently argued for active participation and contribution of such public enterprises for augmentation and agricultural development in the study area.

5.6: Perception of Households about NHM

Needless to mention, besides better extension facilities and improved marketing and processing infrastructure, provisions of many other crucial aspects is supposed to have significant positive impact in upholding horticultural production and enhancement of horticultural cultivation. However, the study finds that only a few beneficiary farmer households have been benefitted from such extension, development and crop promotion activities (Table 5.6.1). In fact, while about 24 percent of the sample beneficiary households have been benefitted rejuvenation with improved varieties, only 28 percent have been benefitted training and capacity building activities. About 21 percent of the farmers benefited from increased availability of good quality planting materials like nursery.

It has been discussed earlier that the farmers engaged in mandarin orange cultivation are out and out dependent on organic manure and traditional method of pest control. The mandarin orange producers, on the other hand, are invasive to divulge active influence of fertilizer dealers and middlemen in their areas. Post harvest management facilities like packhouse, storage units, and mobile processing units are seen nowhere in these areas. Obviously the cumulative effect of non-existence and non-performance of such important items of modern agriculture have negative impact of growth in horticultural development in both of these two districts.

It is here that in case of perception of sample beneficiary households about the scheme NHM, we got a mixed response from the households regarding the functioning of NHM in the study area (Table 5.6.2). The perception of households about functioning of NHM was categorized in various items and the well-structured questionnaire was canvassed among them. From the subjective response we find that NHM did well by providing financial assistance to the farmers. The financial assistance as provision of subsidy had, to some extent, boosted up the farmers for horticultural cultivation.

However, it is interesting to observe that as while 74 percent of the sample beneficiary households responded that NHM has not in any way increase employment in farming activities, as much as 65 percent of the households also alleged that NHM has played an insignificant role in increasing income from cultivation. Further, 68 percent of the respondents consider that the subsidies provided under NHM have actively benefitted the farmers to some extent. In should also be noted here that more than one-thirds of all sample households (36 percent) suggested that the government should increase the amount of subsidy provided under NHM to make the policy a success, especially as the total value of subsidy stands less than 5 percent of total investment requirement.

It has to be noted that due to improper market infrastructure and unorganized nature of cultivation practices, the farmers are more or less dependent on traditional cultivation methods. It appears that the public sector has failed to provide off-farm infrastructure for attracting the farmers for more inclination towards horticultural cultivation. It is here that the suggestions from the beneficiary side remain crucial for chalking out specific requirements to make the policy a success.

5.7: Summary of the Chapter

An analysis of the subjective perceptions of the farmers in general and the beneficiaries owing to implementation of this mission in particular brings out some interesting observations. We find that on an average though the area cultivated by the farmers belonging to different size-classes in the sample area covered under pineapple cultivation increased marginally over

the period 2004-05 to 2009-10, that in case of mandarin oranges exhibited a steady increase. In case of productivity, it has been observed that the yield rate for pineapple increased only marginally over the aforesaid period, while that for mandarin oranges increased by 22.26 percent on an average.

Again, it is important to note that the per acre coverage under certified input verities increased gradually over the period 2004-05 to 2009-10, which indicates that the dissemination of the higher production of the improved varieties (as compared to the traditional ones) has to some extent influenced the cultivators in these areas.

In case of area expansion by rejuvenation and protection (acres per household per crop) it has been observed that area per household per crop increased by 0.02 acres and 0.23 acres respectively for the marginal farmers in case of pineapple and mandarin orange cultivation respectively. Furthermore, in case of yield rate, it is interesting to note that the rejuvenation and protection supports have resulted into an increase in productivity for all the size-class of farmers in the study area, especially for mandarin oranges.

Regarding procurement of resources for pineapple and mandarin oranges cultivation, it has been observed that the private nurseries and fellow farmers play an important role in case of provision of pineapple saplings, while open market sources and the farmer themselves are the major source of sapling in case of mandarin oranges. The role of State Department of Horticulture is turns out to be extremely limited in this particular aspect.

In case of subsidy, this survey reveals the subsidy provided under the present scheme forms only a negligible amount of the total investment requirement, especially for pineapple cultivation. In fact, the total value of subsidy accounts for less than 5 percent on an average of total investment requirement.

It is significant also to note that the dissemination and extension activities provided by the district horticulture and agriculture officials make only a sorry figure as the frequency of training provided by the state horticulture department to the marginal farmers stands extremely low for the sample beneficiary households.

It remains highly significant to observe that post harvest management facilities like packhouse, storage units, and mobile processing units are seen nowhere in these study areas. Understandably enough, the effect of non-existence and non-performance of such important activities/aspects of modern agriculture have little impact on growth and development of horticultural in the study area.

