

**ECONOMICS OF AGRICULTURAL DIVERSIFICATION
WITH SPECIAL REFERENCE TO RECENT
HORTICULTURAL DEVELOPMENT IN
WESTERN MAHARASHTRA**

**A THESIS SUBMITTED TO THE UNIVERSITY OF POONA
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY (ECONOMICS)**

**BY
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June 1998

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CERTIFICATE

Certified that the work incorporated in the thesis ECONOMICS OF AGRICULTURAL DIVERSIFICATION WITH SPECIAL REFERENCE TO RECENT HORTICULTURAL DEVELOPMENT IN WESTERN MAHARASHTRA submitted by Mrs. Sunayini Parchure was carried out by the candidate under my supervision. Such material as has been obtained from other sources has been acknowledged in the thesis.

Pune

June 1998



Dr. A. K. MITRA
(Research Guide)

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CHAPTER 1

INTRODUCTION

1. BACKGROUND

This study proposes to examine the impact, spread and the benefits of horticultural crops as a means of agricultural diversification.

In overpopulated and underdeveloped countries like India characterised by dominant subsistence agriculture, land holdings are not only small but also of variable quality. A major problem for subsistence landholders is to earn a sufficient and stable income flow. Given the constraints of a) the size of their landholdings, (b) the availability of water and (c) the quality distribution of landholdings, the only means by which farmers can achieve a sufficient and stable income is by means of a change in technology of farming, suitable to meet the constraints. Horticulture represents one of the several alternative technologies that farmers can adopt. There is thus a need to examine whether such farmers can adopt production of horticultural crops as an additional means to harness the unutilised land, limited water and excess labour in a more optimum manner.

In an agricultural set up as in India, the problems of this sector can be stated as given below:

a. Underdeveloped countries are characterised by land of variable quality and severe scarcities of water and capital. Quite naturally, the best land gets devoted to food grains and cash crops. It is essential to examine how the inferior and fallow land can be utilised for horticultural activity and with what effect. It is here, that the potential of horticultural crops as a supplementary activity for small and medium scale farmers can gain significance.

b. The traditional foodgrains and cash crops produced by the farmers are seasonal in nature creating output, price and income uncertainties for the farmer. In this context horticulture can be viewed as a subsidiary activity which can, to some extent, overcome the seasonal problems of agricultural production and provide the farmer, with a more certain and continuous flow of income. It must therefore be recognised at the very outset that the objectives of increasing income of

the farmers by traditional techniques such as introduction of HYV seeds for traditional crops, mechanization of farms, subsidization of key inputs like fertilizers, electricity, water, etc. will have inherent limitations for two reasons:

- i. These strategies involve a more or less permanent price support programme, which will play a progressively diminishing role in a liberalized economic regime and
- ii. The reach of the benefits of traditional policy techniques is confined to the most productive land owned by the farmer (and in many cases has favoured the large/rich farmers)

The traditional policy techniques do not reach dry or wasteland, which continue to remain unutilised. However, it happens to be a dominant segment of the land holdings in India and many farmers in the small and marginal categories depend exclusively on these lands. Hence, there is a need to find alternative means to support the income of such farmers. On the part of these farmers, this means a diversification of both the products that he produces and technology that he uses.

In the Indian context, the objectives and impulses of diversification could be briefly summed up as given below.

- a. To meet the need for fuller employment in the farm households,
- b. to increase incomes from small holdings,
- c. to stabilize farm incomes,
- d. to conserve and enhance natural resources,

The major issues relevant to formulating an agricultural diversification policy are:

- a. Identification of the cropping system suitable to environmental conditions.
- b. Estimation of demand of each of the products.
- c. Identification of expected domestic market and markets abroad.
- d. Technological and infrastructural improvements.

The most important factor identified (Vyas 1996) in setting the nature and pace of diversification is the market. The movement of the relative prices determines the cropping pattern and changes therein. For example, in the recent years due to a notable rise in price of oil-seeds and pulses farmers have responded to diversification in favour of such crops. Such diversification is a continuous and perpetual process which

is influenced by changes in prices, market yields, consumer demand, changes in consumer tastes and habits, costs of production, water availability and other resources constraints. (It is quite a legitimate possibility that if food-grains would become acutely scarce and the relative rise of their prices is far ahead than that of other crops, the farmer may then consider diversifying from cash crops to food-grains).

2. AREAS OF AGRICULTURAL DIVERSIFICATION

It should be pointed out that there are a variety of technologies that can activate the unutilized labour and land resources, and also enable the farmer to introduce flexibility in the use of their scarce capital equipment.

Agricultural diversification could take the following forms:

- a. Between sub-sectors of agriculture i.e. animal husbandry, forestry, fishery, etc.
- b. Between various crops i.e. a change in the cropping pattern within food grains itself or a shift from food grains to cash crops or, even going a step further, to include horticultural crops like fruits and vegetables.
- c. A shift from farm to non-farm activities. This however is a broad-based rural-diversification process rather than being agriculture specific.

The alternatives of agricultural diversification thus include quasi-agricultural activities like fruits, vegetables, floriculture, plantations and social forestry and allied activities like fisheries, poultry, sericulture, apiary, etc.

The present study focuses on changes in cropping pattern or crop-mix as a means of agricultural diversification i.e. diversifying into production of horticultural crops, mainly fruits.

Of all the prospective technologies, fruit growing, has the maximum natural advantage for adoption at both the micro and macro levels. Firstly, its production process being agricultural in nature its adoption by farmers does not require considerable education and training and is easily adaptable. Secondly, fruit growing does not require location-specific inputs like for e.g. fisheries or apiaries would require.

Fruit production represents a new technology, which holds the following promises for the farmers -

- a. This production process can make use of excess land, specially the marginal or fallow land or even wasteland with a lesser requirement of water and fertilisers.
- b. It holds a potential both for income generation and stability in income.
- c. Fruit production involves building a capital asset, which, once it reaches maturity, gives a stream of income over the life of the asset.
- d. It permits some variation like inter-cropping, which further increases the income of the farmers and also makes the flow of income more continuous. The multi-product uses of fruits strengthen the demand side for these crops.
- e. As income increases the demand and consumption pattern move favorably for crops like fruits, vegetables, milk, eggs (high value crops) due to increasing awareness of nutritional standards and increase in purchasing power.
- f. Finally, the export potential of fruits both in fresh and processed forms strengthen the case for fruits.

A closely related horticultural crop, vegetables, has also been duly examined as a means of agricultural diversification in the section pertaining to the primary data analysis. However, the detailed analysis of vegetables has been given a secondary place, on the grounds that they require considerable amount of water, fertilisers, pesticides and attention. Fruits on the other hand, require relatively less water and hence their option is the most appropriate in the context of country's almost seventy percent rain-fed agriculture.

Bearing these aspects in mind, the present study attempts to analyze the various issues related to agricultural diversification through adopting cultivation of horticultural crops i.e. mainly fruits.

Once the role of horticulture has been accepted there are three major issues to be dealt with:

- i. Whether horticulture is a viable option in the given context of Indian agriculture.

- ii. Whether technology for adopting such a production process is available to the Indian farmers.
- iii. Which class of farmers will find it appropriate to take up such diversification.

With the recent economic liberalisation process introduced in the Indian economy, the farmer will now have to function without much support and subsidies, which may aggravate the uncertainties that he faces, emphasising the need to diversify his cropping pattern.

3. OBJECTIVES

The objectives of this study are as follows:

1. To briefly outline the structure of Indian agriculture as it exists presently and highlights the major developments in agricultural policy in the past and present.
2. To study the broad features of cropping pattern changes over the years and to examine, also, the trends in income, demand and consumption patterns of various agricultural products in general and horticultural products, in particular, in India.
3. To enquire into the spread and benefits of the adoption of horticultural technology by medium, small and marginal farmers. The benefits will be accounted in terms of the demonstrated potential of horticultural crops to
 - a. increase the incomes of farmers,
 - b. stabilise the farmers income and
 - c. promote the use of their hitherto under-employed land and labour resources,
 - d. utilise the wasteland and hither to uncultivated land.
4. To present detailed case studies (from Western Maharashtra) of the impact of agricultural diversification and expansion through horticultural crops on incomes, standard of living, use of unutilised and marginal lands. This would enable identification of the group or class of farmers, the regions, where horticultural technology can be successfully adopted.
5. To make a detailed cost-benefit analysis of the horticultural initiatives of farmers at the individual as well as group levels in

various regions of western Maharashtra.

6. To review the policy initiatives undertaken at the level of the Central Government and at the level of the Maharashtra State Government to promote horticulture. Of these, the Capital Subsidy Scheme and the EGS linked horticultural development programme initiated by the Government of Maharashtra are noteworthy and have been reviewed in detail.
7. To study the export potential of major horticultural crops, namely, fruits in both fresh and processed forms (with special reference to grapes and mangoes).
8. To critically appraise the impact of the policy of economic liberalization on the potential of horticultural products both in domestic as well as export market, and to finally make a case for such agricultural diversification in the present juncture in the Indian economy (i.e. in the context of changes that have been initiated in 1990's in the form of economic reforms). Economic liberalisation has largely negative implications for programs of farm subsidisation and budgetary support for agriculture. The policy of macro economic liberalisation may, however, have positive implications for the adoption of progressive technologies in agriculture.

4. METHODOLOGY AND SOURCES OF DATA

The study has been carried out in two parts:

- A. The part that deals with the survey of secondary literature
- B. The part that deals with the results of the field survey.

Part A

The secondary data deals with the recent trends in agricultural diversification in some developing countries, India and Maharashtra state. Horticultural data regarding the production, exports, and economics of horticultural farms covering input costs, the overhead costs, the other recurring costs, production cycle of a horticultural farm, the yield, the surplus above cost, marketing and allied problems have been obtained from the authentic secondary data which are available from various sources which include reports of International Financial Institutions, Food and Agricultural Organisation (FAO), Agricultural Productivity Organisation, Ministry of Agriculture reports

(Central Government), Ministry of Agriculture (MOA), State Government of Maharashtra, Indian Journal of Agricultural Economics, Reports of National Horticultural Board, Gurgaon, books and other research publications.

Part B

For the field investigations for collecting the primary data for this study three different regions representing the diverse agroclimatic zones of western Maharashtra were selected. The main sub regions of Western Maharashtra include a) the eastern slopes of a western ghats, i.e., the *Sahyadri*, having on an average an altitude of 500 - 1000 meters; this area is called *Maval*. The most prominent '*Mavals*' of Maharashtra are in and around Pune district, e.g., *Junnar 'Maval'*, *Ander 'Maval'*, *Wadgaon 'Maval'*, *Mulshi 'Maval'*, *Velha 'Maval'* and *Bhor 'Maval'*. These areas have a very high altitude, rocky and undulated terrain, heavy rainfall and red soil as well a humid and temperate climate. Generally in rainy season and winters the climate is cold. Most of the rivers originate from this region. However, the water in the region is available up to February of the calendar year, and the area finds acute water shortage inspite of having very heavy rainfall. These *Mavals* have been selected by the horticultural experts for promoting Alphonso mangoes. According to them the agro-climatic conditions of these *Mavals* are suitable for the cultivation of the Alphonso variety of mangoes. b) The Eastern side of Western Maharashtra, which covers the plains and plateau of *Nasik*, *Ahmednagar*, *Pune*, *Satara*, *Sangli* and *Kolhapur* districts. Within this sub region there are two distinct zones, one which has adequate irrigation facilities (dams, wells, canal) and the other type which is completely drought prone like *Shirur*, *Daund*, *Indapur*, *Talukas of Pune*, *Shrigonde*, *Parner*, *Pathardi of Ahmednagar district* *Dahiwadi*, *Man of Satara district*, *Aatpadi of Sangli district*, *Mohol Mangalwadi of Solapur District*. The first category which has adequate irrigation facilities is suitable for the production of grapes, vegetables and cash crops like mainly sugarcane. Fruits like ber, pomegranate, custard apple, oranges etc are produced in the drought-prone areas.

In order to represent the above diverse agro-climatic zones of western

Maharashtra i.e. (a) The *Maval* region (b) The Plains of Western Maharashtra having irrigation facilities and (c) The plains of western Maharashtra having no irrigation facility and belonging to drought prone category, the following three regions were selected for the purposes of the primary data analysis in this study.

- 1) The Mulshi region – 3 main villages have been covered from this region which include; the Kule-Bhalgudi group of villages and the Belewade village.
- 2) The Junnar region – from this region the Bori-Budruk village and the Vaishnavwadi, Parunda villages have been covered in this study.
- 3) The Shirur region – this includes a number of closely set villages, details of which are provided in chapter 7 section 6.1.

There is a distinct difference in the cropping pattern of western- *Mavals* and eastern plains, as well as in the types of fruits grown in these regions. In the *Maval* area, the dominant fruit crop is mangoes, whereas in the plains where adequate irrigation facilities are available all kinds of fruits can be easily grown. The drought prone area, however is suitable for dry area fruit crops like oranges, ber, custard apple, pomegranate etc.

For the purposes of this study, three main fruit crops have been considered viz. mangoes, grapes and oranges, keeping in view the suitability of the above regions for these crops as well as considering the importance of these crops specially mangoes and grapes for exports. To maintain an unbiased data base, a list of the beneficiaries of the Capital Subsidy Scheme of the Government of Maharashtra, introduced in 1981-82 to promote horticultural crops, was obtained from the Deputy Directorate of Horticulture, Pune Region. The names of the beneficiaries from Mulshi region, Junnar region, and the Shirur region were obtained from the above department which maintains a record of the beneficiaries of the Capital Subsidy Scheme of 1981-82. The records regarding the EGS Linked Horticultural Development Scheme of the government of Maharashtra introduced in 1990-91, were available, but since the scheme was introduced in 1990-91, and the trees start yielding fruits only after 5-6 years the survey of EGS Scheme beneficiaries was deliberately avoided because no factual data regarding cost benefit would have been available from them.

In order to make a cost-benefit analysis of the three main crops of the study i.e. mangoes, grapes and oranges the following procedure have been adopted for collecting data.

- a. For the mango crop, information was obtained from two areas of Western Maharashtra, i.e., the Mulshi taluka and the Junnar Taluka, Pune district. In total 45 cultivators were contacted of which, some were beneficiaries of the Capital Subsidy Scheme and some had adopted mango cultivation on their own initiative, and later availed the benefits of the scheme.
- b. For the grape crop 6 individual farmers were contacted from the Junnar region inclusive of Narayangaon village of Junnar Taluka.
- c. The Shirur region was chosen to study the spread and benefits from dry area crops i.e. basically oranges. Information was obtained from 22 farmers in this region.
- d. The primary survey was thus based on information obtained from a total of 73 individual farmers from different regions of the Western Maharashtra.

Since the scheme itself selects only small and marginal holders who are mostly the subsistence farmers and the field investigational data was intended to focus on the horticultural development as a supporting income for poor peasants and subsequent changes in their cropping pattern, and annual income living standard, they were found to be the most appropriate respondents for our questionnaire-cum-interview based primary data analysis. There was no need of any sampling because the number was fairly moderate. On visiting their farms, it was actually found that about 50 per cent of the beneficiaries could not give any information because they had a frustrating experience of new plantations of Alphonso trees. Out of the remaining 50 per cent, the survey collected comprehensive information about the pre diversification cropping patterns and the changes in income and output per acre due to adoption of the new cropping pattern in the post diversification period. In addition to the study of the above mentioned individual farmers producing mangoes, grapes and oranges a detailed analysis of two Grape Growers Societies have been covered in the primary data investigation. These societies include:

- 1) The Abhinav Grape Growers cooperative society, Aagar Taluka, Junnar district Pune &
- 2) The Vighnagar Grape Grower Society, Narayangaon, Taluka Junnar district Pune.

These societies are engaged in the production and export of Thompson-seedless grapes and have been included in the study on account of the growing importance of exports of horticultural crops mainly grapes.

The following aspects related to the two societies have been covered- a) The general profile and horticultural spread of the member farmers of the society with special reference to grapes. b) The profile of grape exports of these societies which include details of the storing, transport, processing facilities, the problems and the prospects related to the export of grapes. c) A cost-benefit analysis of grape cultivation based on data provided by the Vighnagar society representing 70 members.

A questionnaire related to the above aspects was given to the Chairman of the 2 grape growing cooperatives societies, viz., Abhinav Grape Growers Society, Junnar and The Vighnagar Grape Growers Society, Narayangaon. Details of the marketing, export trading was also obtained from the above said societies.

The most prominent fruits of Maharashtra which have sizable production as well as export markets are only four, i.e., mangoes (Alphonso), grapes (Thompson seedless) bananas and cashew. Since Western Maharashtra zone can grow Alphonso mangoes and grapes this survey has focused on the horticultural development of mangoes and grapes. The export potential of mangoes from the Mulshi and Junnar areas and that of grapes from Junnar and Narayangaon areas has been examined.

To sum up, the field investigation in this study has covered a total of 73 individual farmers and two cooperative societies, (with a total membership of about 200 farmers). Details of costs of cultivation, yield, market price, farm gate prices, and problems related to the marketing and storing of the three main fruit crops i.e. mangoes, grapes, and oranges were obtained from the above respondents.

In the course of the survey, information was also obtained on various other food grains, cash crops, fruits and vegetables which have

also been considered in the study.

5. CHAPTER SCHEME

Chapter 2 Agricultural Diversification Strategies: India And Some Developing Countries.

The second chapter begins with a review of the paradigm shifts in the agricultural development policies over the period 1940 to 1990's, in general, and with specific reference to the Indian economy. In the recent years, there has been an emphasis on agricultural diversification as a policy measure to develop the agricultural sector, of which diversification into horticultural crops has received special significance. The second part of this chapter deals with the incentives provided during the 8th plan for the development and promotion of horticultural crops specially fruits and vegetables in India. This is followed by an analysis of the changes in the cropping pattern in India, based on the data at the macro level for the period 1960-61 to 1994-95. The data indicates a definite increase in area under horticultural or high value crops, specially, in the recent years.

The final part of this chapter deals with the experience of some selected developing countries, with the process of agricultural diversification. This is presented as an annexure to Chapter 2 (see ANNEXURE 1). The experience of agricultural diversification in almost all these selected developing countries reveal that the impulses of such a diversification process has been to enhance farm incomes, increase foreign exchange earnings through export of 'non-traditional' commodities, and to reduce dependence on one or a few crops.