However, from the subjective responses made by the farmer households, we find that NHM did well by providing financial assistance and subsidy to the farmers as those have, to some extent, boosted up the farmers towards diversifying cropping pattern in favour of horticultural crops. In fact, on an average, while 85 percent of the sample beneficiaries express that provision of subsidies is an attractive an important part of the NHM scheme, 65 percent of beneficiary farmer has expressed that financial assistance can be considered as a good point of the mission.

It thus makes sense when we find that on an average 36 percent of beneficiary farmers in the study area aspire for enhancement of subsidy amount. Again, about one-fourths of the beneficiary farmers in the study area expressed that proper marketing facilities should be developed to make NHM more effective. At same time, a large section of beneficiary farmers expressed that enhancing institutional credit and improving extension and capacity building services may bring about drastic changes in agriculture, especially horticulture, in the study region.

Table 5.1 (a)
Impact of NHM on Area and Yield Rate of Pineapple

Year	Area cultivated in acres per household					Yield rate obtained quintals per acre*				
	Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
2004-05	0.55	0.89	2.61	0.00	0.76	105.11	105.66	103.87	0.00	105.18
2005-06	0.54	0.89	2.61	0.00	0.76	105.39	107.35	105.24	0.00	105.89
2006-07	0.54	0.89	2.61	0.00	0.75	104.31	106.58	103.65	0.00	104.86
2007-08	0.54	0.89	2.61	0.00	0.75	104.83	104.96	105.79	0.00	104.92
2008-09	0.54	0.89	2.61	0.00	0.75	105.56	105.27	104.08	0.00	105.40
2009-10	0.58	0.91	2.64	0.00	0.79	107.06	107.42	107.16	0.00	107.16
Average	0.55	0.89	2.62	0.00	0.76	105.38	106.21	104.97	0.00	105.57

** Calculated on a yearly basis; Sample Size = 50*
Source: Field Survey

Table 5.1 (b)
Impact of NHM on Area and Yield Rate of Mandarin Oranges

Year	Area cultivated in acres per household					Yield rate obtained quintals per acre				
	Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
2004-05	.69	1.50	0.00	0.00	.71	9.80	9.55	0.00	0.00	9.79
2005-06	.69	1.50	0.00	0.00	.71	9.95	9.61	0.00	0.00	9.94
2006-07	.70	1.80	0.00	0.00	.72	10.08	9.61	0.00	0.00	10.07
2007-08	.71	1.80	0.00	0.00	.74	10.43	9.56	0.00	0.00	10.41
2008-09	.83	2.50	0.00	0.00	.86	9.59	9.60	0.00	0.00	9.59
2009-10	.84	2.50	0.00	0.00	.87	9.83	9.60	0.00	0.00	9.83
Average	0.74	1.93	0.00	0.00	0.77	9.95	9.59	0.00	0.00	9.94

* Calculated on a yearly basis; Sample Size = 50
Source: Field Survey

Table 5.2.1 (a)
Area/Productivity Expansion via Rejuvenation/Protection through NHM Resource Provision in Pineapple Cultivation

Year	Input quantity procured (acres) - certified					Input quantity procured (acres) – non certified				
	Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
2004-05	1.47	1.06	1.17	0.00	3.70	4.77	2.80	1.44	0.00	9.02
2005-06	1.88	1.22	1.30	0.00	4.40	4.15	2.64	1.31	0.00	8.11
2006-07	2.87	1.99	1.15	0.00	6.01	3.08	1.90	1.46	0.00	6.45
2007-08	3.98	2.28	1.63	0.00	7.89	2.04	1.59	0.98	0.00	4.61
2008-09	4.94	2.97	1.65	0.00	9.57	1.12	0.90	0.96	0.00	2.98
2009-10	5.29	3.13	2.30	0.00	10.71	2.15	0.95	0.39	0.00	3.49

Sample Size = 50
Source: Field Survey

Table 5.2.1 (b)
Area/Productivity Expansion via Rejuvenation/Protection through NHM Resource Provision in Mandarin Orange Cultivation

Year	Input quantity procured (acres) - certified					Input quantity procured (acres) – non certified				
	Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
2004-05	0.00	0.00	0.00	0.00	0.00	1.69	.08	0.00	0.00	1.76
2005-06	0.00	0.00	0.00	0.00	0.00	1.69	.08	0.00	0.00	1.76
2006-07	0.00	0.00	0.00	0.00	0.00	2.05	.39	0.00	0.00	2.44
2007-08	0.40	0.00	0.00	0.00	0.40	2.25	.09	0.00	0.00	2.34
2008-09	6.10	0.13	0.00	0.00	6.23	3.38	.70	0.00	0.00	4.08
2009-10	1.59	.00	0.00	0.00	1.59	2.17	.13	0.00	0.00	2.30

Sample Size = 50
Source: Field Survey

Table 5.2.2 (a)
Increase in Productivity due to Rejuvenation/Protection Supported by the NHM in Pineapple Cultivation

Sr No	Details of the items	Marginal	Small	Medium	Large	Total
1	Rejuvenation or protection support provided under NHM (% of households)	68.00	26.00	6.00	0.00	100.00
2	Area expansion by rejuvenation/ protection (acres per household)	0.02	0.02	0.03	0.00	0.02
3	Existing area rejuvenated /protected under the Mission (acres per household)	0.00	0.00	0.00	0.00	0.00
4	Number of trees per acre rejuvenated /protected	-	-	-	-	-
5	Productivity enhancement as a result of rejuvenation (quintals per acre)	1.95	1.76	3.29	0.00	1.98
6	Increase in Yield (percentages)	6.37	3.42	5.09	0.00	5.21

Sample Size = 50
Source: Field Survey

Table 5.2.2 (b)
Increase in Productivity due to Rejuvenation/Protection Supported by the NHM in Mandarin Orange Cultivation

Sr No	Details of the items	Marginal	Small	Medium	Large	Total
1	Rejuvenation or protection support provided under NHM (% of households)	98.00	2.00	0.00	0.00	100.00
2	Area expansion by rejuvenation/ protection (acres per household)	0.15	1.00	0.00	0.00	0.17
3	Existing area rejuvenated /protected under the Mission (acres per household)	0.09	0.00	0.00	0.00	0.09
4	Number of trees per acre rejuvenated /protected	49.76	0.00	0.00	0.00	46.91
5	Productivity enhancement as a result of rejuvenation (quintals per acre)	0.04	0.05	0.00	0.00	0.04
6	Increase in Yield (percentage)	21.87	67.60	0.00	0.00	23.77

Sample Size = 50
Source: Field Survey

Table 5.3 (a)
Sources of NHM Resource Procurement (Sapling) for Pineapple during 2004-05 to 2009-10 (percentage of households)

	Dept. of Horticulture	Private Nursery	Open Market	Fellow Farmers	Self Owned	None	All
Marginal	0.00	30.64	3.68	21.32	26.96	17.40	100.00
Small	0.00	34.62	15.38	24.36	16.67	8.97	100.00
Medium	0.00	41.67	27.78	16.67	5.56	8.33	100.00
Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	32.33	8.17	21.83	23.00	14.67	100.00

Sample Size = 50
Source: Field Survey

Table 5.3 (b)
Sources of NHM Resource Procurement for Mandarin Orange during 2004-05 to 2009-10 (percentage of households)

	Dept. of Horticulture	Private Nursery	Open Market	Fellow Farmers	Self Owned	None	All
Marginal	8.84	1.53	38.44	4.08	1.36	47.11	100.00
Small	0.00	8.33	41.67	8.33	0.00	41.67	100.00
Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	8.67	1.67	38.50	4.17	1.32	47.00	100.00

Sample Size = 50
Source: Field Survey

Table 5.4
Details of Subsidy Provided by NHM

Sl No	Details of the items	Marginal	Small	Medium	Large	Total
Crops/items for which subsidy provided (% of households)						
1	Pineapple	34 (34.0)	13 (13.0)	3 (3.0)	0 (0.0)	50 (50.0)
2	Mandarin Oranges	49 (49.0)	1 (1.0)	0 (0.0)	0 (0.0)	50 (50.0)
3	None	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
4	None	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Details of activities for which subsidy was provided (% of households)						
1	Area Expansion	39 (39.0)	14 (14.0)	3 (3.0)	0 (0.0)	56 (56.0)
2	Rejuvenation	23 (23.0)	0 (0.0)	0 (0.0)	0 (0.0)	23 (23.0)
3	Both Area Expansion & Rejuvenation	21 (21.0)	0 (0.0)	0 (0.0)	0 (0.0)	21 (21.0)
4	None	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Amount of aggregate investment (Rs per household)						
1	Aggregate Investment (Variable + Fixed)	18000.30	50610.11	171088.46	0.00	27158.32
2	None	0.00	0.00	0.00	0.00	0.00
3	None	0.00	0.00	0.00	0.00	0.00
4	None	0.00	0.00	0.00	0.00	0.00
Amount of subsidy provided by NHM (Rs per household)						
1	Cash	546.69	1357.14	1800.00	0.00	697.7
2	Sapling	418.86	0.00	0.00	0.00	347.60
3	Total Subsidy	965.54	1357.14	1800.00	0.00	1045.40
4	None	0.00	0.00	0.00	0.00	0.00
Subsidy as a percentage of investment (%)						
1	Cash	3.04	2.68	1.05	0.00	2.57
2	Sapling	2.33	0.00	0.00	0.00	1.28
3	Total Subsidy	5.36	2.68	1.05	0.00	3.85
4	None	0.00	0.00	0.00	0.00	0.00