Chapter 3 Production And Demand Characteristics Of Fruit Crops

The third chapter gives the details of the production and demand characteristics of horticultural crops, mainly fruits. The first part of this chapter deals with the agronomical and technical details of the cultivation of fruit crops and production peculiarities of such crops as distinct from the 'regular' agricultural crops. The second part of this chapter reports the production figures of horticultural crops specially fruits of such crops. The third part of this chapter explains the demand characteristics of fruit crops and gives a survey of literature on the income elasticities and expenditure elasticities for horticultural crops. The chapter concludes that horticultural crops i.e. fruits and vegetables have a relatively high income elasticity of demand indicating that as income levels in an economy would increase, the demand for such crops would also tend to increase.

Chapter 4 Diversification Of Indian Agricultural Exports: The Potential Of Horticulture

Two major reforms in the very recent past i.e. (a) the new GATT Uruguay Round 1993 agreement and (b) the economic liberalisation or reform policy of the government of India (1991), have changed the economic scenario both in the domestic as well as external sector. This chapter deals with the impact of the above reforms on agricultural exports of India, the structure and pattern of agricultural exports and the recent diversification of agricultural exports. The analysis in this chapter, however, concentrates basically on the status and potential of horticultural crops as a newly emerging export area in the Indian agricultural trade. Over the recent years it has been found that exports of non-traditional agricultural commodities i.e. fish, marine products, horticultural products, both in its fresh and processed form, have been increasing. However, though horticultural crops do hold a significant promise of emerging as a major foreign exchange earner in future, to what extent the country would be able to take advantage of this situation would depend on the efficient management of the technical and institutional constraints to export trade. These factors have so far constrained the expansion of horticultural exports of India.

The chapter also gives a detailed profile of exports of the two main crops of this study viz. grapes and mangoes. The concluding part of the chapter discusses the various incentives provided by the government to enhance exports of 'non-traditionals' in agriculture especially horticultural exports.

Chapter 5 Economic Viability Of Agricultural Diversification: A Survey Of Literature.

Since the success of any horticultural venture or programme and its associated subsidisation will have to be judged in terms of the extent to which beneficiaries make profits, a detailed cost benefit analysis of cultivating such crops is necessary. This chapter therefore deals with a survey of literature on the cost-benefit analysis as well as the economic viability of some horticultural crops. The various studies on economic viability of agricultural diversification have adopted three approaches. The first group of studies relies on the techniques of break-even analysis which involves estimates of the variable and fixed costs and the revenues from the crop which ascertains whether the project is economically viable or not.

The second approach, has used the capital-budgeting technique which is necessary, specially, for horticultural crops since they involve long gestation periods, heavy capital expenses, a long life-cycle and where the return occurs over

a considerably long period of time.

The third approach of studies have concentrated on the impact of agricultural diversification on the stability of farm incomes and how such diversification can in fact enhance farm incomes.

The various studies do reveal that fruit crops can be a means not only to enhance and stabilise farm incomes, but also to make a more optimum use of the hitherto unutilised land. However, a support system in terms of infrastructural, marketing and other facilities are required.

Chapter 6 Horticulture In Maharashtra: Scope, Policy And Spread

This chapter presents an account of the spread of horticulture in the state of Maharashtra, with special reference to the initiatives of the state government in the early 1980's and 1990's. Maharashtra's soil, topography and climate show a definite potential and scope for the promotion of various horticultural crops. This chapter begins with a detailed account of the geographical and agroclimatic features of the state of Maharashtra, the pattern of land utilisation and land holdings. A survey of this kind brings out the importance and necessity of agricultural diversification as a method of economising on the scarce water, fertile land resources and as a means of utilising the domestic farm labour and less fertile land to augment and stabilise farm incomes. This is followed by a detailed trend analysis of the cropping pattern in the state from 1960-61 to 1994-95, with a view to bring out the magnitude and rate of adoption of horticultural technology. The chapter concludes with the discussion of the incentives provided by the state government in the plans especially the 8th plan and the 2 major schemes introduced by the government of Maharashtra to accelerate the process of agricultural diversification. The state government had introduced two major schemes i.e. the Capital Subsidy Scheme (1981-82) and the EGS linked horticultural development scheme (1990-91) with a view to promote adoption of horticultural crops to develop Maharashtra into a leading horticultural state. The impact of the government initiative is assessed in the final section of this chapter.

Chapter 7 A Profile Of The Regions, Respondents, Crops Covered And The Salient Features Of The Study Regions

In order to make an assessment of the costs and benefits, the problems the successes and failures, the attitudes of farmers towards crop diversification and the effectiveness and reach of policy initiatives, it was thought necessary to conduct a sample survey representing a cross section of farmers who attempted to diversify

their cropping pattern by adopting horticultural crops. For this purpose various diverse areas from Western Maharashtra were chosen for the sample survey. The primary data analysis therefore is based on a sample survey of 73 individual farmers from 3 regions of Western Maharashtra i.e. (I) The Mulshi-'Maval' regions, (ii) The Junnar 'maval' region and (iii) the dry region of Shirur. In order to have a completely unbiased data base the sample survey has relied on the list of beneficiaries dominantly of the Capital Subsidy Scheme introduced by the government of Maharashtra in 1981-82. The main fruit crops of the study are mangoes, grapes and oranges, keeping in view the suitability of Western Maharashtra for these crops and also considering the export potential of mangoes and grapes.

The first part of this chapter presents the salient features of the 3 study regions viz. Mulshi, Junnar and Shirur. A detailed profile of the respondent farmers, the impulses for diversification into horticultural crops, the irrigation facilities, the educational status, the size and pattern of land holdings, the pre and post diversification cropping patterns etc. have been provided for the 3 study regions. In almost all these regions, diversification into horticultural crops has taken place in the 1980's due to the impetus provided by the Capital Subsidy Scheme of the government of Maharashtra. Such diversification has been undertaken by the farmers to stabilise and enhance their incomes, and to utilise their hitherto unutilised waste-land.

Chapter 8 Costs, Volume, And Revenue (CVR) Analysis Of The Selected Fruit Crops In The Study Regions

Since the success of the horticultural venture has to be judged in terms of the economic returns it provides, chapter 8 deals with the cost volume and revenue analysis of the selected fruit crop i.e. mangoes, grapes and oranges in the three study regions. Such an analysis is based on the data provided by the farmers / beneficiaries (in the respective regions) about the initial year costs, recurring costs, the number of trees planted, the area under fruits, the yield pattern etc.

Chapter 9: Cost- Benefit Analysis Of The Selected Fruit Crops In The Study Regions

This chapter gives a detailed cost-benefit analysis i.e. relating to the Net

Present Value (NPV), Internal Rate of Return (IRR) and the Benefit-Cost Ratio (BCR), of the selected fruit crops i.e. mangoes and grapes. Such a detailed cost benefit analysis has not been undertaken for oranges due to inadequate data regarding the cash inflow and outflow from oranges.

The Cost-benefit analysis for mangoes has been carried out for the different study regions i.e. for the Mulshi region and Junnar region. Because of the diversity between these regions and due to soil differences and differences in access to irrigation facilities the IRR, NPV and BCR estimates show wide variations between regions and between farmers.

A detailed cost-benefit analysis has also been worked out for grapes in the Junnar – Narayangaon region. A greater degree of uniformity in the IRR and NPV and benefit-cost ratio between farmers was found in the case of grapes. These estimations establish grapes to be a highly viable commercial venture, (though heavy initial capital expenditures and heavy expenditures on fertilisers, pesticides, insecticides have to be incurred.)

Chapter 10 Organised Efforts In Grape Farming (Case Study Of Two Grape Growers Co-operative Societies).

In addition to the study of Individual farmers producing mangoes and grapes, a detailed analysis of two grape growers co-operative societies has been covered in the primary data investigation. These include (I) The Abhinav grape growers co-operative society, Aagar, Taluka Junnar, Dist Pune and (ii) The Vighnagar grape growers society, Narayangaon, Taluka Junnar, Dist. Pune.

This chapter provides details of

- a) the general profile and horticultural spread of the member farmers of the societies with special reference to the main horticultural crop i.e. grapes.
- b) The profile of grape exports of these societies, which include a study of the total exports, the storing and processing facilities the problems and prospects related to export of grapes and
- c) A cost benefit analysis of grape cultivation based on data provided by the Vighnagar society representing 70 member farmers.

Such a study shows the contributions of 'co-operative organisations' in marketing, Storing, processing and specially export of horticultural crops, which is

difficult to implement at the level of individual farmers. Such co-operative organisations can take advantage of the 'external economies' like bank credit, subsidies, crop insurance arrangements, centralised market information, transportation both in national and international markets.

Chapter 11 Summary and Conclusions

Chapter 11 draws out the central conclusions from the review of the secondary literature and the sample survey. The costs, benefits, and the drawbacks and problems of agricultural diversification have been brought out. A critical review of the policies at the central level and at the Maharashtra State level has also been made, with a view towards improvising the policy design.

The study, in addition to the above chapters contains 4 ANNEXURES, the details of which are given below-

Annexure 1: Experiences With Agricultural Diversification (Some Selected Developing Countries).

Which is an Annexure to chapter 2 and contains a review of the experiences of some selected developing countries, with agricultural diversification specially in the early 1980's.

Annexure 2: Case Studies of 'Outliers '.

In the course of our sample survey we came across some respondents/ farmers whose success in horticultural ventures and experience with agricultural diversification was distinct from the others in terms of returns from these crops, profitability and extent of diversification. Such cases have also had a long standing family tradition of horticultural cultivation and hence have been enjoying tremendous success as regards such ventures. They also stand out as cases where continuous agricultural diversification is witnessed with large measures of success. Such cases have therefore been considered separately in this Annexure on the "Case of Outliers." Including them in the regular analysis would have disturbed the uniformity of the data.

Annexure 3: Costs And Revenue Estimates Of Selected Horticultural And Non-Horticultural Crops In The Junnar-Narayangaon Region And Mulshi Region.

During the sample survey and field investigations information regarding cost, revenue and net surplus per acre for some selected food grains, cash crops, vegetables and fruit crops could be gathered, region wise (i.e. for the study regions i.e. Mulshi and Junnar.) This Annexure therefore has provided a region wise estimates on the above aspects of various food grains, cash crops, vegetables and fruit crops. Such an exercise would be useful in making a comparative analysis of the viability of cultivation of different crops (both food crops and horticultural crops) and could also serve as basis to understand the returns from various diversified crops.

Annexure 4: Income Estimates In The Junnar And Mulshi Regions.

Based on the region-wise land and cropping patterns this Annexure attempts to provide estimates of income for the farmers who adopt a diversified cropping pattern i.e. inclusive of fruits and vegetables. Such estimates have been worked out for the Mulshi and Junnar region with the purpose of showing the extent to which farm incomes can be enhanced by adopting horticultural crops.

CHAPTER 2

EXPERIENCE WITH AGRICULTURAL DIVERSIFICATION STRATEGIES : INDIA AND SOME SELECTED DEVELOPING COUNTRIES .

1. INTRODUCTION

This chapter is devoted to a review of the major paradigm shifts in the agricultural development policies over the period 1940 to 1980's, in general, and with specific reference to the Indian Economy. The review documents the strategies of agricultural economic development, followed during the last five decades and brings out some major shifts in agricultural development thinking. These cover the transition from the traditional dual economic models of Lewis, Fei-Ranis and others, which primarily modeled the agricultural sector as an instrument of economic development, to the 'urban bias' school of Lipton, Johnston, and others which emphasised that the purpose and end of economic development should be the agricultural sector.

The chapter also reviews the shifts in the agricultural economic policy in India from the First Five Year Plan which laid emphasis on food self sufficiency to the Eighth Five Year Plan which lays stress on making the agricultural sector self sufficient not for others but for the farmers who subsist on it a specific strategy which got a special impetus under this shift of ideas was the program of agricultural diversification through horticulture and other technologies, i.e. fishery, floriculture, sericulture and others. This has been done with a view to enhancing incomes specially of the small and marginal farmers and in order to provide a means for a more optimum utilisation of land. The second part of the chapter deals with the incentives provided during the Eighth plan for the development and promotion of horticultural crops in India. This is followed by an analysis of the changes in the cropping pattern in India based on data at the macro-level (for the period 1960-61 to 1994-95), which indicates a definite increase in area under horticultural or high value crops specially in the recent years. The final part of this chapter covers the experience of agricultural diversification in some selected developing countries, which have undertaken the process of diversification in 1970's and 1980's. This review has been presented as an Annexure to this Chapter (see annexure to Chapter 2 i.e. Annexure 1).

2. PARADIGM SHIFTS IN ECONOMIC DEVELOPMENT

2.1. Paradigm Of Economic Development 1940 To 1970

The strategy of planned economic development in general and agricultural development in particular in nineteen forties and nineteen fifties was largely dominated by economic development models of the dual economy type.

Agriculture was given a central role in the overall economic development in the entire class of dual economic models beginning with the pioneering work of Arthur Lewis and including the Fei-Ranis model. The role of agriculture in these models was mainly a 'supplier' with the industrial/progressive sector being the 'demander'. Agriculture in these models, was assumed to be an over-populated sector characterised by low productivity, whereas the industrial sector was assumed to be an under populated but progressive sector as far as productivity was concerned. Accordingly, the process of economic development was seen as a process of transfer of surplus from the agricultural sector to the industrial sector, chiefly in the form of food, raw materials and foreign exchange earnings through exports all of which could be utilised for the progress of industrial sector. At the same time the labour, (of low productivity) from the agricultural sector would migrate to the urban-industrial sector completing the picture of development. In developing and agriculturally dominant economies the proportion of population dependent on agriculture ranges between as high as 40 to 68 percent (for example India, Bangladesh, China, Philippines, Sri Lanka, Pakistan). In developed countries on the other hand the proportion is only about 2 to 6 percent for example - in Japan, Canada, UK and USA.¹

Therefore, in the earlier decades it was widely believed that "both in concept and in practice it is possible for agricultural sector to make net transfers of resources to other sectors. If these transfers are used productively rate of economic growth can be accelerated."²

In later economic literature, however the development planning models recognised the constraints that the agricultural sector can put on the development of the industrial sectors. This is true of the earlier socialist plan models associated with the names of Preobrazenski, Feldman, and later in India, Mahalanobis. These bottlenecks were also recognised by Fei-Ranis Model of economic development.

¹ Tata Services Limited. Statistical outline of India. (1996-97), Page 236.

² Mellor (1973). Page 5.

This body of literature brought out for the first time the primacy of increasing the contribution of agricultural sector as a pre-condition for industrial development. Thus, it was recognised that the stimulus for overall economic development would come, not from the industrial sector with agricultural sector in tow, but could come by enlarging the agricultural surplus which in turn would create the infrastructure as it were for industrial expansion.

In effect, the focus was shifted towards increasing the productivity of the agricultural sector. Throughout the fifties and sixties this trend of thought continued viz. expand the agricultural surplus, increase rural savings, tap the rural savings for industrial growth, increase agricultural exports especially from cash crop exports, and use the foreign exchange for industrial capital formation and the surplus labour for industrial expansion. The agricultural strategies followed during the fifties and sixties have been characterised as 'broad based' agricultural development strategies. The broad based view looked upon agriculture as a backward sector that was in need of transformation and a sector which would contribute to the national economy whilst in the process of transformation. The vision of economic development continued to be that of primarily urban industrial development. The objective being always to develop the urban industrial sector with agriculture serving as a handmaiden in the growth process. The urban bias in the developmental process was quite evident in the development plans.

The disparity between rural and urban sectors is more pronounced in poor countries than was in rich countries during their early development processes. In most LDC's governments have taken numerous measures with the unhappy side effects of accentuating rural - urban disparities: their own allocation of public expenditure and taxation measures raising price of industrial production relative to farm production. The agricultural income remained much below the incomes of the industrial sector.

Three stages in the developmental process can thus be identified.

Stage I - where the farming sector is left along with few resources, taxing it heavily if possible, rich farmers could be squeezed to provide surpluses, (evident in state in policy) and in a mild way in the Mahalanobis model of 1956-61.

Stage II- involves a policy for rural development arising out of failures of stage I. In stage II agriculture is made to develop not for its own sake but to provide resources, workers, material and market to the industrial sector. This creates an urban bias, where development of the rural sector is advocated for the growth of

the industrial sector.

In stage III the argument shifts to accepting the need for a transformation of the mass rural sector through major resource input shift. A better strategy is to concentrate upon high yielding mass rural development supported by selective ancillary industries to make rural development viable. If you wish for industrialisation prepare to develop agriculture.³

2.2 Shift In Paradigm Of Agricultural Development – Post 1970.

Studies throughout the seventies reveal the following fall-outs of the development strategies related to agriculture and the economy in the past.

- 1) The use of large scale irrigation programmes resulted in the development of production and income in restricted areas, leading to regional imbalances.
- 2) The incomes of large farmers grew much faster than the incomes of small farmers and landless labourers.
- 3) Farm mechanization and the subsidized provisions of power, fertilizers, high yielding varieties and credit proved to be labour saving rather than land saving devices.
- 4) On account of the decreasing mortality and generally a decreasing death rate in the rural areas the density of population in rural areas increased rapidly. The progressive industrial sector was unable to absorb the surplus labour created in rural areas. At the same time fragmentation of land holdings led to non-viable holdings from the viewpoint of capital intensive agriculture. The number of small farmers and landless labourers grew rapidly. Migration to urban areas continued unabated creating a rural urban disequilibrium. This started putting strains on urban infrastructure and urban social services.

The inequalities created by the earlier development strategies emerged in;

- a) inequalities between the urban and rural areas and
- b) inequalities within the urban areas
- c) and inequalities within the rural area. Allegations of an urban bias in the strategy of economic development began being made.

Poverty was not seen to decline even after 20 years of following such a strategy.

In earlier days of development planning, deliberate and rapid industrialisation was often advocated, experience however has shown the limitations of overemphasizing industrialisation and it is being increasingly recognised that agricultural progress must have a vital role in the developmental

process. The earlier industrial development Vs agriculture has shown to be a false issue and the concentration now is rather with interrelationships between industry and agriculture and the contributions that each can make to the other. Thinking about agriculture as (i) an instrument of economic development (Implicitly equated with industrial development) or (ii) as a precondition of industrial development, came to a grinding halt.

2.3. Paradigm Shift : Post 1980's

The emphasis now shifted to agricultural development for its own absorption of labour and its own increase of real income among rural target groups of small farmers and landless labourers. It was recognised that an agricultural strategy that would improve rural urban balance requires extension of agricultural infrastructure, appropriate technology, and directed resource transfers in favour of the agricultural sector. "If in earlier decades of development, agricultural development has instrumental value, in future decades it must have an intrinsic value of its own."³

There was thus a third paradigm shift, and in the new approach towards formulating an agricultural strategy it was recognised that industry cannot absorb sufficient labour, industrial development does not make a substantial dent on agricultural or rural poverty. Enlarging the size of agricultural surplus also does not reduce rural poverty, (on the contrary it widens rural inequality and increases only the income of large farmers) and further that small farmers are more productive and respond more effectively to policy incentives even though they may not be able to produce a greater marketed surplus.