Sample Size = 100
Source: Field Survey

Table 5.5
Sources of Training/Dissemination Activity Provided to the Farmers

Details of training	Marginal	Small	Medium	Large	Total
Percentage of Households provided with training	33 (39.76)	9 (64.29)	2 (66.67)	0 (0.00)	44 (44.00)
Frequency of the training provided during the year (per household)					
State Horticulture Department	0.52	1.64	1.67	0.00	0.71
State Agricultural University / Colleges	0.00	0.00	0.00	0.00	0.00
Krishi Vigyan Kendras	0.00	0.00	0.00	0.00	0.00
Kisan Call Centre	0.00	0.00	0.00	0.00	0.00
Cooperatives / Local Bodies	0.00	0.00	0.00	0.00	0.00
Input Dealers / Private Company Representatives	0.00	0.00	0.00	0.00	0.00
Special Research Stations set up by the Government	0.00	0.00	0.00	0.00	0.00
Non Government Organizations (NGOs)	0.18	0.00	0.00	0.00	0.15
Any other	0.00	0.00	0.00	0.00	0.00
Average number of days per household during the year					
State Horticulture Department	0.52	1.64	1.67	0.00	0.41
State Agricultural University / Colleges	0.00	0.00	0.00	0.00	0.00
Krishi Vigyan Kendras	0.00	0.00	0.00	0.00	0.00
Kisan Call Centre	0.00	0.00	0.00	0.00	0.00
Cooperatives / Local Bodies	0.00	0.00	0.00	0.00	0.00
Input Dealers / Private Company Representatives	0.00	0.00	0.00	0.00	0.00
Special Research Stations set up by the Government	0.00	0.00	0.00	0.00	0.00
Non Government Organisations (NGOs)	0.36	0.00	0.00	0.00	0.30
Any other	0.00	0.00	0.00	0.00	0.00
Training sessions organized within village or nearby village (% of households)					
State Horticulture Department	18 (18.0)	9 (9.0)	2 (2.0)	0 (0.0)	29 (29.0)
State Agricultural University / Colleges	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Krishi Vigyan Kendras	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Kisan Call Centre	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cooperatives / Local Bodies	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Input Dealers / Private Company Representatives	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Special Research Stations set up by the Government	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Non Government Organisations (NGOs)	15 (15.0)	0 (0.0)	0 (0.0)	0 (0.0)	15 (15.0)
Any other	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Training sessions organized within town/district or state capital (% of households)					
State Horticulture Department	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
State Agricultural University / Colleges	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Krishi Vigyan Kendras	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Kisan Call Centre	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cooperatives / Local Bodies	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Input Dealers / Private Company Representatives	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Special Research Stations set up by the Government	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Non Government Organisations (NGOs)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Sample Size = 100
Source: Field Survey

Table 5.6.1
Did NHM Help Households to Increase their Area under Horticultural Crops
(Percentage of Households Saying Yes to the Following Questions)

Description	Marginal	Small	Medium	Large	Total
Making available good quality planting material like nursery	19 (22.89)	2 (14.29)	0 (0.00)	0 (0.00)	21 (21.00)
Rejuvenation with improved varieties	24 (28.92)	0 (0.00)	0 (0.00)	0 (0.00)	24 (24.00)
Upgrading the existing tissue culture unit	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Mother stock block maintenance under poly cover to protect from adverse weather	9 (10.84)	2 (14.29)	0 (0.00)	0 (0.00)	11 (11.00)
Raising root stock seedlings under net house conditions	6 (7.23)	1 (7.14)	0 (0.00)	0 (0.00)	7 (7.00)
Polyhouse with ventilation, insect proof netting, fogging and sprinkler irrigation	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Pump house to provide sufficient irrigation with/without storage tank, community tank	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Soil sterilization-steam sterilization system with boilers	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Establishment of new garden or seed production	14 (16.87)	3 (21.43)	0 (0.00)	0 (0.00)	17 (17.00)
Protected cultivation like green house, shade net, plastic tunnel etc	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Precision farming implements, e.g., computer, GPS, GIS, sensors and application control	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Promotion of integrated nutrient management or integrated pest management	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Help provided for organic farming (vermi compost unit, certification etc.)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Post harvest management like pack house, storage unit, mobile processing unit etc	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Training and capacity building	18 (21.69)	9 (64.29)	1 (33.33)	0 (0.00)	28 (28.00)
Total	83 (100.00)	14 (100.00)	3 (100.00)	0 (0.00)	100 (100.00)

Sample Size = 100
Source: Field Survey

Table 5.6.2
Perception of Households about the NHM (% of Households)

Details of training	Marginal	Small	Medium	Large	Total
How NHM has helped you to increase your area under horticultural crops					
By providing seedling/nursery	44.00	0.00	0.00	0.00	44.00
By providing material inputs	0.00	0.00	0.00	0.00	0.00
By capacity building (providing training)	17.00	1.00	0.00	0.00	18.00
By providing processing facilities	0.00	0.00	0.00	0.00	0.00
By providing market for our end product	0.00	0.00	0.00	0.00	0.00
By providing procurement facility	0.00	0.00	0.00	0.00	0.00
What are the good points in the policy towards NHM					
Financial assistance	53.00	11.00	1.00	0.00	65.00
Building infrastructure	0.00	0.00	0.00	0.00	0.00
Capacity Building (awareness camps / training etc)	0.00	0.00	0.00	0.00	0.00
Subsidy provision	71.00	12.00	2.00	0.00	85.00
Any other	6.00	3.00	1.00	0.00	10.00
Do you think NHM has increased employment opportunities for the farmers and agricultural labourers, How?					
By increasing area under horticultural crops that are manually operated	9.00	6.00	1.00	0.00	16.00
By establishing horticultural processing units in the local areas	0.00	0.00	0.00	0.00	0.00
By providing subsidy to those who have diversified their crops from field to horticultural crops	12.00	2.00	1.00	0.00	15.00
No NHM has not increased employment in any way	65.00	8.00	1.00	0.00	74.00
Do you think your income has grown up after adopting horticultural crops with the help of NHM. If yes how much?					
less than 20 %	15.00	6.00	1.00	0.00	22.00
20 to 40 %	7.00	1.00	1.00	0.00	9.00
40 to 60 %	4.00	0.00	0.00	0.00	4.00
60 to 100 %	0.00	0.00	0.00	0.00	0.00
No increase at all	57.00	7.00	1.00	0.00	65.00
Are farmers in your village aware about the National Horticulture Mission, How?					
They have actively benefited from the subsidies provided by the NHM	58.00	8.00	2.00	0.00	68.00
They actively participate in the training programmes provided by the NHM	36.00	9.00	2.00	0.00	47.00
They have benefited from the infrastructural building up being done by the NHM	0.00	0.00	0.00	0.00	0.00
They have been able to raise their area under horticultural crops with the help of NHM	28.00	7.00	2.00	0.00	37.00
No they stand aloof and completely unaware about the activities of NHM	27.00	2.00	0.00	0.00	29.00
What changes do you suggest to make NHM more effective – mention					
Make formal/institutional credit available	17.00	3.00	1.00	0.00	21.00
Develop effective marketing facilities	22.00	2.00	1.00	0.00	25.00
Improve extension, capacity building & infrastructure	14.00	3.00	1.00	0.00	18.00
Increase amount of subsidy	30.00	6.00	0.00	0.00	36.00

Sample Size = 100
Source: Field Survey

CHAPTER 6

CONCLUDING REMARKS AND POLICY SUGGESTIONS

6.1: Concluding Remarks

From its traditional identity, over the years the scope of horticulture has been expanded in dimensions and has become the science of growing and management of fruits, vegetables including tubers, ornamental, medicinal and aromatic crops, spices, plantation crops as well as their processing, value addition and marketing. At present, facing a decelerating rate of growth of agriculture, the horticulture sector assumes ever more importance to achieve and sustain targeted growth in agriculture at large.

At such a crucial juncture, the Government of India has initiated several programmes and missions to check the downward trend in agricultural production and to find sustainable solutions. Among these the National Horticulture Mission (NHM), the single largest program within the Ministry of Agriculture, has been implemented in 2005-06 to promote holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushroom, spices, flowers, aromatic plants, cashew and cocoa ensuring forward and backward linkages with the active participation of all the stake holders. The mission acquires a unique position as it adopts a cluster-based approach to promote specific commodities in specific regions with comparative advantage.

Now, horticultural cultivation is an age-old practice in West Bengal as the state is traditionally among one of the pioneering horticultural states in the country. In fact, West Bengal's six agro-climatic zones offer an extensive and diversified variety of environs for the development of temperate, sub-tropical and tropical horticulture produce to cater to the horticultural market round the year. The state is the leading producer of a wide range of horticulture items, including pineapple, while it has significant contribution in the national production of mandarin oranges.