At the same time the concept of "Development" itself was also undergoing a change. Earlier development was viewed as growth in aggregates and it was believed that increases in GNP would automatically trickle down to the masses. This however was not witnessed, (also evident in case of India). The emphasis then shifted to "redistribution from growth".

From thereon the formulation of strategies reversed from agriculture being for economic development to economic development for agriculture and formulation of strategies for reaching development to the farmers, especially the farmers who stands lower on the endowment scale began to occupy the minds of policy makers.

³ Meier (1984), page 440.

⁴ Meier (1984), Page 431.

The following issues gained significance in such a 'rural based' strategy for development:

- a. utilisation of excess labour, unutilised resources and wasteland,
- b. providing the required technical stimulus,
- c. developing a series of non-crop farm activities like sericulture, pisciculture, horticulture,
- d. a disaggregated approach to agricultural development based on the peculiar characteristics of various agro-climatic zones,
- e. strengthening agriculture industry linkages,
- f. promoting agricultural exports,
- g. and developing the cooperative sector for marketing both domestically and internationally.

A positive agricultural strategy therefore requires spread of planning, infrastructure, technology resources to the rural areas. In the 1990's a number of developing countries are experimenting with a range of new policies for agricultural development. The new policy for agricultural development emphasises on, among other aspects, increasing productivity of the sector, diversification of cropping pattern into suitable high value crops, developing allied sectors of agriculture and adoption of an export-oriented policy in order to provide increasing incomes in the rural sector.

3. REVIEW OF AGRICULTURAL STRATEGIES IN INDIA

The Indian case typifies the changes and paradigm shifts in the thinking and policy of economic development in relation to the agricultural sector.

3.1. The Immediate Post-Independence Strategy- The First Plan (1950-51 To 1955-56).

Agricultural policy in India in the post independence period concentrated chiefly upon increasing production and productivity of foodgrains and cash crops, the pressing concerns being achieving self sufficiency in the foodgrains and creating food security in the country. The three goals on which the entire agricultural strategy of the immediate the post independence period rested were:

- (a) increasing agricultural production and productivity,
- (b) reducing excess pressure on land and creation of off farm employment,
- (c) reducing inequalities both between regions and between farmers.

The urgency for emphasising food self-sufficiency was partly prompted by the 1943 Bengal famine, and prior to this the post World War period put a

strain on the food grain situation, therefore the emphasis was on increasing food production and avoiding any kind of a 'Food Crisis'. The problem of food scarcity was further aggravated by the partition of India in 1947 when almost 32% of the irrigated land was transferred to Pakistan, India was left with only 17.6% irrigated land. The first plan therefore, naturally gave priority to agriculture and increasing food production and recognised the complementary nature of the dependence between the agricultural and industrial sector. Solving the food crisis and averting any food shortage of the nature of the Bengal famine was the main concern of this plan, for which, 31% of total outlay of the Central Government was provided for agriculture. The food grains production target was more than satisfied, (with actual production of foodgrains reaching the level of 67 million tonnes as against the targetted level of 60 million tonnes during this plan), given the favourable weather conditions and successful implementation of projects undertaken.

3.2 The Second Plan- (1956-61)

The Second Plan popularly known as the 'Mahalanobis Plan Model' emphasised on building the basic infrastructure for industrial development, not however overlooking the need to further increase agricultural production in view of rapidly increasing population and demand in future. The agricultural sector received about 20% of the total outlay during this plan. Till the second plan, the main lines of action taken by the Government were

- a) Diversifying from cash crops i.e. mainly short staple cotton to food crops.
- b) Intensifying cultivation on lands through spread of irrigation, better seeds, manure, and improved farms practices and
- c) Extending cultivation through use of fallow cultivable wasteland.

With these concentrated efforts the second plan almost achieved its target of 81 million tonnes, but in many areas there were shortfalls.

3.3. The Third Plan (1961-66) And The Fourth Plan (1969-74).

Towards the Third Plan a food shortage again threatened to emerge and the Ford Foundation team (1959) was appointed to go into the causes of food crisis. This team predicted a gap of 26 million tonnes in foodgrains production by 1965-66, if immediate remedial steps were not taken. This led to a major policy decision by Government Of India to concentrate on Crops and areas which have potential to increase food production. The main thrust was to develop areas quick to respond to incentives. Based on this approach the 'Intensive Agricultural District Programme (IADP) was introduced, in early 60's i.e. (1960-61).

The salient features of this programme were (a) development of a package of improved agricultural practices for each crop, based on research findings and (b) to assist cultivators to develop modern techniques of production. By 1967-68 the IADP plan covered about 5 percent of the total cultivable area. The plan came in for criticism and caution since "Concentration of efforts on high potential districts could not be a substitute for universal region specific core programme for agricultural development". The introduction of the IADP programme set the stage for ushering in the use of improved seeds i.e. the high yielding variety and finally the "Green Revolution."

In 1964-65 a slightly diluted version of the package approach known as "IAAP" Intensive Agricultural Area Programme was introduced covering 10 percent of cultivated area by 1966-67.

The third and fourth plans both however fell short of targeted foodgrains production by almost 20 million tonnes and a tremendous breakthrough was required to avert the acute food problem. By the end of the Third Plan and beginning of the Fourth Plan again the country faced near famine conditions. The strategy of the Fourth Plan was to intensify efforts by extending HYV, multiple cropping programme for commercial crops and increasing yield per unit of land. The fourth and the fifth plan saw agricultural production fluctuating with climatic fluctuations, as a result by end of the fourth plan there was again food shortages creating serious inflationary pressures of 1972-73.

3.4. Strategies Of The Mid-Sixties: Modernisation Of Agriculture And The Green Revolution.

Since mid sixties efforts to modernise agriculture beginning with the IADP had been initiated and under this the HYV programmes, also known as the seed-fertiliser-water technology was introduced. This modern agricultural technology or the 'Green Revolution' was ushered in 1967-68 which brought into use new high yielding variety of seeds, i.e. short gestation, short stem, fertiliser responsive varieties of seeds (wheat: Mexico; and Rice: Philippines).

With this radical breakthrough, the agricultural strategy in the country took a dramatic turn from traditional to modern, with the major accent being on non-farm purchased inputs, fertilisers, and pesticide use, electric pump-sets, tractors, etc. Production of foodgrains averaged 100 million tonnes in the period 1967-1968 to 1971-1972 as compared to 83 million tonnes in the Pre-Green revolution period.

The 'Green Revolution' however came in for heavy criticism. The basic criticisms

against the strategy was that it increased inter-regional disparity, as it was restricted mainly to wheat. It also enhanced disparities between small and large farmers. However "A single uniform technology cannot satisfy diverse climatic conditions of India - A Technology package of practices appropriate for different soils, climate and ecological conditions is necessary."⁵

The above developmental programme of agriculture was supported by a price policy (minimum support prices and procurement prices) with the objective of ensuring remunerative prices to farmers and reasonable prices at which consumers would be able to purchase food grains. The other supportive policy instruments included subsidy inputs, credit on easy terms, huge public investments and massive expenditures on irrigation i.e. constituting 22 percent of the total outlay on agriculture of the Central Government and also by 1970's the 'Garibi Hatao' or Removal of Poverty had become a very strong focus in the development process.

3.5. The Fifth Plan (1974-79) And The Sixth Plan (1980-85)

The fifth and the sixth plan raised allocations on agricultural development, irrigation, HYV and fertiliser consumption with a view to promote agricultural productivity. The fifth plan continued to emphasize on the extensive use of HYV, the new technology and irrigation. The sixth plan increased allocation to the agricultural sector to 25 percent and further emphasised on the water-seed-fertiliser technology. By 1983-84 foodgrains production increased to 152 million tonnes. However since poverty in the country was not seen to decline inspite of the plan effort in 1979-1980 the Integrated Rural Development Programme i.e. IRDP, was formulated as an anti-poverty programme. This programme was intended to promote self-employment of poor households and to increase their incomes. The target groups in this programme were the small and marginal farmers and agricultural labourers and rural artisans. The basic objective of this plan was to alleviate rural poverty by providing the poor with productive assets or skills so that they could employ themselves to earn greater income and thus cross the poverty line. This programme was initiated in October 1980 in all 5011 blocks of the country. The incomes of the farmers increased from Rs.1642 in 1980 to Rs.3339 in 1984-85. The programme sought to formulate and implement an integrated programme of rural development which would concentrate on sectoral, social and economic progress of rural areas to bring about growth, poverty reduction and employment generation.

⁵ Dantwala (1991).

3.6. The Seventh Plan (1985-1990)

This plan after having evaluated the weaknesses in the agricultural sector took up development of irrigation as a crucial input in agriculture and continued the projects undertaken in the sixth plan i.e. developing a National Watershed Programme for rain-fed agriculture. The other highlights of this plan was a special thrust on rice production programme in the East, a National Oil seeds Development Programme and a Country-wide Social Forestry Programme and a special focus on small, medium farmers and development of rain fed areas and dry land. In addition to these programmes for pulses a centrally sponsored National Pulse Development Programme was launched in 1986-87 to increase area and production of pulses. This program adopted a location- specific technology, and assistance was provided to farmers through block demonstration effect of different variety of pulses, use of fertilisers, chemicals etc. The production of pulses as a result of this reached a peak of 13-14 million tonnes during the last two years of the seventh year plan. Special focus was laid on small, medium farmers and rain-fed dryland areas. The plan by and large met the targets.

3.7 Evaluation Of The Above Strategies.

The success of Government's initiative towards increasing food production is evidenced by the fact that the total food grains production in the country has increased from 50.8 million tonnes in 1950-51 to 191.1 million tonnes by 1994-95. (and marginally declined to 185 million tonnes in the recent year). i.e. a growth rate of 2.8 percent per annum on an average.⁶ During this period the population of India has approximately doubled. Thus the food grain availability per capita has practically doubled strengthening the food security. (The food production has increased approximately by almost 4 times during the same period). The policy and programme of the HYV technology and subsidisation of credit, extension of irrigation facilities etc. resulted in a rapid growth of cash crop production. For instance, the production of oil seeds increased form 7.0 million tonnes in 1960-61 to 22.4 million tonnes in 1995-96. Sugar cane during the same period increased from 110 million tonnes in 1960-61 to 282.9 million tonnes in 1995-96 and groundnuts increased from 4.8 million tonnes to 7.8 million tonnes. The per capita availability of cereals/pulses increased from 395 grams per day per capita to 498 grams in 1996. Further, certain selected indicators like increases in area under

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HYV, irrigation, show a favourable trend. The area under HYV increased from 15.4 million hectares in 1970-71 to 75 million hectares in 1995-96 and area under irrigation increased from 38 million hectares to 79.9 million hectares in the same period.⁷ All these initiatives helped to increase farm incomes in selective areas.

However, though food security objective was attained to a considerable extent, certain essential aspects of the rural/ agricultural sector continue to cause concern, viz.,

- a) Highly skewed land distribution pattern, with almost 75 percent of the holdings in the marginal and small category i.e. with land holding size between less than 1-2 hectares operating only about 30 percent of the land holdings in 1990's.
- b) Dominance of small, marginal farmers and landless labourers with low level of income (together they constituted in 1990-91, 78 percent of the total land holdings accounting for only 32.2 percent of the area under cultivation).⁸
- c) Concentration of impact of modern technology in North West Coastal regions and only in some eastern regions and irrigated areas
- d) Inability of large rain-fed areas in Deccan plateau to adopt and derive benefits of new technology.
- e) Many promotional policies in agriculture not succeeding in improving income levels of small, marginal farmers and landless labourers.

To remedy the problem of raising the income levels of small and marginal farmers with diverse endowments in terms of quality of land and availability of water, a different approach came to be sought. In the present context it was not mere self-sufficiency of food grains which can sustain agriculture but a well contemplated agricultural development strategy which is essential and has attracted attention of a number of economist and policy makers.⁹ Several studies attempting to deal with this problem found that agricultural diversification in general and horticultural crops in particular provide a viable strategy. Nayyar and Sen (1994) recognised that the real potential for income and employment growth lies in fruits and vegetables instead of in only specialised crop production. Alagh (1994) strongly advocates diversification from low yield crops to a variety of new crops. Further, in 1986-87 with the severe drought conditions there was a greater emphasis on drip irrigation and activities like dry land horticulture and even grape

⁶ CMIE Basic Statistics Relating to the Indian Economy Vol I. (1992), Table 10.7

⁷ Government of India, Economic Survey, (1996-97) pages 16 & s-22).

⁸ Tata Services Limited. Statistical outline of India. (1996-97).

⁹ Bhalla (1994). ed .

production. The program of agriculture diversification was slowly becoming an integral part of the policy for agriculture and rural development. In 1990's a number of developing countries have been experimenting with a number of new policies for agricultural development and transformation, of which agricultural diversification i.e. diversification in the cropping pattern, among other instruments, emerges as a major option. A recent study; Timmer (1993), recommends an export oriented policy along with providing growing incomes in the rural sector as a meaningful policy in the 1990's.

4. THE EIGHTH PLAN INITIATIVE FOR HORTICULTURAL DEVELOPMENT.

As seen in section one, international thinking on appropriate strategies for agricultural and rural development underwent a radical paradigm shift during the 1980's. Simultaneously, (as was seen in section 2), in India also, policy makers and economists recognised the need and urgency to change the approach towards agricultural development. Accordingly, a concrete and determined initiative to develop farmers from their own initial conditions was launched only during the Eight Plan. The Eighth Plan shifted its focus from an aggregate approach to a desegregated approach. Such a policy was however, recognised way back in 1968, (D.R Gadgil 1968) when it was realised that more than the national aggregate policy a disaggregate crop-specific region-wise approach towards agricultural development policy would be more meaningful. The 8th plan has accorded top priority to removal of the persistent problems of the agricultural sector and to fulfill this objective it seeks to:

- a) Initiate growth of regions which have hither-to lagged behind (mainly Eastern India) hilly areas and rain-fed tracts.
- b) Initiate programmes in rain-fed agriculture like watershed development programme, dry land development schemes, development of horticultural plants, agro-forestry. This would enable farmers to make optimum use of land and water resources and create employment opportunities in rural areas.
- c) Concentrate on the development of small and marginal farmers who lack even a minimum standard of living. This is sought to be done through diversification of agriculture into allied activities like animal husbandry, horticulture, sericulture, fisheries, etc. These activities have a strong potential for generating higher incomes and employment generation. In this direction a major area identified is expansion of agro-based industries.

- d) Maximise production of traditional export commodities and also non-traditional commodities like fruits, vegetables and flowers.

Among the areas earmarked as having potential for generating income, employment and export earnings *Horticulture* has been recognised by the planners as a lead area. It is also recognised as a source of high economic returns to the farmer.

The main thrust and strategy of the eighth plan can be summed up as "In rain-fed areas farming system approach should be the basis for enabling farmers to make scientific and optimum use of land and water resources to increase their income. Diversification of agricultural production system may be called for together with scientific management of land to prevent soil erosion".¹⁰ In the Indian set up where dominant land holdings fall under small and marginal category even the best efforts towards increasing productivity and yield have concentrated on only traditional crops cannot yield sufficient and stable income for farmers. Diversification of agriculture into other allied activities with potential for generating higher returns and income such as animal husbandry, horticulture (both in irrigated and unirrigated areas) fishery, agro-forestry, sericulture is unavoidable or rather desirable to augment rural income and employment.

The 8th five year plan states that, given the wide diversity of climate and soil conditions, Indian agriculture provides great scope for growing a variety of horticulture crops making it all the more attractive because of its employment generation potential. The Eighth plan with caution to food security has emphasized on a faster growth of agriculture, employment generation, poverty alleviation and has focussed on agricultural diversification as a means to achieve the above. It has specifically recognized horticulture as a strong potential area of such diversification. The earlier efforts to increase food production through strengthening infrastructure, expansion of agro based and processing units, maximising output of traditional crops as well as non traditional crops for exports would also continue to be the mainstay of the 8th plan and new policy programmes.

A concrete and determined initiative to develop horticulture in the country was thus launched only during the Eighth Plan. However, efforts to initiate development of the horticultural crops in India had begun since the sixth plan through promoting the National Watershed Development Project for Rain-fed

Areas, (NWDPRRA). By the Seventh plan these efforts gathered momentum and two major efforts to promote this sector were undertaken –

- (a) Increasing the allocation for this sector to 21.94 crores.
- (b) In 1998 the Agro-regional Planning Approach (AGRP) was adopted to formulate an integrated development plan for agriculture and the allied sectors by homogeneous agro-climatic regions. A macro-level strategy for 15 broad agro-climatic zones was proposed. This in fact formed the basis of the desegregated approach towards agricultural development adopted in the Eighth five-year plan and continued in the Ninth-Plan.

These efforts formed the background from which the Eighth Plan took up the development of the horticultural sector. The following table 2.1 provides the trends in the Central Governments plan outlay for horticulture between the Fifth to the Eighth Plan.

Table 2.1 Plan Outlay By Central Government For Horticultural Crops

Plan	Outlay Rs.(Cr.)
V (1973-1978)	7.61 (actual)
VI (1980-1985)	9.13 (actual)
VII (1985-1990)	24.19 (actual)
VIII (1992-1997)	1000 (actual)

Source : National Horticultural Board Technical Communications. (1995.)

As can be seen from table 2.1 between the Seventh and Eighth plan period the central government's plan outlay for the support of horticultural crops rose by 40 times. (Perhaps there is no single major head of central Government expenditure that has increased so dramatically within successive plans!). During the same period a number of state governments have taken special initiatives to promote horticultural development.

The Eighth plan emphasises on the following aspects in respect of the development of horticultural crops.

- a) Improvement in the quality of planting material,
- b) area expansion under horticultural crops,
- c) quality increases in productivity,
- d) introducing modern agro-technology through tissue culture, green and glass house, drip irrigation, etc,
- e) developing infrastructural facilities including grading, storing, marketing,
- f) supporting horticultural through APEDA (Agricultural Product Exports

¹⁰ Government of India 8th Five Year Plan (1992-97), Page 10-12. Vol II.

- Development Authority) and NHB (National Horticultural Board),
- g) promoting production specially of fruits, vegetables & cutflowers,
- h) and a suitable selection of crops for exports.

The following tables 2.2 and 2.3 give a detailed idea of the break-up of allocation in the Seventh and Eighth Plans on the various items of horticultural crops.

Table 2.2 Schemewise Allocation In VII And VIII Plans. (Rs. in crores)

Scheme (On going)	VII Plan	VIII Plan
Fruits	2.88	74.38
Vegetables	1.77	15.00
Coconut	7.71	79.29
Spices	2.01	125.00
Cashew	2.90	47.85
Cocoa	0.14	3.00
NHB (Schemes)	4.80	200
Oil Palm	1.95	-
Total	24.16	544.52

Source : National Horticultural Board Technical Communications. (1995_a)

Table 2.3 Thrust Areas And Allocation Of VIII Plan

Area	Outlay (Rs. Cr.)	Percentage of Total
Productivity Improvement	375.44	41.8
PostHarvest Management	181.15	20.1
Planting Material	105.98	11.8
Technology Transfer	102.71	11.4
Area Expansion	83.74	9.3
Export Enhancement	50.00	5.6
Total	899.62	100.00

Source : National Horticultural Board Technical Communications. (1995_a)

As can be seen from the above tables, the Eighth plan has allocated a total of 89.38 crores for fruits and vegetables alone. (See table 2.2). Productivity improvements are to receive 41.8 percent of the total allocation followed by post harvest management expenses which account for 20 percent of the total outlay (See table 2.3). Therefore the plan has identified two crucial areas in promotion of horticulture in the country i.e. productivity increases and post harvest management technology which includes storing, processing, packaging, marketing, etc. (Infact this accounts for about 30 to 40 percent of losses of horticultural crops in the country).

4.1. Other Incentives For Development Of Horticultural Crops

In addition to the direct allocation of funds and other supportive measures emphasised in the Eighth Plan there are a number of additional schemes and incentives initiated by the Government of India to promote horticultural activity, these are discussed in the following section.

1. Drip Irrigation Assistance: Rs.250 crores has been allocated in the 8th plan for horticultural improvements in the nature of drip irrigation, green houses and plastic mulches. From 1995-96 facilities and assistance for drip irrigation will now be provided for the entire holding of the beneficiary for growing horticultural crops.

2. Post Harvest Technology Assistance: The government is concentrating on developing post harvest technology, which is a crucial area. The post harvest losses amounts to about Rs.6000 crores for fruits and vegetables, arising mainly due to poor infrastructure and lack of organised marketing. The National Horticultural Board (NHP) has provided Rs.200 crores for implementing appropriate schemes during the Eighth plan for providing infrastructural support to this sector. A budgetary provision, (Central Government) of Rs.41crores has been also made in 1996-97 for this purpose.

3. Subsidy Assistance And Credit Facilities: During 1996-97 subsidy for horticultural crops has been increased to 90percent of the total cost of the venture RS.25000 per hectare whichever is less for small and marginal farmers, SC/ST and woman farmers. For other farmers it is 70 percent of the total cost or Rs.25000 whichever is less. Various credit institutions like National Bank for Agriculture and Rural Development (NABARD), NCDC provides support for post harvest management of horticultural crops and import of seeds. The Agricultural Products Export Development Authority (APEDA), NHB continue to support marketing and processing of such crops. Pre cooling units, cold storage packaging houses and soft loans form a part of the package of developing horticulture.¹¹

4. National Dairy Development Board (NDDB) Plan for Fruit and Vegetable Grid.

The NDDB assisted by the World Bank proposed the creation of a national grid for fruits and vegetables to stabilise the prices of these commodities. This was to be established in 10 big cities for e.g. Bombay, Madras, Calcutta, Hyderabad, Lucknow, Ahmedabad (involving Rs. 500 crore). Earlier the NDDB introduced a 30 crore pilot project few years back in Delhi, wherein 200 shops and air

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conditioned storage rooms were opened for supply of fruits and vegetables at fixed rates, currently about 150 tonnes of fruits and vegetables are sold through these shops which have all modern facilities of weighing, billing, etc. Another proposal to form 390 fruit and vegetable grocers cooperatives in Gujrat, Andhra Pradesh, Karnataka by 2000 AD is underway which guarantees remunerative prices for farmers as well as seed assistance, new scientific methods of production and modern refrigeration plants.

5. Dry Land Area Development Programmes: Under the dry land area development during 8th plan it is proposed to bring 13 percent of 100 million hectares of low lying dryland area and 3 million hectares of wasteland under horticultural crops. Present area under fruits and vegetables is 13.6 million hectares and production stands at 100 million tonnes. To facilitate horticultural development 100 large scale nurseries also are to be set up i.e. about two to three in each state.

Due to the above incentives and promotion schemes and also due to private initiative horticultural crops like fruits, vegetables, flowers, plantation crops, coconuts, cashewnuts, presently covers about 13.6 million hectares. By 1996-97 this has been estimated to have increased to 15.7 million hectares. The production of these crops is estimated to be about 106 million tonnes, with fruit production alone at 39.47 million tonnes in 1993-94. For 1996-97 the total production of horticultural crops is estimated to have reached 141 million tonnes with fruit production alone at 46.9 million tonnes.¹²

5. THE NINTH FIVE YEAR PLAN AND HORTICULTURAL DEVELOPMENT :

In the Ninth Five-year Plan approach paper, agriculture and rural development have once again received priority in the development strategy of the plan. The horticultural sector among other allied sectors would continue to be an area of emphasis with the objective to raise agricultural and rural income. The ninth plan seeks to introduce concrete measures to raise the level of agricultural and rural incomes through programmes specially designed to benefit the small, medium, marginal farmers and landless labourers. The targeted growth rate in the agricultural sector is 4.5 percent per annum. During the ninth plan, allied sectors like horticulture i.e. fruits and vegetables, fisheries, livestock are estimated to grow

¹¹ Government of India Economic Survey (1996-97) Page 146.

¹² Government of India Economic Survey (1996-97)

at a favourable rate. The ninth plan would continue to follow the regionally differentiated strategy based on agronomic climatic conditions, (introduced in the earlier plans). In the northwestern high productivity region, the strategy focuses on promotion of agricultural diversification, specially into high value crops to strengthen linkages with agro-processing industries and exports. In the water scarce region of peninsular India, including Rajasthan, suitable irrigation packages based on watershed approach and promoting appropriate farming system is to be encouraged. In both these areas promotion of horticultural crops has been identified as having a strong potential. The ninth plan places special emphasis on the development of horticultural crops – " efforts will be made towards proper blending of technology, credit, scientific management, post harvest infrastructure and marketing for accelerated growth of horticulture".¹³

The plan seeks to remove the various constraints to horticultural developments including low productivity of perennial fruits, spices and post-harvest infrastructural constraints. The latter accounts for 20 to 40 percent of the losses at various stages of storage, grading and packing. It is therefore evident that the initiatives for agricultural diversification through horticulture will be further strengthened in the ninth plan.

6. AGRICULTURAL DIVERSIFICATION: CHANGES IN CROPPING PATTERN IN INDIA

In the preceding sections we have taken an account of the direction and steadily increasing magnitude of policy initiatives towards encouraging agricultural diversification in the interests of extending the utilisation of agricultural resources. This account was largely qualitative in nature, emphasising the shifts in thinking and the parallel shifts in incentives given through the various expenditures and programmes under the plans. To assess the impact of the policy initiative, we now turn towards examining the experience with agricultural diversification i.e. in the nature of the changes in the cropping pattern in India over the period 1960-61 to 1994-95. The trend of diversification i.e. changes in the cropping pattern towards non-traditional/non-food crops, (especially fruits and vegetables) is witnessed in India, as well as, in a number of Asian countries. (Note: For the pattern and experience with agricultural diversification for some countries primarily in the South and East Asia and some countries in Africa, Latin America and Middle East

¹³ CMIE Draft Approach paper to 9th Five Year Plan (1997-2002), Page 57.

see Annexure I).

As regards the Indian economy, the land use statistics on cropping pattern in India for the period 1960-61 to 1994-95 reveals such a diversification trend. Table 2A shows the changes in cropping pattern between the period 1960-61 to 1994-95.

**Table 2.4 Changes In Cropping Pattern Over Time In India :
Area & Percentage Share Of Each Crop To Total Cropped Area
(area in '000 hectares)**

CROP	1960-61		1980-81		1989-90		1994-95	
	Area	Share (%)	Area	Share (%)	Area	Share (%)	Area	Share (%)
1. Rice	34056	22.3	40282	23.3	42141	23.3	42800	23.4
2. Wheat	12931	8.5	22241	12.8	23500	13.0	25700	14.0
3. Jowar	18426	12.1	16381	9.5	14827	8.2	11500	6.2
4. Maize	4401	2.9	6053	3.5	5910	3.3	6100	3.3
5. Total Pulses	23665	15.5	22797	13.2	23275	12.8	23000	12.5
6. Total Foodgrains	115564	75.6	127965	73.9	126430	69.8	123700	67.7
7. Sugarcane	2417	1.6	2834	1.6	3525	1.9	3900	2.13
8. *Condiment/ Spices	1569	1.0	2077	1.2	2364	1.3	2377	1.30
9. Total Oil seeds	12957	8.5	15950	9.2	23627	13.0	25000	13.6
10. Total Fruits & Veg.	2649	1.7	4882	2.8	6148	3.5	8700	4.8
11. *Other Crops	17722	11.6	19560	11.3	19020	10.5	19020	10.4
12. #Total Area	152772	100	173099	100	181143	100	182700	99.93
13. Herfindahl Index 'H'		0.5928	-	0.5685	-	0.5337	-	0.4905
14. Index of Diversification ('D')		1.686	-	1.7588	-	1.8734	-	2.03

* The area under condiments, spices and other crops are close approximations.

There is a marginal difference in the total area of figures which is the sum of items 6-11 which may be on account of some crops not featuring here.

Source : Haque (1996), page 20, Government of India, Economic survey (1996-97) page 17. Tata Services Ltd, Statistical outline of India (1996-97), page 56, Hindu (1995), page 115.

NOTE : Data on total cropped area is for the period 1991-92 upto which it was available.

The following major conclusions about the trend of diversification in the cropping pattern in the Indian economy are revealed from the above table (see table 2.4).

- a) Percentage of area under foodgrains has decreased from 75.61 percent in 1960-61 to 69.8 percent in 1989-90, and further to 67.7 percent in 1994-95 mainly due to decrease in area under crops like Jowar, Bajra, Barley, Millet, Pulses.

b) There is an upward trend in area under oilseeds, fruits and vegetables. The area under fruits and vegetables increased from 2649 '000 hectares in 1960-61 to 6148 '000 hectares in 1990 and further to 8700, 000 hectares in 1994-95. In percentage terms the area increased from 1.7 percent in 1960-61 to 3.5 percent in 1989-90 to 4.8 percent in 1994-95. The area under fruits and vegetables have thus registered a rapid increase from 3.5 percent to 4.8 percent between a span of only 3 to 4 years i.e. between 1989-90 to 1994-95. A positive trend of diversification towards such high value crops specially in the recent years is thus seen. Yet a point to be noted here is that in the context of Indian agriculture, diversification is still in its initial stages. Among the foodgrains category the area under rice and wheat show a marginally increasing trend, specially rice, which is essential to maintain food self sufficiency. However the inferior cereals like jowar, maize have shown a decline in the area.

A significant increase in area under non-foodgrains is thus witnessed especially since 1980's. The rate of return from food grains viz- a-viz non-foodgrains is considered to be a key factor determining allocation of land.

To measure the degree of diversification in the pattern of allocation of land, the standard method is to compute the Herfindahl index (H). The Herfindahl index is the measure of the degree of concentration. Therefore either is reciprocal $1/H$ or $1-H$ can be used as the degree of diversification.

The 'H' index is computed as follows:-

$$H = \sum_{i=1}^n (x_i)^2$$

where: x_i is the share of the land devoted to the 'i'th crop. [if for example all the land is devoted to some crop 'i', then $x_i = 1$].

Therefore 'H' = $(1)^2 = 1$.

This implies that there is full concentration or zero diversification.

Suppose there are only two crops each occupying 50 percent of the land or 1/2 the land, 'H' can be calculated in this case as-

$(1/2)^2 + (1/2)^2 = 0.25 + 0.25 = 0.50 = 1/2$ i.e. $H = 1/2$ which implies a lower degree of concentration and so on.

As can be seen from the above example, as the number of crops increases and as the proportion of land devoted to each crop becomes more and more diversified, the degree of concentration 'H' reduces. When there is a single crop the degree of concentration reaches its maximum value of 1. If there are

numerous crops (in principle infinite number of crops) spread uniformly over the land the degree of concentration will reach its minimum value equal to zero. Thus this measure of degree of concentration 'H' is inversely related to the degree of diversification or Index of diversification 'D'. Very simply 'D' can be defined as an increasing measure in diversification. This is easily done by defining D either as

$$D = 1-H$$

or as $D = 1/H$.

This Herfindahl index (H) and the index of diversification (D) can be used to measure the diversification which has taken place in the cropping pattern in India for the period 1960-61 to 1994-95. (See table 2.4 items 13 & 14). As can be seen from the table for the period 1960-61 the 'H' shows the value of 0.5928 (item 13) and D shows the value 1.686 (item 14). [It is calculated as follows, the percentage share of area under foodgrains, sugarcane, condiments, spices, total oil seeds, fruit and vegetables and other crops have been used for deriving values of xi (i.e. the proportion of area devoted to these crops). This has then been squared and summed up to arrive at the values of 'H' and 'D' using the formulae given above]. This method of calculation is also followed for the later years.

Based on the above index, of diversification the following observations of the data for the period 1960-61 to 1994-95 can be summarised.

1. Between the period 1960-61 to 1980-81 there was a marginal increase in crop diversification which was more evident after 1980's between 1960-61 to 1980-81 the diversification index increased from 1.686 to 1.7588. Between a short span of 1989-90 to 1994-95 the index of diversification increased from 1.8734 to 2.03 (see table 2.4 item 14).
2. If we study the composition of this, it is observed that oilseeds, fruits and vegetables, are two categories of crops that have registered a significant increase in the share in total area under various crops. Oilseeds, which accounted for 8.5 percent of the total area in 1960's increased to 13.6 percent in 1994-95. (This crop has been a major import commodity in the past and the current policy has been to encourage its domestic production). Fruits and vegetables, which occupied only 1.7 percent of the total area in 1960-61, accounted for 4.8 percent of the total area in 1994-95. A recent study by Haque (1996) has made a detailed analysis of two related aspects of agricultural diversification (i) the percentage distribution of area under food and non-food crops by major size group of farms in India and (ii) The

trends in cropping pattern in irrigated and unirrigated areas. As regards the first aspect, the results of the study are provided in Table 2.5. The following conclusions are worth noting-

a) The small and marginal farmers are not averse to agricultural diversification. The marginal, small and semi medium farmers in all categories of scheduled castes, scheduled tribes devote about 11 percent to 18 percent of their total area to non foodgrains. It is however, higher for the medium and large farmers at 22 percent to 26 percent of the total area. This is basically due to better access to technological, and infrastructural facilities, better irrigation, etc.

Table 2.5: Percentage Distribution Of Area Under Food /Non Food Crops By Major Size Group Of Farms In India: Reference period 1980's.

Size Group	Scheduled Caste		Scheduled Tribe		Overall	
	Food Crop	Non food crop	Food Crop	Non food crop	Food Crop	Non food crop
Marginal Farmers (Less than 1 hectares)	87.8	12.2	86.9	13.1	88.6	11.4
Small Farmers (1-2 hectares)	83.6	16.4	84.4	15.6	85.2	14.8
Semi Medium Farmers (2-4 hectares)	80.9	19.1	83.4	16.6	82.0	18.0
Medium Farmers (4-10 hectares)	77.9	22.1	83.2	16.8	77.5	22.5
Large Farmers (7-10 hectares)	74.0	26.0	83.5	16.5	73.2	26.8
All Groups	81.8	18.2	83.5	16.2	80.3	19.7

Source: Haque (1996), Page 21.

b) The study has relied on a work by Thakur, Kapila and Moorti (1985) and a number of other studies to show that there is evidence of small farmers showing favour to diversifying into vegetable production, seasonal fruits, dairy, etc. to maximise household income and employment.

c) By his own earlier study (Haque 1992) the author also indicates that in a number of cases small and marginal farmers do not generate adequate income through diversification.

As regards the second aspect i.e. the cropping pattern in irrigated and unirrigated areas, the study (Haque 1996) noted the following conclusions:

Observations:

1. The percentage of area under food grains in both irrigated and unirrigated category of land between 1950-51 to 1983-84 has shown a decline, from 81.2

percent of irrigated area in 1950-51 to 74.5 percent in 1983-84. During the same period percentage of area under food grains in the non irrigated category of land declined from 78.8 percent to 72.5 percent. The increases in production of total food grains has been mainly through yield increases.

2. The percentage of land under oilseeds has shown a significant increase from 1.1 percent to 5.7 percent of the irrigated land and 9.8 percent to 12 percent of unirrigated land during the same period.

3. Fruits and vegetables also have shown an increase in percentage terms from 0.5 percent to 3.6 percent in the irrigated category and 2 percent to 2.6 percent during the same period in the unirrigated category.

4. Wherever irrigation facilities are available crops like rice, wheat, sugarcane, fruits, vegetables do find favour with farmers, irrespective of their size of holdings.

(Note: This kind of a detailed information however was not available for the later period).

The process of agricultural diversification in the Indian situation as compared to some selected developing countries reveals that India is still in the initial stages of diversification. As can be seen from the table 2.6 given below.

Table 2.6 Trends In Agricultural Diversification In Selected Asian Countries [Annual Growth Rates Of GDP In Various Subsectors Of Rural Economy] 1980-90.

Country	Cereals	Potato	Fruits	Vegetables	Meat	Milk	Fish
Bangladesh	2.8	1.4	-0.3	1.8	4.1	0.2	3.1
Bhutan	-5.7	3.5	9.0	-0.6	3.4	0.7	0.0
India	3.4	5.7	3.6	2.5	5.1	5.1	3.9
Nepal	4.5	9.0	2.0	2.0	3.3	2.6	16.0
Philippines	2.9	4.4	-1.0	-1.3	2.6	1.4	3.1
Thailand	1.5	3.1	-0.5	-1.5	4.0	22.1	4.6
Indonesia	4.1	10.4	2.8	6.5	8.1	8.3	4.8
China	2.8	2.4	10.6	4.4	8.1	9.6	11.7
Rep. of Korea	1.6	-0.9	7.2	0.6	7.8	14.7	3.4

Source :Haque,(1996), Pg 17.