It is here that the present study attempts to evaluate the impact of the National Horticulture Mission scheme in West Bengal. The objectives of the present study include assessment of impact in terms of increase in area, production and productivity of the two selected crops, viz. pineapple and mandarin oranges, in the two selected districts for the study, namely Jalpaiguri and Darjeeling districts respectively. At the same time, the study makes an attempt to assess the impact of the mission on employment generation and increase in income to suggest proper implementation strategies. The major findings of the study along with the concluding remarks has been briefly presented here as follows -

Available secondary information on ***area, production and productivity of horticulture in West Bengal*** reveals that though the percentage share of cultivable area to total geographical area marginally declined over the period from TE 2004-05 to TE 2007-08, the glimmer of hope is that the area under horticultural crops exhibited an increase of about 5.75 percent over the concerned period, which in turn establishes the growing importance of horticulture in the state. In particular, there has been a tremendous growth at an average of 10 percent per annum in area under vegetable crops during the period 2004-05 to 2009-10, while that for fruits, flowers and spices comes out to be 5.06 percent, 5.89 percent and 3.70 percent per annum respectively.

In case of pineapple however, available data suggest that there has been a sharp decline in the area under pineapple in West Bengal at an annual average rate of – 6.32 percent over the period 2004-05 to 2008-09, though yield rate of pineapple registered an increase at around 2.16 percent per annum over the period. In contrast, in case of mandarin oranges, the annual average rate of growth of area and yield rate of mandarin oranges stand to be 1.56 percent and 1.58 percent respectively.

An enquiry into the ***household characteristics, cropping pattern and production structure*** of the sample beneficiary farmers reveal that the study area represents a highly marginalized farming economy with agriculture as the single major primary occupation for the workforce. The land holding pattern reveals that while the net operated area for the marginal farmers is much smaller than their larger counterparts, but the intensity of cropping remains comparative higher for the marginal farmers to compensate for the smallness of size.

The socio-economic profile of the sample beneficiary farmers reveal that the sample farmers are heavily indebted from institutional as well as non-institutional (informal) credit sources like commission agents, traders/merchants, etc. The need for formal agricultural credit is reflected in the fact that a major part of these formal and informal borrowings have been taken as crop loans / production loans in both the districts. Only the marginal farms, owing to severe financial constraints, opt for consumption loaned from non-institutional sources of credit. In case of ownership of productive assets by the farmer households, it has been observed that livestock occupy the prime position among all animate and inanimate farm assets, while modern implements like tractor, trolly, tiller, plank, combine harvester, etc. have not been found among the sample farmer households.

In case of technological adoptions, it has been observed that the use of HYV is extremely low in case of mandarin orange cultivation as compared to the pineapple cultivation. However, while the mandarin orange cultivators follow a purely traditional cultivation practice with the use of organic manure only, in sharp contrast, pineapple cultivation is completely covered by HYV technology with heavy use of chemical fertilizers.

Nevertheless, the cropping pattern of the sample farmer households reveals that the horticultural crops, mainly pineapple and mandarin oranges, dominate the cropping pattern in the study region covering nearly about half of the gross cropped area.

In the present context, an analysis of ***production structure and resource use*** provides us with a deeper insight into the economics of cultivation of the selected horticultural crops. In particular, it comes out that in pineapple cultivation the total revenue accrued per acre of land is quite high, as also the cost of production - thereby making the net returns from pineapple at comparatively higher than mandarin oranges. In sharp contrast, total revenue accrued per acre of land from mandarin orange cultivation comes out to be much lower than pineapple cultivation, as also the costs of production – thereby bringing down the net returns per acre of land to less than half of the net returns per acre from pineapple. Nevertheless, it has been observed that for both the selected horticultural crops, net return per unit of land remains much higher than the net returns from kharif crops like paddy.

The resource-use patter for the pineapple and mandarin orange also appear different in nature altogether. In fact the resource use in pineapple cultivation appears comparatively capital-intensive as total material investments (variable + fixed) accounts for almost three-quarters of total costs per unit of land. In contrast, in case of mandarin orange production, the variable labour costs claims more than half of the total costs and thus appears to be comparatively more labour-intensive. In absolute terms however, human labour application in mandarin orange cultivation per acre of land is merely one-thirds of that in case of pineapple cultivation. In comparison to traditional field crops like paddy, it has been observed that the requirement of human labour (including family labour) remains much higher in pineapple cultivation, while that remains much lower in case of mandarin orange cultivation.