As can be seen from the table 2.6 India's growth rates in production of fruits, vegetables, milk, meat, fish are not as high as China, Indonesia, and South Korea. In China for example between the period 1980-1990 fruits grew at a rate of 10.6 percent per annum, for India it was 3.6 percent per annum during the same period. India is therefore in the initial stages of diversification. The post-90 period however has shown a much more rapid growth rate in horticultural crops. (See

chapter 2, section 4).

This section has reviewed the extent in pattern of the shift in the crop mix at a macro level. This kind of a shift is not unique to India. As has been mentioned time and again the strategy towards agricultural diversification has captivated the minds of economists as well as policy makers as being an eminently viable strategy for raising and stabilising farm incomes. It is natural to expect that a similar strategy would be followed with similar effects in other underdeveloped and overpopulated regions of the world. A review of some selected developing countries experience has been made in the ANNEXURE to this chapter. (See ANNEXURE 1).

CHAPTER 3

PRODUCTION AND DEMAND CHARACTERISTICS OF FRUIT CROPS.

Horticultural technology is characterised by diversity i.e. diversity in the variety of crops, their gestation period, their land requirements, their soil requirements, and labour requirements etc. It includes a wide variety of crops ranging from vegetables, fruits, flowers, spices, condiments, plantation crops, tuber crops, etc. It ranges from short gestation crops like vegetables to long gestation crops like mangoes. Alongside, the gestation period, the horticultural crops also range from low capital intensity to high capital intensity crops.

In this chapter we shall deal with fruit crops, its production and demand characteristics. The first part of this chapter deals with the agronomical and technical details of cultivation of fruit crops and the production peculiarities of such crops. The second part reports the production figures of horticultural crops in India with special reference to fruits. The third part of this chapter explains the peculiarities of the demand characteristics of fruit crops.

PART I

1. AGRONOMICAL AND TECHNICAL DETAILS OF CULTIVATION OF FRUITS CROPS¹

1.1 Soil Details

The physical conditions of the soil which include testing, aeration, depth and friability are more important than the chemical nature (i.e. salinity, acidity, alkalinity and mineral contents) in the production of fruit crops. Medium textured loams are most suitable and generally preferable for fruits because heavy soils like clay or clay loams possess undesirable characteristics such as poor soil aeration, drainage and moisture holding capacity.

1.2 Planting Details

Generally pits are dug at least three months prior to planting.

- * For trees such as mangoes, guava, citrus, chikus, jackfruits, pits of 1 cubic meter are required and small pits of 75 cubic centimeter for shrubby plants such as bananas, pomegranate, papaya are required.

¹ Rao (1991)
Vyas (1994)
Weathen (1993)

- * Dried twigs are burnt at the bottom of the pits to ensure sterilisation after which the bottom pit is filled with sand up to 15-22 cm deep and covered with a mixture of one part of decomposed farmyard mixture, two parts red earth and one part river sand.

- * After the planting material is planted firmly, pits are filled with mud and dusted with 25-30g of 10 percent BHC powder (DDT common name).

- * Spacing at a distance of 7.5 meters to 9.0 meters is maintained between two trees, for shrubby trees such as citrus, and for medium and large trees like guavas the distances maintained are 3.0 to 3.6 meters and 4.5 to 6.0 meters respectively.

For shrubs, pineapple and bananas the spacing distance are - 1.5 meters to 2.5 meters, 45 cm., and 1.5 meters respectively.

1.3 Pruning And Shaping

Pruning is done to stimulate growth of the fruit; more pruning is required in case of temperate fruits rather than tropical fruits, for e.g. peach, apricot, apple, grape need more pruning.

1.4 Manure And Fertiliser Use

Fruit trees generally need good manure, i.e. both well decayed farm manure and application of fertilisers. A large fruit-bearing tree would need annually about one basket (10kg) of farmyard manure (nitrogen) and one kilo of bone meal (phosphorus contents) and some other fertilisers. The manure and fertiliser requirements would however vary between fruit crops.

1.5 Bearing Life Of Fruit Trees

Many fruit crops can be propagated naturally from seeds or artificially by grafting, budding, or cloning that uses tissue-culture. Some can be reproduced vegetatively such as banana shoots or suckers that develop from corn. The fruits produced naturally take a longer period to bear fruit as compared to grafted fruits. Commercial crop growers commonly profess the grafted method. There is a lot of variability in number of years of economic bearing life of fruit trees from less than a year for banana, pineapple, papaya to more than 100 years for fruits like mangoes, jackfruit. It must be stated here that, fruit production involves a capital investment and that it has a relatively longer gestation period compared to traditional crops.

Details of fruit bearing from date of planting i.e. the gestation period for some selected crops is given below in Table 3.1.

Table 3.1 Gestation Period For Selected Fruit Crops

Type of Fruit	Gestation period from date of planting
I. Banana, Grapes, Papaya, Pineapple	1 - 2 years
II. Citrus fruits, Custard Apple, Guava, Mango, Pomegranate, Hybrid, Coconut Palms	4 - 5 years
III. Apple, Plum, Mango, Tall Coconut trees	6 - 7 years
IV. Jackfruit	8 years

Source: Vyas (1994), Page 149-50.

1.6 Detailed Agronomic Characteristics Of The Selected Fruits Crops Of This Research Study : Viz. Mango & Grapes

Since Mangoes and grapes have been selected for primary data analysis, the following part of this section deals with the agronomical details of these two crops.

MANGO (Botanical name: *Mangifera Indica*) : A tropical as well as Sub-tropical plant growing almost all over India. It is an evergreen tall spreading tree and grows almost up to 18metres. The plant blossoms between December to March. There is a great deal of variation in size, and weight ranging from 0.06 kg. to 1.1 kg. The two important conditions for mango cultivation are a frost-free dry period at flowering time and sufficient heat during ripening of fruits. The ideal temperature is between 75^oF (°F Farenhite) to 80^oF. Mango grows best in areas with annual rainfall of 30 to 75 inches with little or no irrigation, it is also suitable for dry areas. Heavier rain fall is tolerated only if it is not at time of flowering or fruit repining, frost and rainfall during blossoming also adversely affects mango crop. About 1000 varieties of mangoes exist of which only 20 are grown on a commercial basis. Some varieties are Alphonso, Bangalora, Banganapalli, Bombai, Chausa, Dophool, Fazil Malda, Himasagar, Jehangir, Krishnabhog, Neelam, Raspuri, Vanaraj, Dasherri, Langra, Totopuri etc. Hybrid varieties which have attracted the most sophisticated world markets are HY-10 (Begampalli X Alphonso, HYB, HY-15, Amrapali and Mallika, HY51, Alphonso X Banglora). Mangoes are rich in vitamins A and C. The mango fruit is utilised in all stages of developments for pickles, as fresh fruit, preserved fruit, dried fruit etc.

GRAPE (*Biological Name: GRAPEVINE VITACNAE*): It is a tropical and subtropical fruit and can be grown under a wide range of climatic conditions. It grows best in warm dry summer and cool winters. Bright sunshine and hot and dry season are required for ensuring proper ripening and good quality of the fruit. It is susceptible to

humid conditions. It is grown largely in France Italy, Australia, USSR and the United States in many temperate and subtropical countries and also in tropical regions recently. India has the highest yields in grapes because of rich varied soils and agro-climatic conditions. It requires extremes of temperature and well drained light friable loamy soil. Usually one crop is raised in a year. Today it is the most important cash crop giving maximum returns per hectare of land. (Obviously it is also involves heavy investment and recurring costs). The major varieties are Bedana, Beauty seedless, Pusa seedless, Tas-a-Ganesh, Thompson seedless, Sonaka, Aanab-i-shahi, Dilkhush, Bangalore – Blue, Gulabi, etc. The hybrid variety of Thompson seedless is the most popular export variety. This fruit is popular as table fruit and also for wine and is rich in carbohydrates, minerals and vitamins.

1.7 Package of Practices for Cultivation of selected fruit crops.

This subsection provides a brief overview of some technical and agronomic details of a few selected fruit crops. Table 3.2 provided below deals with the time of planting, the spacing details, the propagation methods and the main varieties of some selected fruit crops.

Table 3.2 Package Of Practices For Cultivation Of Fruit Crops

CROP	TIME OF PLANTING	SPACING (meters)	PROPAGATION METHOD	*VARIETIES
Apple	December - January	5 x 5	Grafting and budding	Red delicious, Golden delicious, Royal delicious, Yellow Newton, Irish Peach (160 - 400)
Mango	Rainy Season	10 X 12	Seeds, Inarching, Vincer Grafting	Dashehari, Langra, Chausa, Bombay, Green, Fazli, Amrapalli, Mallika, Alphonso (100 to 500)
Guava	On set of Monsoon	4 X 5	Seeds, air layering, In arching	L-49 Chittidar, Allahabad, Safeda, Ped flesh (70 - 100)
Grape	January	3 X 3	Cutting / layering budding	Anab-e-shahi, Bangalore blue, Bangalore Purple, Thompson seedless, Pusa Seedless (300 - 400)
Papaya	On set of Monsoon	2 X 2	Seeds Tissue Culture	Honeydew, Pusa delicious, Pusa dwarf Solo (30 - 70)
Banana	Throughout except heavy rains or severe winter	2 X 2.5	Swordsuckers	Poovan, Basrai, Rasthali, Robusta, Harichal (300 - 400)

Source : Vyas (1994) Page 149-150.

* Figures in brackets indicate number of varieties of the crop.

1.8. Production Characteristics Of Fruit Crops.

Fruit crops possess certain distinctive characteristics different from the traditional, agricultural crops. An understanding of these characteristics is necessary to make any further economic evaluation of these crops, their costs, returns, and the life cycle, yield pattern etc. This section deals with some highlights of the production characteristics of horticultural crops i.e. mainly fruit crops.

1. Unlike the traditional agricultural crops whose production functions are in the nature of point-input and point-output or continuous input and point - output, horticultural crops are of a different nature. These crops require longer gestation periods ranging between 1 to 5 years on an average. Therefore while calculating the revenue from such crops or while making a decision to adapt fruit crop cultivation this aspect becomes extremely significant.

2. In case of fruit crops there is thus a building up of a capital asset, with generally high initial - year capital investments. Thereafter these crops require annual recurring expenses, which vary between fruit crops being very high for some crops like grapes, and relatively low for some crops like mangoes.

3. The product - yield life cycle is different in traditional agriculture as compared to the life cycle of fruit crops. (For example for grafted mango trees, like Alphonso Mango), the trees start yielding fruits in the 5th year. Initially the yield is very low i.e. on an average about 50 fruits per tree, by the 7th year it yields 200 fruits and reaches the peak yield period in the 10th year when it can give almost 500 fruits per tree, after which a grafted Alphonso bears fruits for almost 25-35 years or even longer. This yield pattern would however differ between regions depending on the agro-climatic soil and other conditions. In case of traditional mango trees the lifetime is much longer, ranging from 50 to 100 years.

Grapes (i.e. the hybrid varieties like for example Thompson seedless), on the other hand start yielding fruits in the first year itself. In the first year itself the plantation yields about 7 tonnes per acre which increases to 9 tonnes per acre in the second year, 10 tonnes in the 3rd and 4th years. By the sixth year its yield reaches a maximum level of 15-20 tonnes per acre which gradually settles at 10 to 12 tonnes per acre till the 15th year. This yield pattern differs between regions to some extent depending on the agro-climatic, soil and other conditions. This information is provided below in table 3.3.

Table 3.3 Product Life Cycle Of Grapes:

Year	Tonnes (per acre)
1st	7
2nd	9
3rd	10
4th	10
5 th	15
6 th	20
.	.
15	10-12

Source: Based on primary data investigation.

The life cycle of grapes lasts till 15 years, the grape farm requires renovation after 10 years. On an average it yields 10-12 tonnes per acre. (Note: The yield has been reported per acre to maintain consistency with the primary data presented from chapter 7 to 10. However this can be converted into yield per hectare).

4. The implication that arises from the above differences in the yield pattern is that under traditional agricultural system no capital asset is created. In case of fruit cultivation there is a creation of a capital created.

5. In fruit cultivation after the initial investment and gestation period there is a flow of revenue for a number of years, with recurring expenses which are high for a few, fruits like rapes but very low for fruits like mangoes. To arrive at the cost benefit analysis of fruits therefore it is necessary to take this aspect into consideration i.e. it involves a calculation of present value of future returns of the tree which is essential while making a decision to adopt horticultural crops. The costs almost become zero in the course of time and fruit orchard only requires variable costs and provides continuously rising revenues.

6. In traditional agriculture there is a greater degree of flexibility in crop mix over a period of time. In horticulture, there is a greater inflexibility of crop mix and also there is blocking or locking up of land and money invested (for a longer period). However, it is possible to practice some inter-cropping during this period, which would bring in a degree of flexibility and revenue during the gestation period of fruit crops. A decision to grow a fruit crop is therefore a long run decision. The area under this crop cannot be varied at a short notice.

7. However once the gestation period is completed, fruit crops yield regular returns for a considerably long period, (extended to even 50 years in the case of mangoes). Such income flows not only enhances farm incomes but also reduces risks in agricultural activity, which is dependent on only traditional crops or even on mono-cropping systems. •(A number of studies have estimated the potential revenue from

such crops, the details are provided in chapter 5. Further, the primary data analysis of this study has carried out a detailed cost and revenue analysis of few selected fruit crops. This is dealt with in Chapters 7 to 10 of this thesis.

PART II

2. PRODUCTION STATISTICS OF HORTICULTURAL CROPS IN INDIA. (WITH SPECIAL REFERENCE TO FRUITS)

India possesses immense agroclimatic diversity i.e. diversity of natural endowments in terms of quality of soil availability of water, distribution of temperature etc. which enables it to grow a variety of horticultural crops which includes fruits, vegetables, flowers, spices and plantation crops.

2.1 India's Position In World Production Of Fruits And Vegetables

In early nineties, India was the second largest producer of vegetables after China and second largest producer of fruits in the world after Brazil. Its ranking in fruit production has however slipped to the third position recently, with fruit production in United States reaching a higher level. India's share in the production of fruits and vegetables in the world production are 11 percent and 7 percent respectively. The details of India's position in world production of fruits and vegetables during the early 90's is provided in table 3.4.

Table 3.4: India's Position in World Production of Fruits and Vegetables (1991-92) (million tonnes)

Country	Production of Fruits (million tonnes)	Country	Production of Vegetables (million tonnes)
Brazil	32.2	China	119.0
India	30.0	India	59.1
U.S.A.	29.9	U.S.A.	30.4
China	23.1	Turkey	19.0
Italy	19.8	Italy	14.1
Spain	14.5	Spain	10.1
Others	29.1	Others	20.3

Source: Singhal (1995) page 117.

In early nineties, as can be seen from the table above India ranked second in production of fruits at 30.0 million tonnes and also second in production of vegetables at 59.1 million tonnes. Its position in the production of fruits has however recently declined to the third position after the United States. India leads in the world production of bananas, mangoes, coconut, cashew, and is amongst the first 10 in production of citrus, pineapple, and apple production. It also leads in the production of cauliflower and is amongst the top 10 producers in the production of potatoes, tomato, onion and green peas.²

² Economic survey (1996-97)page 146. GOI₄₈

2.2 Production Of And Area Under Horticultural Crops In India:

Presently the area under horticultural crops is estimated to be around 13.6 million hectares, and the production is estimated at about 100 million tonnes. These crops occupy about 7 percent of the total cropped area and account for 18 percent of the gross agricultural output. A wide variety of fruits and vegetables are grown in the country like Mangoes, Banana, Papaya, Oranges, Mosambi, Grapes, Apple, Pineapple, Chikoo, Citrus fruits, Litchi, Walnut, Guava and Vegetables like Potato, Onion, Lady fingers, Chilies, Brinjal, Peas, Cabbage, etc. Of these, the major fruits produced in the country are: bananas, mangoes, citrus, guavas and apples, which account for 75 to 80 percent of the total fruit production. Onions is a major vegetable crop accounting for almost 50 percent of the vegetables production in the country.³ The following table 3.5 shows the production of fruits and vegetables for the period 1984-85 to 1996-97 (for the period 1996-97 the figures reported are estimates).

Table 3.5 Production Of Fresh Fruits And Vegetables In India (million tonnes)

Year	Fruits	Vegetables
1984 – 85	23.76	45.40
1989 – 90	26.80	48.60
1990 – 91	28.20	53.80
1991 – 92	30.00	57.68
1992 – 93	32.25	61.50
1993 – 94	35.00	65.00
1996 – 97 Estimated	40.00	80.00

Source : (1) Singhal, (1995), Page 117. (2). Economic survey, (1996-97). Govt. of India.

Between the period 1984-85 to 1993-94 the fruits production has shown an increase of 47.3 percent i.e. an increase of 5.2 percent per annum. This works out to be a 4.39 percent per annum compound rate of growth. During the same period vegetable production grew at 43.17 percent i.e. a 4.7 percent growth per annum which works out to be a compound rate of growth of 4.06 percent per annum.

The area under fruits and vegetables have shown a significant increase. The area under fruits in 1951-55 was just 1.12 million hectares. This has increased to 3.3 million hectares in 1993-94. The area under vegetables in the period 1993-94 is estimated at 5.24 million hectares. By 1993-94 fruits and vegetables accounted for 8.54 million

³ 8th five year plan, Government of India vol.2, pg.3: (1992-97)

hectares i.e. 4.8 percent of the total cropped area in the country.⁴

It is estimated that by the end of the eighth plan the production of fruits will be expected to rise to 40 million tonnes and that of vegetables to 80 million tonnes. The 8th plan proposes to bring 13 percent of 100 million hectares of low-lying dry land area and 3 million hectares of wasteland under horticultural crops.⁵

It has been projected that the domestic demand for fruits and vegetables alone by the year 2000 A.D., (when the country's population is expected to be about 1 billion), is expected to rise to about 45 million tonnes and 103 million tonnes respectively i.e. a total of about 148 million tonnes (see table 3.18). Though the total production of fruits and vegetables is high in the country, 30-40 percent of this produce gets spoiled due to lack of storing facilities and lack of market accessibility generating a national loss of almost Rs. 6000 cr. per annum. The following table (3.6) gives the trends in production of selected fruits and vegetables between 1961-1993.

Table 3.6 Trends in Production of Selected Fruits / Vegetables in India (1961 - 1993)
(Production in '000 tonnes)

Fruits & Vegetables	1961	1980	1993
TOTAL FRUITS	13372	20352	31850
Mango	6988	8363	10000
Banana	2257	4354	7200
Oranges	752	1171	2000
Papaya	228	413	1200
Apple	185	658	1200
Grapes	70	196	730
Peaches	43	78	83
Pears	33	64	130
VEGETABLES			
Tomato	464	1500	4600
Dry Onion	1200	2500	4000
Cauliflower	413	660	700
Green Peas	171	255	267
Garlic	130	216	370
Green Beans	23	41	50

Source: Haque. (1996), Page 19.

As seen from the above table, production of mangoes increased from 8 million tonnes to 10 million tonnes between 1980-93, production of bananas, oranges, pears almost doubled while that of grapes and papaya have increased by almost three times. This increase has been possible due to both, increases in area under fruits and vegetables and also due to increases in productivity, supported by various incentives and schemes of the government. "In the recent years there has been a renewed emphasis on the promotion of diversified agricultural growth in favour of horticultural

⁴ (Source : Hindu (1995), pg.115).

⁵ Singhal Vikas (1995, ...). Page 120

and vegetable crops⁶ Table 3.7 given below shows the per hectare productivity of some selected fruit crops for the period 1992-93. The average productivity of fruit crops in the country seems to be low at 9.2 tonnes per hectare this is mainly because 60 percent of the orchards are in the rainfed areas receiving rain for only 2 - 4 months. The productivity is however higher in better orchards and infact India has a world record in productivity of grapes which is on an average 22 tonnes per hectare and there are individual records of 50 tonnes per hectare also witnessed in India. The average productivity of grapes in developed is about 30 tonnes per hectare.

Table 3.7 Productivity of Major Fruits 1992 – 93

Fruit	Productivity tonnes/ hectares
Banana	26
Guava	13
Mango	9
Citrus	8
Apple	6
Grapes	22

Source: Uppal and Abbas ed. (1992-93), page 35-50.

The need to diversify agricultural production has been emphasised in the recent years and inclusion of fruits as an integral component of land use system in different regions, is now gaining prominence. A better and more rational land use is possible by horticultural development in wasteland and arid lands. Plantation crops can be encouraged on degraded lands both hilly and plain regions of India, thereby enriching also the economic system. India with its total cultivable area of 140 million hectares land has 100 million hectares of rainfed land and 40 million hectares of irrigated land. The cultivable wasteland is estimated at 15 million hectares. Efforts to bring at least 13 percent of the rainfed area into the fold of irrigation are underway in the government's policy along with the objective of converting 3 mill hectares of cultivable wasteland into horticultural plantations. With the present production of horticultural crops at about 100 million tonnes and projected demand by 2000 AD at 166 million tonnes (of which almost 150 million tonnes is the projected demand for fruits and vegetables specifically), the government and the Horticultural Board seeks to achieve this target through the following means.

- a) 133 million tonnes are expected to be generated by area expansion from 13 million hectares to 18 million hectares.
- b) The additional 33 million tonnes are to be generated through productivity increases. For which drip irrigation, new technologies, use of HYV seeds, better crop management has been promoted. Maharashtra, Tamil Nadu,

⁶ Haque. T. (1996), Page 18.

Karnataka have been able to show 50 -100 percent increase in productivity for different crops through these means.

2.3 Statewise Profile Of Production Of Fruits And Vegetables In India

The major fruit producing states in India are Uttar Pradesh, Bihar, Jammu and Kashmir, Himachal Pradesh, Kerala, Karnataka, Tamil Nadu, Orissa, West Bengal, Maharashtra, and Gujrat. Hardy fruits like gooseberry, date palm, guava, pomegranate, custard apple, Karonda, have specially been encouraged in states like Andhra Pradesh and Madhya Pradesh. A state wise break up of production and area for different fruits is provided in the Table 3.8. In early 1990's, Uttar Pradesh (plains) was the leading state as regards area under fruit crops is concerned. A number of states like Uttar Pradesh, Andra Pradesh, Bihar, Karnataka, Maharashtra show high levels of fruit production ranging from 27.99 lakh tonnes (Bihar) to 58.84 lakh tonnes (UP plains).

Table 3.8 Statewise Area And Production Of Fruits And Vegetables In 1991-92
(Area in lakh hectares, Production lakh tonnes) Source : Singhal (1995), Pg. 133

State	Fruits		Vegetables	
	Area	Production	Area	Production
Andhra Pradesh	3.13	40.08	1.55	14.53
Arunachal Pradesh	0.20	0.47	0.17	0.80
Assam	0.72	8.87	2.72	21.32
Bihar	2.67	27.99	8.43	86.43
Goa	0.11	0.84	0.07	0.60
Gujarat	0.85	18.29	1.15	16.68
Haryana	0.19	1.10	0.61	8.77
Himachal Pradesh	1.57	3.40	0.39	4.76
Jammu & Kashmir	1.19	7.01	1.80	7.45
Karnataka	2.09	37.92	3.58	36.73
Kerala	2.36	11.01	2.02	32.29
Madhya Pradesh	0.65	12.45	1.76	22.21
Maharashtra	2.56	35.78	2.41	41.71
Manipur	0.20	0.43	0.12	0.50
Meghalayaa	0.24	2.18	0.26	2.19
Mizoram	0.09	0.35	0.06	0.32
Nagaland	0.05	0.09	0.08	0.67
Orissa	1.36	9.78	7.10	72.75
Punjab	0.73	6.64	0.85	14.50
Rajasthan	0.23	1.14	0.63	3.07
Sikkim	0.08	0.19	0.08	0.46
Tamil Nadu	1.36	23.16	8.89	37.97
Tripura	0.45	3.19	0.30	3.07
Uttar Pradesh (Hills)	1.50	4.29	0.57	6.18
Uttar Pradesh (Plains)	7.16	58.84	1.20	176.16
West Bengal	1.11	11.32	4.56	46.80
Andaman & Nicobar	0.03	0.13	0.03	0.13
Chandigarh	-	0.02	-	0.11
Daman & Diu	-	0.03	-	-
Delhi	-	0.01	0.55	6.28
Dadra & Nagar Haveli	0.01	0.07	0.02	0.14
Lakshadweep	-	0.01	-	-
Pondicherry	0.01	0.20	0.02	0.22
All India	32.87	320.66	62.25	665.81

Table 3.9 gives a detailed break-up of the area, production and percentage share of fruits in some selected states for the early 1990's.

Table 3.9 Major Fruit Producing States (1991-92)

State	Area under Fruits (lakh hectares)	Fruit Production (lakh tonnes)	Percentage share in Total Production	Yield per hectare (Tonnes per hectare)
Andhra Pradesh	3.13	40.08	12.4	12.8
Bihar	2.67	27.99	8.7	10.4
Gujart	0.85	18.29	5.7	21.5
Karnataka	2.09	37.92	11.8	18.1
Kerala	2.36	11.01	3.43	4.66
Maharashtra	2.56	35.78	11.1	13.9
Tamil Nadu	1.36	23.16	7.2	17.0
Uttar Pradesh (plains)	7.16	58.84	18.3	8.2
Total India	32.87	320.66	-	-

Source : Compiled from the information in table 3.8

It is quite evident from table 3.9 that Uttar Pradesh (plains) leads both in area and production of fruit crops, followed by Andhra Pradesh, Karnataka, Maharashtra, Bihar, Tamil Nadu and Kerala, which are the major fruit producing states in the country. A notable feature from the table is that though only 0.85 lack hectares is under fruits in Gujrat, the state produces 18.29 lakh tonnes of fruits. This implies a very high productivity of 21.5 tonnes per hectare. The productivity per hectare in the state of Maharashtra is also higher than Uttar Pradesh, Andhra Pradesh, Tamil Nadu and Bihar, inspite of the irrigation and water constraints. The other dominant fruit producing states like Kerla, Himachal Pradesh, West Bengal and Orissa also have almost 1.11 to 2.36 lakh hectares under fruits with production ranging between 3.40 lakh tonnes to 11.32 lakh tonnes.

India with its wide diversity of agroclimatic and soil condition spread across states and regions has a distinct comparative advantage in the production of fruits and other horticultural crops, which is being emphasised in both the Central as well as State government's policies in the recent years.

PART III

3. DEMAND CHARACTERISTICS OF HORTICULTURAL CROPS.

This section deals with the demand characteristics of fruit crops, which includes the study of demand elasticities, the trends in demand for fruit crops and projections of demand for fruit crops in the future.

3.1 Estimates Of Demand Elasticities Of Fruit Crops.

The few estimates of demand elasticities of fruit crops available in the Indian economy do show a relatively higher income elasticity for fruit crops indicating that as

the income levels increase in the economy the demand for such crops would also tend to increase. Fruits possess a high nutritional value and are a rich source of essential vitamins and minerals. Its importance in human diet cannot be overemphasised. This accounts for its high degree of income elasticity and is one of the reasons for increasing world market demand. A few of these crops possess high medicinal value and provide energy since many fruits contain sugars and glucose in its natural form, (predominantly fructose).

A study by Agricultural Productivity Organisation, APO (1990) lists out the estimates of income elasticity for food commodities in selected regions for the period 1970. Table 3.10 given below reports the income elasticity of fruits and vegetables in the selected regions of South Asia, East South Asia, Asian Centrally planned Economy, North America etc. Estimates of fruit crops has been found to be positive and higher than that of traditional crops indicating an increasing preference for these crops with increases in income. (See Table 3.10). For the period under study, the average income elasticity of demand for fruits in the selective regions of South Asia is 0.74. Amongst the fruit crops, citrus fruits i.e. oranges and lemons exhibit income elasticity greater than one. (The level of aggregation at which the FAO study has been made does not permit a comment about the income elasticity of demand for fruits like mangoes and grapes which has witnessed a boom after the 1970's.) The income elasticities of demand for fruits in all the countries covered by the study have been found to be much greater than those for cereals, pulses, oilseeds and somewhat lower than those for meat and fish. The income elasticity of demand for fruits in the period 1970 ranges between 0.25 (in North America) to 0.85 (in Asian Centrally planned economies), with most of the countries having elasticity ranging close to the 0.61 to 0.74 range.

Table 3.10 Income Elasticity of Demand for Fruits and Vegetables in Selected Regions, 1970.

Commodity	South Asia	East South Asia	Asian Centrally planned Economy	Japan	North America	Western Europe	Oceania	USSR Eastern Europe
Vegetables	0.61	0.43	0.48	0.6	0.11	0.36	0.18	0.4
Fruits	0.74	0.56	0.85	0.57	0.25	0.61	0.68	0.72

Source: APO (1990).

Another study, Basu (1975), has projected the demand and consumption pattern for food grains and non-foodgrains for the year 2000 A.D (with 1964-65 as the base year since NSS data on 1970-71 was not available). The study has analysed the trend and projections for the above demand for four alternatives scenarios with varying

rates of population growth and economic growth.⁷ This is done also for rural and urban population separately. For almost all scenarios the study found that the consumption pattern now and in future, (2000 A.D.) shows a the positive trend for fruits and nuts. The main results of the study are provided below. It should be noted that the expenditures relate to the per capita annual expenditure.

a) For the rural house holds the present expenditure on cereals, grams and pulses is in the range of Rs. 236 per capita per annum, constituting 49.3 percent of the expenditure. By the year 2000 A.D. it is estimated to increase to Rs. 300 to 360 i.e. about 41 percent of the total expenditure. Milk and milk products which are presently Rs.33 per annum is expected to increase to a maximum of Rs. 89 per capita per annum i.e. 8.9 percent of the total expenditure. Fruit and nuts are to increase from Rs. 4 to a maximum of Rs. 10 per capita per annum i.e. it would increase from 0.8 percent to a maximum of 1.1 percent of the total expenditure.

b) For the urban household expenditure on cereals, grams and pulses would increase from Rs. 184 to a maximum of Rs. 200 per annum registering a decline from 28 percent to a minimum of 15 percent of the total expenditure. Expenditure on milk and milk products were expected to increase from Rs. 60 to a maximum of Rs. 118 per capita per annum i.e. an increase from 9.2 percent of the total expenditure to a maximum of 10 percent. The expenditure on fruits and nuts was projected to increase from Rs. 9 to Rs. 13 to a maximum of Rs. 26 per annum, i.e. an increase from 1.4 percent to 2 percent of the total expenditure.

c) The total analysis of both the rural and urban house-holds combined together indicate that the expenditure on cereals, grams and pulses would increase from Rs. 226 to Rs. 272 to a maximum of Rs. 321 per annum which implies a decline from 44 percent to 35 percent to a minimum of 26 percent of the total expenditure. (the minimum applicable to scenario D). The expenditure on milk and milk products was expected to increase from Rs. 38 to Rs. 68 to a maximum of Rs. 113 per annum, (Scenario D), this implies an increase from 7.4 percent to 9 percent to a maximum of 9.3 percent of the total expenditure. Expenditure on fruits and nuts was estimated to increase from Rs. 5 to Rs. 9 to a maximum Rs. 16 per annum i.e. an increase from 1 to 1.2 to 1.3 percent of the total expenditure.

The study thus concludes that for all scenarios, dependence on cereals will reduce and in- take of milk, milk products, fruit and nuts, processed fruits, will increase,

⁷ Scenario A: high population, low economic growth.
Scenario B: low population, low economic growth.
Scenario C: high population, high economic growth.
Scenario D: low population, high economic growth.

specially for scenario D. Therefore, in the future with the increasing awareness of nutritional composition of diets and increasing incomes, the demand for such superior commodities would increase.

The World Bank staff working papers (1981) has made an analysis of expenditure elasticity of demand for fruit and nuts in India for the period 1970's for rural and urban areas. The results of the study are provided in table 311.

Table 3 11. Expenditure Elasticity Estimates For India

	RURAL	URBAN
Milk	1.73	1.43
Pulses	0.86	0.81
Edible Oil	1.00	1.01
Meat, Fish, Eggs	1.15	1.12
Vegetables	0.82	0.94
Fruits & Nuts	1.36	1.54
Sugar Khandsari	1.51	1.06
Gur	1.09	0.53
Spices	0.67	0.50
Rice	0.71	0.42
Wheat	1.01	0.55
Maize	0.03	-0.76
Sorghum Millet	0.07	-0.59
All Other	1.11	1.28
Food grains	0.63	0.39

Source: World Bank staff working papers, No. 50, (1981).

In fact, of all the commodity groups covered, the expenditure elasticity of demand for fruits and nuts in urban areas exhibits the highest level 1.54 which is followed by milk, meat, fish and eggs, sugar and khandsari and edible oil which ranges between 0.94 to 1.43. In rural areas the expenditure elasticity is found to be higher for milk at 1.73 followed by sugar at 1.51. Fruits and nuts also have a high expenditure elasticity at 1.36. The expenditure elasticity for demand for fruits and nuts was thus found to be 1.36 in rural areas and 1.54 in urban areas. It may be noted that the expenditure elasticity of demand for food grains in urban areas is 0.39 and in rural areas it is 0.63. What is noteworthy however is that the rural expenditure elasticity of the main food grains rice and wheat are as high as 0.71 and 1.01 and the urban income elasticities are 0.42 and 0.55. When we observe the expenditure elasticities of demand for maize, sorghum, millet, they are quite low, and even negative ranging between 0.03 and 0.07 in rural areas and -0.76 and -0.59 in urban areas. These estimates of expenditure elasticity of demand unmistakably establish that (a) maize and sorghum millet are being substituted by rice and wheat rapidly in both rural and urban India and (b) that rural India's own consumption of rice and wheat production is rising at a faster

rate than the urban consumption and (c) the demand for high-value and more nutritional crops like vegetables and fruits and nuts are increasing both in rural and urban areas. •

Three inferences can be drawn from this study.

i. As income increases commodities like fruits and nuts, vegetables, milk, meat and fish are going to occupy increasing shares in the total expenditure both in the rural and urban areas. For which purpose, increases in production of such commodities have been emphasized in the recent agricultural development strategies.

ii. Transmission of income growth from urban to rural India will, in the near future take place through an increased demand for vegetables fruits and nuts. This is not to say that milk, sugar, rice and wheat have lost their places in the transmission mechanism. These commodity groups do retain a definite, (though a declining) place of importance, and further these commodities i.e. rice and wheat being staple commodities would continue to retain their status in the expenditure pattern.

iii. Yet another inference is of relevance here. The low-income elasticity of demand for maize and sorghum millet in both rural and urban areas imply that the resources (land and labour) devoted to their cultivation would decline (or at best remain constant) as income grows. Now maize, sorghum millet and other crops such as jowar, bajra etc. are grown on lands of inferior quality in terms of the fertility of soil and availability of water. The trends that can be inferred from expenditure elasticities of demand indicate that farmers would withdraw their marginal lands from the cultivation of foodgrains like maize, millet etc. and devote them to (a) foodgrains with higher rural and urban elasticities of demand and (b) vegetables, fruits and sugarcane if these are feasible.

A significant study on income elasticities of demand for foodgrains in India, Sarma and Gandhi (1990), has analysed the distribution of income elasticities of demand by income strata at the All India and Urban India levels (reported in table 3.12). Sarma and Gandhi have estimated the income elasticity using NSS data for 1977-78 and projected the elasticities for period 1990-95 by using a simulation technique. They estimated the income elasticities of demand for foodgrains by segregating the NSS 1977-78 data into 4 income quartiles. It is readily seen that the income elasticity of demand for food grains and its components namely rice, wheat, coarse cereals and pulses decrease, as the income quartile increases. Next, they simulated the elasticity matrix by considering different rates of per capita income groups and projected the income elasticities of demand for the period of 1990-95.