In case of marketing of output, it is extremely unfortunate to find that there has been a complete absence of formal marketing channels like government agencies or cooperative bodies to the relief of the beneficiary pineapple and mandarin orange growers in the study region. Most of the output is sold at the wholesale markets or to the intermediaries at the farm-gates. Again, though there are ample opportunities for processing activities for both the crops, it has been found that none of the sample beneficiary farmers are involved in on-farm processing activities of any kind.

An analysis of the ***impact of NHM on the expansion of horticultural crops*** and the subjective perceptions of the farmer households brings out important revelations relating to the performance of the National Horticulture Mission.

On the one hand, it has been observed that during the period 2004-05 to 2009-10, both area and yield rate of mandarin oranges have increased significantly, though there has been a marginal increase in area and yield rate of pineapple. At the same time, there has been a gradual increase in the coverage under certified inputs, which indicates a gradual shift of production technology with certified inputs in place of traditional inputs. The positive impact of the National Horticulture Mission can also be witnessed in case of area expansion by rejuvenation and protection, as the area per household per crop increased (though marginally) for both pineapple and mandarin orange cultivation, resulting into increase in production and productivity for the respective crops. However, in case of sources of procurement of resources for pineapple and mandarin orange cultivation, informal sources like private nurseries and fellow farmers continue to play an important role.

However, the survey reveals the subsidy provided under the NHM forms only a negligible amount of the total investment required. Furthermore, the extension activities provided by the district horticulture and agriculture officials under NHM make only a sorry figure, as very little has been done in case of dissemination of technologies through training and capacity building activities. At the same time, there has been a complete absence post-harvest management facilities like packhouse, storage units, and mobile processing units formed under the NHM in the study regions of both of the districts.

Nevertheless, with due respect to the subjective responses made by the beneficiary farmer households, it can be said that the NHM performed well by providing financial assistance to the farmers to boost up and motivate them towards diversification of cropping pattern in favour of horticultural crops. It should be noted however that there has been an aspiration for enhancement of subsidy among the beneficiary farmers, while at the same time they appeal for development of proper marketing facilities, enhancement of institutional credit and improvement of extension and capacity-building services under NHM.

6.2: Policy Suggestions

Based on the findings of the present survey, the following are the suggested policy measures to mitigate the problems relating to the performance of the National Horticulture Mission. However, it needs to be noted that coordination among the different government and non-government agencies plays a crucial role in bringing about effective implementation of the National Horticulture Mission. The specific policy suggestions may be presented here as follows -

- It remains highly disturbing to observe that though both pineapple and mandarin orange have immense potential in terms of ***processing activities***, none of the sample beneficiary farmers undertake any type of processing activity by themselves. In fact, it has been observed that there has been no initiative either from the government side or from the non-government side to promote processing activities by the farmers in the study region. [*Attention: Ministry of Food Processing, Government of India*]
- Though ***agricultural credit*** has made a tremendous quantitative progress over the decades, non-availability of formal credit still stands to be common phenomena among the resource-poor farmers. It has been observed that owing to non-availability of formal credit, the farmers are often compelled to take loan from various informal credit agencies at exorbitant interest rates. Unless the reach of the formal credit agencies extend even to the marginal farms with very little collateral/mortgage to offer against loans, the dependence on informal agencies will continue to suffice the higher investment requirements for horticultural of crops like pineapple. [*Attention: Ministry of Agriculture, Government of India*]
- There is no denying the fact that ***marketing of outputs*** assumes immense importance especially for the highly perishable crops like pineapple and mandarin oranges. However, the present study does not encounter any marketing support being provided either to the pineapple cultivators or to the orange cultivators. In fact in the absence of proper marketing infrastructure, it has been observed that the farmers are often compelled to sell their products at lower price to the local traders at the farm-gate or in the local markets. [*Attention: West Bengal Agriculture Marketing Board, Government of West Bengal*]
- It has been observed that the state of ***extension services*** provided under the mission accounts only for sorry state, which is especially true for district Darjeeling under continuous political disturbances. In fact, it appears that there has been a severe lack of initiative from the government officials to extend extension services to the farmers. [*Attention: Directorate of Agriculture, Government of West Bengal*]

- The amount of ***subsidy*** provided under the mission for pineapple accounts only for a very small fraction of the total costs involved. Hence, there is a felt need to revise the amount of subsidy to promote horticulture and to make subsidization more meaningful. [*Attention: State Horticulture Board, Government of West Bengal*]

Annexure I

Coordinator's Comments on the Draft Report

1. The sample selected is only 100 beneficiaries from two districts whereas all states were asked to select 200 beneficiaries from four districts. The districts selected have also been changed. This is to bring to the notice of the Ministry representatives.

2. Chapter 1: The subtitle 1.6 An Overview: it should provide summary of details of the report. In other words, it should indicate what is the subject matter discussed in different chapters of the report.

3. Chapter 2 Table 2.1: Area horticulture crops (TE 2004-05) is shown as sum of area under fruits and vegetables. Kindly check the total horticulture area includes area under fruits, vegetables, floriculture, aromatic, plantation etc as shown in Table 1.2.1. Please make sure that the data presented is total horticultural crops and not only fruits and vegetables.

4. Table 2.2: Please present the data for the Triennium ending (TE) that is average of three years, e.g., 1980-81 is average of 1978-79, 1979-80 and 1980-81 and so on. The total figure presented should not be NA as is the present case, in case no data is there e.g. flower then treat it as zero and add rest of the figures to get the total. Similarly, in Table 2.3, growth rate of gross total should be presented as stated above. The total values are required in the other tables also like table 2.4a, 2.4b, 2.5. Table 2.6, the figure given in parentheses is percentage of what?

5. The data analysis of primary survey is done with respect to state total and not with respect to the district level. The analysis has to be state total and crop wise but not district wise. Please recalculate Tables for the total 100 households for the whole state and not 50 households for each district as has been done at present as our primary survey analysis is focused on the state and not the districts. Recalculate all the tables in Chapter 3 and analyse data accordingly. This is must, for consolidation we need state level tables and not district level tables. (Tables 3.10 to 3.20). See the Chapter Plan which clearly mentions that the analysis has to be at the state and not district level.

6. Chapter 4: Table 4.3a and 4.3b; 4.4.1a and 4.4.1b, make the table at the state level rather than district level.

7. Chapter 5: Table 5.2.1 and 5.2.2 input quantity procured certified and non certified, please present data acres per household rather than aggregate acres. Table 5.2.2a and b, also present increase in yield in percentage (after over before). Table 5.5 a and b, also present the percentage of households provided with training. Tables 5.4, 5.5, 5.6.15.6.2 need to be framed for the state total and not at the district level, please see the Table and Chapter Plan. Last table includes households' suggestion for improvement of NHM present a summary of that as well.

8. In the chapter also discuss and present the life time of the plantation (years) used for amortization of the fixed cost.

Annexure II

Action Taken Report

1. The Final Study Proposal as has been communicated by the coordinating centre vide letter dated 17-03-2010 included the districts Murshidabad, Nadia and Hoogly in West Bengal for the two selected crops pineapple and orange to be covered under the study by this centre. Unfortunately, the selected districts do not grow mandarin oranges in reality. In fact, mandarin orange is only grown in Darjeeling district. Again, pineapple production is extremely low and scanty in the districts selected by the coordinator at present, while the district Jalpaiguri turns out to be the appropriate district for pineapple in the perspective of the study on NHM (please refer to table 1.3.6 and 1.3.9). This very problem had earlier been communicated to the coordinating centre by us vide letter dated 22/01/2010 as suggestions on the draft study proposal, but to no avail.
Again, the Final Study Proposal nowhere asks to 'select 200 beneficiaries from four districts', rather it asks to select 2 villages from each district and 25 beneficiaries from each village.

2. In Chapter 1, the sub-title 1.6, an overview, and its contents have been changed as has been suggested by the coordinating centre.

3. In Chapter 2, as *district-level* data for sub-groups other than fruits and vegetables (e.g. flowers, plants, aromatic & medicinal plants, spices, …etc. – as presented in Table 1.2.1 at the national level) are not available, only data for fruits and vegetables are considered to arrive at total horticultural area in Table 2.1.

4. In Chapter 2, data presented in Table 2.2 has been converted into TE averages, and 'NA' has been replaced by '0.00' as suggested. Table 2.4(a), 2.4(b), 2.5 and 2.6 have been modified as suggested. In case of Table 2.3 however, growth rates for certain years for specific sub-groups of horticultural area and yield cannot be calculated owing to unavailability of consistent time series data for the sub-groups at the state level, and thus left as 'n.a'. In some cases, the missing values have been replaced by linear trend value at point to arrive at semi-log time / average annual growth rates.

5. In Chapter 3, all tables have been recalculated and re-analyzed at the state-level for all 100 households.

6. In Chapter 4, necessary changes have been made in selected tables and analyzed accordingly.

7. In Chapter 5, necessary changes have been made in selected tables and analyzed accordingly. A summary of households' suggestions has also been presented in the analysis.

8. In Chapter 4, the life-time of the plantation (years) and the statistical method used for amortization of the fixed costs has been incorporated.

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