Table 3.12 Income Elasticities Of Demand For Food Grains In India
(According to quartiles)

Food Grain	Estimated within each Quartile by Log-Log using National Sample Survey 1977/78 Data				Sample of Step elasticity Matrix.(1990-95) Used for Simulation							
					Under past per Capita Income Growth rates and no change in Distribution				Under Second Accelerated Growth Rate Scenario with change in income distribution.			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
ALL India												
Rice	1.02	0.59	0.28	0.09	0.93	0.58	0.36	0.03	0.68	0.42	0.26	-0.02
Wheat	1.37	0.74	0.81	0.41	1.23	0.92	0.71	0.39	1.01	0.77	0.61	0.33
Coarse Cereals	1.46	-0.09	-0.16	-	0.68	0.3	0.08	-0.24	0.41	0.14	-0.03	-0.29
Pulses	1.27	1.05	0.9	0.38	1.34	1	0.78	0.42	1.09	0.84	0.66	0.36
All food grains	1.24	0.47	0.35	0.2	0.98	0.64	0.44	-0.1	0.74	0.49	0.32	0.05
URBAN												
Rice	0.95	0.28	-0.04	-	0.52	0.26	0.08	-0.2	0.24	0.06	-0.06	-0.27
Wheat	3.25	0.28	0.26	0.1	1.39	0.69	0.28	-0.27	0.64	0.24	-0.01	-0.38
Coarse Cereals	1.61	-0.65	-0.95	-0.11	-0.38	-0.54	-0.64	-0.78	-0.55	-0.65	-0.71	-0.81
Pulses	1.53	0.8	0.58	0.2	1.14	0.73	0.47	0.04	0.71	0.43	0.25	-0.06
All Food Grains	1.35	0.22	0.07	0.06	0.68	0.36	0.15	-0.18	0.34	0.12	-0.02	-0.26

Notes: 1. Quartiles are according to the ascending order of income while Q1 represents the bottom quartile, Q4 represents the top quartile. 2) Based on data collected from tables on consumer expenditure Round 32(1977-78) published by the National Sample Survey organisation, Dept. of Statistics and bulletin on food statistics (various issues, Directorate of Economics and Statistics, ministry of Agriculture.)
Source: Sarma and Gandhi, (1990)

Table 3.12 shows the figure for the income elasticity of demand for all foodgrains. The elasticity of the lowest quartile group in urban areas (1.35) is greater than the All India figure (1.24). In case of the second quartile the income elasticities diminish rapidly standing at 0.22 in urban areas and 0.47 in all India level. In the 3rd and 4th quartiles, Q₃/Q₄, similar trends are observed with income elasticities in urban areas at 0.07 and 0.06 in comparison to all India figures at 0.35 and 0.2. The same patterns are observed in simulated figures for the period 1990-95. The income elasticities of demand for foodgrains is thus negative in urban areas but positive, though diminishing, at the all India level.

A recent study, Kumar (1996) has examined the structural changes in consumption patterns for food and has projected the short term and long term demand for high value commodities like milk, fruits, vegetables, meat, eggs, and fish. The study clearly shows an increasing demand for high value foods and stated that as population moves from rural to urban areas, structural shifts in consumption patterns can take place as a result of the following (a) wider choice of available food in urban markets (b) greater exposure to dietary patterns of foreign culture, in the urban areas i.e. (demonstration effect) (c) an urban preference for less time consuming preparations (d) a preference for low calorie but higher nutritional food.

The study has used the NSS cross sectional data on household and consumption expenditure at national level of the 32nd and 43rd rounds for period 1977 - 78 to 1987-88. Based on this, it provides information on the per capita consumption levels of some foodgrains, cash crops and non-foodgrains for the two periods, dis-aggregated by rural and urban areas. This information is provided in table 3.13 given below. Table 3.14 shows the changes in the annual per capita consumption of the above category of crops.

The following major observations can be noted from the tables 3.13 & 3.14 given below.

1) In the urban areas there is a more diversified food basket and higher level of per capita consumption of milk, milk products, fruits and vegetables. (See table 3.14). In 1987 the annual per capita consumption of milk, vegetables and fruits were found to be 64.9 kilos, 66.4 kilos and 18.8 kilos respectively in the urban areas. Increasing urbanisation is likely to increase the demand for fruits, vegetables and milk at a faster rate.

Table 3.13 Annual Per Capita Food Consumption (Kg.) In India

Income Group	Rice	Wheat	Coarse Cereals	Pulses	Milk	Oil	Vegetables	Fruits	Meat	Sugar
In 1977										
Rural	86.5	49.4	56.7	8.7	24.6	2.7	24.7	2.6	2.7	13.5
I	68.9	30.6	57.9	5.1	6.0	1.5	15.8	1.0	1.4	5.7
II	92.9	44.4	55.3	7.9	15.3	2.4	23.3	1.4	2.3	9.9
III	101.5	57.4	55.6	10.4	30.5	3.2	29.5	3.0	3.4	15.9
IV	99.8	93.6	57.1	17.0	77.9	5.3	42.6	8.2	5.7	35.7
Urban	67.6	64.6	14.8	11.7	39.7	4.8	39.7	5.9	4.8	17.1
I	54.2	45.1	23.6	5.8	8.3	2.0	18.7	1.4	1.8	7.7
II	68.5	56.8	18.6	8.1	17.4	3.1	26.6	2.1	2.9	11.1
III	76.2	61.7	14.8	11.0	31.6	4.4	35.7	3.9	4.4	15.4
IV	66.7	81.3	8.5	17.0	73.5	7.3	60.2	11.7	7.6	26.3
In 1987										
Rural	88.1	61.6	29.8	11.5	58.0	4.3	50.8	10.3	3.3	11.0
I	66.4	41.3	36.8	6.8	10.2	2.0	33.3	3.0	1.4	4.6
II	87.2	52.3	29.7	9.3	22.3	3.1	41.4	5.2	2.3	7.2
III	93.4	61.4	28.7	11.0	44.0	4.1	50.4	8.7	3.1	10.5
IV	98.3	82.1	26.1	16.7	130.0	6.8	70.0	20.5	5.4	18.6
Urban	68.1	60.4	10.6	12.2	64.9	6.8	66.4	18.8	4.9	12.3
I	55.0	47.9	17.6	6.7	15.6	2.9	35.4	5.0	2.8	6.0
II	66.8	54.4	14.5	9.1	32.0	4.5	48.2	9.0	3.6	8.9
III	71.0	60.5	9.7	12.1	58.4	6.5	65.3	14.9	4.3	12.1
IV	71.6	70.1	5.5	17.0	116.7	10.4	94.3	35.8	4.3	17.6

Source: Kumar (1996) page 175.

Note I : Expenditure classes of NSS persons below 75 percent of Poverty line Note II : Expenditure classes between 75 percent and Poverty line
 III: Expenditure classes between poverty line and 150 percent of poverty line. IV. Expenditure Classes above 150 percent of poverty line.

Table 3.14 Change In Annual Per Capita Consumption, India

Items (in Kilograms)	Rural			Urban		
	1977	1987	Change	1977	1987	Change
Rice	86.5	88.1	+1.6	67.6	68.1	+0.5
Wheat	49.4	61.6	+12.2	64.6	60.4	-4.2
Coarse Cereals	56.7	29.8	-26.9	14.8	10.6	-4.2
Cereals	192.6	179.5	-13.1	147.0	139.1	-7.9
Pulses	8.7	11.5	+2.8	11.7	12.2	+0.5
Milk	24.6	58.0	+33.4	39.7	64.9	+25.2
Edible Oil	2.7	4.3	+1.6	4.8	6.8	+2.0
Vegetables	24.7	50.8	+26.1	39.7	66.4	+26.7
Fruits	2.6	10.3	+7.7	5.9	18.8	+12.9
Meat, Fish & Eggs	2.7	3.3	+0.6	4.8	4.9	+0.1
Sugar	13.5	11.0	-2.5	17.1	12.3	-4.8

Source: Kumar (1996), Page 176.

2) For the period under study i.e. 1977 to 1987, the consumption of cereals per head declined and is seen to be substituted by milk, fruits and vegetables, i.e. in the rural areas it declined from 192.6 kilos to 179.5 kilos and in the urban areas a decline from 147 to 139 kilos was seen.

Therefore increasing trends in consumption towards high value commodities has generated the high growth in demand for milk, fruit, vegetables.

Based on the consumer demand elasticities the study has further made projections about the demand for food, the results are reported in tables 3.15 and 3.16. The assumptions made for these projections are -

- (i) Total expenditure grows at 4 percent, 5 percent and 7 percent per annum
 - (ii) Population is assumed to grow at 2 percent per annum during 1991-95; 1.91 percent during 1995-2000, 1.8 percent during 2000 - 2010, and 1.7 percent during 2010 - 2020
 - (iii) The pace of urbanisation is consistent with the recent trend.
 - (iv) The volume of production ended 1992 is taken as an estimate of 1991 demand.
- The study estimates the expenditure elasticities (proxy for income elasticities) of demand for 4 food components i.e. milk, fruits, vegetables and meat, fish and eggs. (see table 3.15). on the basis of these estimates of total demand for the 4 commodities have been made for the period 1995 up to 2020 under the respective economic growth scenarios viz. 4%, 5% and 7%.

Table 3.15 Expenditure Elasticities By Commodities, India

	RURAL	URBAN	INDIA
Milk	0.458	0.372	0.435
Fruits	0.442	0.360	0.410
Vegetables	0.385	0.253	0.344
Meat, Fish, eggs	0.848	0.633	0.733

Source :Kumar (1996), Page 180.

(Note : Consumer demand elasticities are based on Food characteristic demand concept developed by Bouis (1992) which is based on demand for energy, variety and tastes of foods is used to derive the income and uncompensated price elasticities).

The results on total demand for milk, fruits, vegetables, meat, eggs and fish is provided in Table 3.16

Table 3.16 : Total Demand For Milk, Fruits, Vegetables, Meat And Eggs And Fish In India (million tonnes)

Item	GDP Percentage growth	1991 Base Year	1995	2000	2010	2020	Percentage Growth (annual compound) (1995-2020)
Milk	4	56.1	62.9	72.4	95.6	126.0	2.82
	5	56.1	64.0	75.3	103.7	142.7	3.26
	7	56.1	66.2	81.3	122.0	182.1	4.14
Fruits	4	30.8	34.5	39.6	52.1	68.3	2.77
	5	30.8	35.0	41.1	56.3	77.0	3.20
	7	30.8	36.2	44.3	65.8	97.6	4.05
Vege-Tables	4	64.8	72.0	82.1	105.8	136.0	2.58
	5	64.8	73.0	84.5	112.7	149.7	2.91
	7	64.8	74.9	89.7	127.7	181.1	3.59
Meat & Egg	4	2.7	3.0	3.5	4.7	6.3	3.01
	5	2.7	3.1	3.7	5.4	7.8	3.76
	7	2.7	3.3	4.3	7.2	12.1	5.33
Fish	4	4.1	4.6	5.3	7.1	9.5	2.97
	5	4.1	4.7	5.7	8.2	11.8	3.75
	7	4.1	5.0	6.5	10.8	18.3	5.32

Source: Kumar (1996), Page 177.

Note: The demand includes Household consumption plus losses plus exports and other uses.

The study projects that in the year 2000 A.D demand for milk is estimated to be 72.4 Million tonnes at 4 percent GDP growth rate, the demand for fruits is estimated at 39.6 million tonnes, meat at 3.5 million tonnes, vegetables at 82 million tonnes and fish at 5.3 million tonnes. For the highest growth rate in GDP at 7 percent the demand for milk is 81.3 million tonnes, demand for fruits is 44.3 million tonnes, demand for vegetables 89.7, meat and eggs 4.3 million tonnes and fish at 6.5 million tonnes.

During 1995 - 2020 the total demand is expected to grow at the annual compound rate of 2.8 to 4.1 percent for milk and fruits, 2.6 to 3.6 percent for vegetables and 3.0 to 5.3 percent for eggs, meat and fish. The rate of growth in output achieved in 1980-90 was 4.7 percent for fruits, 5.2 percent for meat, fish and eggs; 5.2 percent for milk, 3.4 percent for vegetables which is higher at the margin than the demand growth of these commodities. The study thus concludes that diversification into such high value labour intensive commodities can provide adequate employment to farmers dependent on small size of farms. It however cautions against post harvest management problem, infrastructural problems production technology.

In another study by Kumar and Mathur (1996), the results of the earlier study, (Kumar 1996) are confirmed. The study (Kumar and Mathur 1996) also shows that rapid structural transformation can have a significant impact on food demand in the long run in addition to the usual income and price effects.

The study has made a detailed analysis of the impact of these structural changes, (i.e. a movement of population from rural to urban areas which is the process of urbanisation), income changes and price changes on the level of consumption of food-grains, fruits, vegetables, milk, eggs, sugar, meat, fish etc. for the period 1977-87. The impact of these factors on the levels of consumption are reported in table 3.17 given below.

Table 3.17 Comparison Of Food Consumption Between 1977 And 1987

Food Items	Income Changes	Structural Increase	Price Effect
Rural			
Rice	6	-6	112
Wheat	8	34	-9
Coarse Cereals	6	-82	-74
Pulses	7	31	98
Milk	10	75	47
Edible Oil	7	47	22
Vegetables	6	64	38
Fruits	6	119	45
Meat, Fish & Eggs	7	-8	25
Sugar	8	-11	-10
Urban			
Rice	15	1	119
Wheat	20	3	-17
Coarse Cereals	14	-244	-41
Pulses	19	13	79
Milk	26	60	39
Edible Oil	19	31	30
Vegetables	16	47	39
Fruits	17	97	17
Meat, Fish & Eggs	17	-8	22
Sugar	20	-35	-28

Source Kumar and Mathur (1996), Page 668.

It has identified structural changes as the dominant factor causing changes in

the consumption pattern both in the rural as well as urban areas. The major following conclusions relating to the impact of structural changes on the consumption pattern are noted below.

- a) The rural demand for coarse cereals was found to decline by 82 percent between the period 1977 to 1987 and by 244 percent for the same period in the urban areas.
- b) A 119 percent growth in consumption of fruits in rural areas and 97 percent growth in consumption of fruits in urban areas was witnessed during the same period.
- c) Significantly it was also found that due to such structural changes the consumption of sugar in rural areas fell by 11 percent and for urban areas by 35 percent for the same period.
- d) The consumption of vegetables registered an increase of 64 percent in rural areas and 47 percent in urban areas for the period under study.

Structural changes thus have a strong influence on food consumption patterns. A positive trend is seen for demand of high value crops like vegetables and fruits under both income and price effects also. The study thus concludes that income price and structural changes would bring about major shifts in consumption of milk fruits vegetables and livestock products in both rural and urban areas. Diversification into ventures like fruits, vegetable products and some non cereals and would enhance incomes as well as export potential. "The diversified food basket will provide the food security and improve the quality of life by adding to the nutritional status"⁸ This increasing demand for high value commodities is likely to be met by diverting about 3 million hectares of crop area to these commodities.

The above estimates of the demand potential need to be scaled down for two reasons: a) There is usually a tendency on the part of those who advocate a certain cause, in this case the movement for agricultural diversification, to overstate the potential benefits in terms income and b) The price effects of production are usually not considered while estimating the income elasticity of demand. Of these two considerations, the second obviously deserves a some what detailed comment. The income elasticity of demand is usually estimated from historical data by regressing the expenditure on crops on the expenditure and incomes. Historical expenditures are products of historical prices and historical quantities purchased and produced. There is, in general, no guarantee that historical prices of a high elasticity era will remain in the future. Therefore, the income elasticities projected should be taken as indicative of the 'marginal' prospects for horticultural crops.

In sum, the estimates of the income elasticity of demand, with reference to their future applications, must be cautiously interpreted. Based on these estimates one should not

project too far into the future. These estimates however hold immediate marginal promise.

4. DEMAND PROJECTIONS FOR SELECTED CROPS

Based on the various estimates of elasticities of demand (Price, income and expenditure elasticities) demand projections have been made for Horticultural commodities. This is determined on the basis of Recommended Dietary Allowance (RDA) for rising population and needs for export and processing industry. The following table 3.18 presents the projection of demand for horticultural crops for the period 1996-97 and the year 2000 AD.

Table 3.18 Demand Projections For Horticultural Commodities (India)
(Commodities in Million tonnes)

Commodity	Production (1991-92)	Demand Projections (Including export- demand and processing demand)	
		1996-97	2000
Fruits	32.70	41.17	44.70
Vegetables	66.58	95.66	103.20
Spices	0.92	3.13	4.24
Coconut	6.50	9.75	13.00
Cashewnut	0.30	0.66	0.99
Olkers(Flowers)	0.25	0.30	0.45
Mushroom,	-	-	-
Coco	-	-	-
Total	106.62	150.6	160.58

Source: National Horticultural Board Technical Communications (1995a).

By 1996-97 the production of fruits and vegetables was already close to 120 million tonnes (see table 3.5). The projected demand for fruits and vegetables taken together for the year 2000 AD has been estimated at about 148 million tonnes (see table 3.18). For the period 1984-85 to 1993-94 fruit production was seen to grow at 4.39 percent per annum (compound rate of growth), during the same period vegetables grew at a compound rate of growth of 4.06 percent per annum (see section 2.2 of this chapter). With this trend in the growth rate of fruits and vegetables, the estimated supply in the year 2000 AD would be close to 151 million tonnes leaving marginal surpluses.

However, estimates on the projected demand and rate of growth of fruits and vegetables differ among studies and a very recent study Shah and Mitra (1997) has concluded that the recent trend in the growth rate of fruits would be inadequate to meet the future demand of fruits. For vegetables however the situation is more comfortable with possibilities of generating surpluses for exports of vegetables in

^a Kumar and Mathur (1996) Page 669.

future. The study has made exhaustive analyses of the trends in the growth rate of horticultural crops amongst other crops and future demand projection of such crops. The study projects the demand for the both fruits and vegetables taken together at 144.3 million tonnes for the year 2001, (i.e. 52.6 million tonnes for fruits and 91.7 million tonnes for vegetables). For the year 2006 AD the total estimated demand for both fruits and vegetables is given at 177.6 million tonnes (i.e. 69.1 million tonnes for fruits and 108.5 million tonnes for vegetables). According to the study the annual compound rate of growth of fruit production for the period 1979-94 has been worked out at 4.78 percent and for vegetables it is 3.56 percent (in the later years the rate of growth of vegetables has increased further). For the latter period i.e. between 1989-94 fruits witnessed an increase of 4.18 percent and vegetables and witnessed an increase of 6.09 percent per annum.

Therefore, there are greater possibilities for India to generate surpluses in vegetable production however, the study raises doubt about the supply of fruits being able to meet the domestic demand or even export demand in future. The study has estimated that to meet the domestic demand, a 6.8 percent per annum growth rate in fruits production and a 5.0 percent growth rate per annum for vegetables (between 1994-2001) would be required. The following table 3.19 summarises the rates of growth as well as the projected demand for fruits and vegetables in the future.

Table 3.19 Production and Demand for Fruits and Vegetables in India.

(Million tonnes)

Item	Years	Fruits	Vegetables
Production	1979	17.52	38.92
	1984	19.45	44.20
	1989	27.33	50.30
	1990	27.84	51.00
	1991	29.36	57.76
	1992	31.19	64.21
	1993	32.45	63.80
	1994	33.24	65.14
Compound Rates of growth of production	1979-94	4.78	3.56
	1984-94	4.65	4.05
	1989-94	4.18	6.09
Domestic Demand	2001	52.60	91.70
	2006	69.10	108.50
Required growth to meet demand	Between 1994-2001	6.78	5.01
	Between 1994-2006	6.29	4.34
Supply Scenario I	2001	44.78	82.24
	2006	56.55	97.96
Supply Scenario II	2001	44.39	85.01
	2006	55.72	103.67
Supply Scenario III	2001	43.01	97.38
	2006	52.79	130.88

Source: Shah and Mitra (1997), page 140. Scenario descriptions on following page.

[Scenario I: Supply projections are based on applying rate of growth in production between 1979 and 1994 on annual average quantity produced during 1992-94 period. Scenario II Supply projections are based on applying rate of growth in production between 1984 and 1994 on annual average quantity produced during 1992-94 period. Scenario III: Supply projections are based on applying rate of growth in production between 1989 and 1994 on annual average quantity produced during 1992-94 period].

The conclusions which emerge from the above study are: a) Export surpluses in the case of vegetables to the extent of 5.68 million tonnes by the year 2001 and 22.38 million tonnes by the year 2006 are likely to be generated. b) Fruit production will fall short by 10-15 million tonnes in the year future. This situation is for scenario III as given in table 3.18. The situation in case of scenario I & II would be different as can be seen from the table.

Almost all the studies of the estimates of income elasticities of demand, expenditure elasticities of demand emphasise that as incomes would increase in future the demand for high value commodities like fruits and vegetables, milk, eggs, meat, fish etc. would have a tendency to rise rapidly. (see income/expenditure estimation in section 3.1 of this chapter). The fact which could explain the high income/expenditure elasticities are factors like greater awareness of nutritional standards, increasing urbanisation (structural changes), changes in the consumption pattern etc.

Given these the estimates of elasticities of demand and projections of future demand of fruits and vegetables, the point is that if India has to develop a competitive strength in these commodities the rate of growth of such high value crops must keep pace with not only the domestic demand but should be high enough to be able to generate export surpluses.

CHAPTER 4

DIVERSIFICATION OF INDIAN AGRICULTURAL EXPORTS THE POTENTIAL OF HORTICULTURE

1. INTRODUCTION:

Two major reforms in the very recent past i.e. (a) the new GATT Uruguay Round 1993 agreement and (b) the economic liberalisation or economic reform policy of the Government of India (1991) have changed the Indian economic scenario both in the domestic as well as in the external sector. This chapter deals with the impact of the above reforms on agricultural exports of India, the structure and pattern of agricultural exports and the recent diversification. However, the present analysis concentrates basically on the status and potential of horticultural products as a newly emerging export area in the Indian agricultural trade. The GATT Uruguay Round (1993) has agreed upon three major provisions, which directly affect trade in agricultural commodities. These are:

- a) Reduction of subsidies to agriculture by both developed and developing countries, along with total elimination of agricultural subsidies by developed countries. Reduction of tariffs applied by developed countries on agricultural exports of developing countries and reduction by developing countries of their agricultural subsidization programmes to less than 10 percent of the value of agricultural output by the year 2005 AD
- b) Better access for trading markets due to proposed reduction of import duties and removal of a number of restrictions on exports (specially agricultural exports).
- c) Removal of all other barriers and distortions, and protective measures to ensure a more competitive environment in world trading system.

The GATT agreement through its major provisions i.e. reduction of tariffs and non-tariff barriers and better in market access is expected to promote world trade. Opening up of markets and increase in price competitiveness of some agricultural commodities would provide better opportunities for some crops especially high value crops like fruits, vegetables, meat, marine products or superior quality Basmati rice. It is estimated that if India can plan its export strategy properly and diversify export trade it can target to reach a 10 percent growth rate per annum from 1995 onwards. It is also estimated that world trade which has been growing on an average at 6.5 percent p.a. between 1970-1992 is expected to increase to 7 percent per annum and

the total world exports which was US\$3846 billion in 1992 is expected to reach about US\$7070 billion by the year 2001. The fear of reduction of subsidies reducing competitiveness of Indian agricultural exports is also unfounded, especially, in the short and medium run because the total subsidy support to Indian agriculture i.e. non-product specific support is estimated at 2.9 percent of the total value of agricultural output which is far below the prescribed limit of 10 percent for developing countries.

It is in this context that commodities having a comparative advantage should be identified. Horticultural crops, specially fruits, and vegetables have been identified in the category of non-traditional exports in agriculture in India. The exports of such crops in the recent years have been increasing. However, there are two constraints to the exports of such crops: a) Though the rate of growth in vegetable production seems to be comfortable, a higher growth rate in production of fruits is necessary to be able to meet the domestic demand as well as generate adequate surpluses for exports, (see chapter 3 section 4). It is specially necessary to concentrate on the quality as well as quantity of production of the major 'exportable' fruits like grapes, mangoes, bananas. b) Indian exports of fruits and vegetables are constrained by a number of other factors like lack of quality control, inadequate transportation, storing, and processing facilities etc. These constraints are to a significant extent responsible for the present almost negligible share of Indian horticultural products in world trade which stands at only about 1.7 percent in 1994.¹

The liberalisation policy of the early 1990's which encourages the free market also makes special provisions for promotion of free trade in general, and export promotion in agriculture in particular. All agricultural units engaged in agriculture and allied activities can avail of benefits of duty free imports only if they export 50 percent of their production. The present export-import policy seeks to promote productivity modernisation and competitiveness in the agricultural sector. Agricultural exports have been receiving special attention from the Government since it has great potential for raising farm incomes, tackling unemployment and earning foreign exchange.

A number of policy incentives and supports in the form of lowering of import duties on capital goods particularly for green house equipment's, plant and machinery necessary for food processing industries, easier availability of credit, have also encouraged such exports. A point to be noted here is that according to the current

1. see next page

export-import policy document, exports of fruits and vegetables except onions are included in the category of 'free exports', therefore factors like licensing, canalizing of exports, prohibition of exports would not restrict the export of such commodities. Thus the written policy on exports of fruits and vegetables are largely regulatory and not restrictive in nature. This is an added advantage that the category of such crops enjoy (Gulati, 1994).

Such policy changes have created a conducive environment for enhancing exports of agricultural products. A number of new products have been included in the export basket which include floricultural products, fresh fruits such as bananas, litchis, grapes, pomegranates and fresh vegetables.²

The export import policy for agriculture should ensure export of high value agricultural products in return for low value essential agricultural commodity imports.

2. STRUCTURE OF AGRICULTURAL EXPORTS IN INDIA:

In order to comment on the trends in agricultural exports and the need for diversification it is necessary to study the existing pattern and structure of export trade in India. To begin with table 4.1 given below shows the share of India in world production and export of principal commodities for the period 1992-93.

As can be seen from table 4.1 India has a leading position in the production of a variety of agricultural commodities like rice, cotton, tea, coffee, oilseeds, oil cakes, tobacco and jute. In case of rice, pulses and tea, India's share in the total world production is about 20-28 percent. Likewise in case of groundnut cake and jute fiber India's share in world production is as high as 35 to 40 percent respectively. However, as shown in the table 4.1 India's share in world exports is very low as compared to her share in world production, in almost all categories of commodities.

The major agricultural exports of India have been, rice which constitutes 7.22 percent of world exports, tea 16.73 percent; groundnut cake 32.33 percent of the world exports. Banana's is the only fruit crop for which India enjoys a relatively significant share in world exports namely 4.09 percent. It is understandable that India's share in world exports would in general be lower than her share in world production because India is herself a large overpopulated country, with a high domestic demand which creates limited exportable surpluses. Further, the inadequate infrastructural facilities, transportation and marketing problems and wastage of crops

¹ Economic Survey (1996-97) Page S-93.

² Government of India, Economic Survey (1996-97) Page 155.

arising in the process of storing and transporting also account for India's share in world exports being low.

Table 4.1. Share Of India In The World Production And Export Of Principal Agricultural Commodities, 1992-93 ('000 tonnes)

Commodity	Production			Export		
	World	India	Percent Share of India	World	India	Percent share of India
Fish Production	105125	4150	3.95	487744	3807	0.780
*Agricultural Production	na	na	na	357715	3198	0.909
Meat fresh + chicken & frozen	177180	2180	1.23	23499	112	0.334
Cereals	1952224	199585	10.22	38809	373	0.961
Wheat	563649	55084	9.77	19017	3	0.016
Rice	352068	73372	20.84	5123	370	7.226
Potato	268492	15500	5.77	1468	0.4	0.027
Pulses	57455	12850	22.36	2230	16	0.72
Tomato	70433	5000	7.09	1910	0.2	0.01
Onion	28233	3500	12.39	675	55	0.15
Oranges	57048	1900	3.33	5806	12	0.20
Bananas	49630	7000	14.10	3122	0.1	4.09
Apples	40346	1200	2.97	2589	31	0.14
Coffee	5919	200	3.38	618	11	1.78
Sugar total	115939	14400	12.43	1060	11	1.04
Tea	2479	703	28.36	2112	370	16.73
Soyabean cake	83228	2153	2.50	577	40	6.93
Groundnut cake	9872	3444	34.88	92	30	32.15
Tobacco unmanufactured	3965	538	6.75	5856	163	2.78
Cotton lint	18430	2195	11.91	8619	330	3.83
Jute fibres	3135	1260	40.19	132	30	2.27
Natural rubber	5304	351	6.60	3640	8	0.22

Source :Bhatia (1994), Page 404. * In the original table these figures have been quoted as negligible however since agricultural production includes a number of commodities, we have taken it to be na. Since the figures were not available.

Table 4.2 given below provides information on the principal exports of India between the period 1970-71 to 1995-96 and indicates the behaviour of export trade in various agricultural and allied commodities during this period.

The trend in exports of principal agricultural commodities of India indicate that India's traditional exports viz. tea, tobacco, cotton and in some periods, rice, have shown a decline in terms of quantity, value as well as share of total agricultural exports. This indicates that the future potential of India lies in non-traditional price elastic and income elastic exportables like fish, marine products, and horticultural products, both fresh and processed. The share of agriculture and allied products in the recent years increased from 17.61 percent in 1992-93 to 19.8 percent in 1995-96 in value terms. Of which, fruits and vegetables which constituted 0.68 percent of the total agricultural and allied products exports in 1992-93, increased to 3.7 percent in 1995-96, a very rapid rate of increase in this non-traditional commodity group.

Table 4.2 PRINCIPAL AGRICULTURAL EXPORTS OF INDIA
Quantity in 000 tonnes, Value in Rs. crores

Commodity group	1970-71		1980-81		1990-91		1992-93		1993-94		1994-95		1995-96	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Coffee	32.2	25	87.3	214	86.5	252	114.1	376	118.5	546	128.5	1053	156.1	1053
Tea and mate	119.1	148	229.2	426	199.1	170	168.1	977	154.3	1059	151.4	975	158.7	1171
Oilcakes	878.5	55	8860	125	2477.8	609	3678.9	1545	4820.7	2324	4150.8	1798	4330.9	2349
Tobacco	49.8	33	9.3	141	87.1	263	88.3	474	104.7	461	53.7	255	87.1	447
Cashew kernels	60.0	57	32.3	14	55.5	477	62.7	349	73.5	1048	80.2	1247	780.8	1237
Spices	46.9	39	84.2	11	103.3	239	128.7	393	182.4	569	155	612	204.1	794
Sugar and molasses	473.6	29	970.0	40	191.0	36	485.1	354	204.5	178	51.1	62	734.4	506
Raw cotton	32.1	14	131.6	165	374.0	846	65.7	182	297.3	654	70.7	140	33.3	204
Rice	32.8	5	726.7	224	505.0	462	1085.4	976	767.7	1287	890.6	1206	4914	4568
Fish & fish preparations	32.6	31	69.4	21.7	158.9	960	210.8	1743	(-)	2552	320.9	3537	310.1	3381
Meat & Meat preparations	(-)	4	(-)	56	(-)	140	(-)	257	(-)	245	(-)	403	(-)	627
Fruits, Vegetables, and pulses	(-)	12	(-)	80	(-)	216	(-)	366	(-)	488	(-)	606	(-)	802
Miscellaneous processed foods (including processed juices and jams)	(-)	(-)	(-)	36	(-)	213	(-)	373	(-)	470	(-)	282	(-)	745
Agricultural and allied product	(-)	487	(-)	2057	(-)	6317	(-)	9475	(-)	13021	(-)	13712	(-)	21138
Agricultural and allied products as per cent of total exports	(-)	31.72	(-)	30.65	(-)	19.4	(-)	17.61	(-)	18.6	(-)	16.5	(-)	19.8
All commodities	(-)	1535	(-)	6711	(-)	32553	(-)	53688	(-)	69751	(-)	82674	(-)	106353

Source: Bhatia (1994) page 40. Government of India, Economic Survey, (1996-97), Page S-86/87.

The following table 4.3 analyses the trends of exports of some selected agricultural commodities.

Table 4.3 Trends In Exports Of Some Selected Agricultural Commodities (India)

Item	1960-61 Value in crores	1970-71 Value in crores	1980-81 Value in crores	1990-91 Value in crores	1992-93 Value in crores	1993-94 Value in crores	1994-95 Value in crores	1995-96 Value in crores
Fruits, Vegetables and Pulses	6	12	80	216	366	488	606	802
Miscellaneous Processed food (Including processed juices & Jams)	1	4	36	213	373	470	282	745
Agriculture and allied products	284	487	2057	6317	9457	13021	13712	21138

Source : Bhatia (1994), Page. 405.

Government of India, Economic Survey (1996-97), Page S-85.

As can be seen from the above table the exports of fruits and vegetables and pulses in value terms have increased from a mere Rs. 6 crores in 1960-61 to Rs.216 crores in 1991 to Rs.802 crores in 1995-96. Between 1991 to 1995-96 there has been a 271 percent increase in value of exports of fruits and vegetables and pulses and a 249 percent increase in the miscellaneous and processed food category. (some part of this increase in value terms could be attributed to a rise in prices because these values are at current prices).

This shows that there is a comparative advantage that India enjoys in relation to several other countries of the world including the competitor countries in the above group of commodities. The comparative advantage is activated by devaluation of the domestic currency. Table 4.4 given below shows the domestic and world prices of principal agricultural commodities in 1992.

If the domestic to world price ratio showing degree of comparative advantage that India enjoys vis-a-vis other countries are ranked for the commodities shown above, it can be observed that banana and mangoes rank the highest followed by jute, tea, coffee, etc. This clearly shows that the comparative advantage in non-traditional agricultural exportables place India in a better position as compared to the traditional agricultural exportables.

The declining comparative advantage of traditional agricultural exportables is largely a result of the fact that in a majority of commodities world prices have shown a declining trend where as in India the prices of these commodities (both the minimum support prices as well as wholesale prices) have been rising at a rate of 7

percent to 10.5 percent per annum. It is therefore no wonder that the comparative cost in traditional commodities have been shifting in India's disfavour.

Table 4.4 Domestic And World Prices Of Principal Agricultural Commodities In 1992. (per tonne).

Commodity	World price C/F Price Rs.	Domestic price- Whole price Rs.	Domestic/World Price Ratio
Wheat	5242	2750	0.58
Rice	9730	4050	0.43
Maize	3890	-	-
Groundnut Oil	18505	36096	1.96
Soyabean Oil	13322	30250	2.29
Sunflower Oil	13901	32000	2.31
Coconut Oil	17897	50490	2.99
Copra	11903	33654	2.85
Cotton	54503	35495	0.660
Jute	11236	3830	0.37 (3)
Sugar	6661	8208	1.28
Tea	58644	36763	0.64
Coffee	44280	38477	0.87
Rubber	64233	24071	0.38
Tobacco	114334	39668	0.35
Pepper	60700	27315	0.45
Banana	17202	2557	0.17 (1)
Mango	19693	4500	0.24 (2)
Potato	4228	1850	0.52
Soyabean Meal	6835	-	-

Source : Bhatia (1994), Page 406.

The study has however identified a major constraint to the competitiveness and comparative costs of the agricultural exportables i.e. the relative level of domestic and world prices and the future movement in their price levels. It concludes that the ratios of domestic prices to world prices during 1992 are significantly lower in case of the following commodities: wheat, rice, maize, cotton, jute, tea, coffee, rubber, tobacco, pepper, oil cakes and horticultural products like potato, mango and banana (see table 4.4). Therefore these commodities are placed at an advantageous export position. However, the future export potential of these crops would depend on the future relative price movements. If prices are likely to be adverse for India it would have to be corrected through devaluation which cannot be a long run policy.

In the recent years trade in these non-trationals have shown a favourable trend with the new liberalisation policy. The following table 4.5 shows India's share in world exports by commodity groups and divisions for selected agricultural and

allied group of commodities for the period 1980 to 1994.³

Table 4.5 India's Share In World Exports By Commodity Divisions And Groups

Commodity Division/ Group	1980			1994		
	World (US\$ Million)	India (US\$ Million)	India's Share (%)	World (US\$ Million)	India (US\$ Million)	India's Share (%)
Meat and meat preparations	17832	67	0.4	39939	125	0.3
Fish , Crustaceans, Molluscs preparations	12258	242	2.0	41797	1111	2.7
Cereals and Cereals preparations	41989	201	0.5	45179	428	0.9
Rice	4355	160	3.7	5780	384	6.6
Vegetables and fruits	24018	259	1.1	39030	649	1.7
Sugar and sugar preparations and honey	16183	46	0.3	13482	22	0.2
Coffee, Tea, Coco	22121	879	4.0	29027	792	2.7
Tobacco and Tobacco manufactures	3423	151	4.4	21474	81	0.4
Oil seeds and legumes	30239	465	1.5	116336	83	0.7

Source: Economic Survey, (1996-97), Page S-90-S-93.

As can be seen from the table given above (see 4.5) India's exports of vegetables and fruits in value terms has increased from \$259 Million in 1980 to US\$649 Million in 1994. For fruits and vegetable exports it is interesting to note the detailed trend of these exports between 1990 to 1994 (the period when liberalisation and export incentives were provided in India). The following sub-table 4.6 provides this information.

Table 4.6 Trends In Growth Of Exports Of Fruits And Vegetables In The World And India (1990-1994).
(Value in US \$ Million)

Item	1990			1993			1994		
	World	India	India's Share %	World	India	India's Share %	World	India	India's share
Fruits & Vegetables	50225	400	0.8	53468	546	1.0	39030	649	1.7

Source: Government of India, Economic survey, (1996-97), Page S-92-S-93.

Between 1990 to 1994 India's exports of fruits and vegetables in value terms increased from \$400 Million to \$649 Million i.e. an increase of about 1.6 times and

³ Source : Economic Survey (1996-97) Page S-90 to S-93.

its percentage share in value of exports which was only 0.8 percent in 1990 increased to 1.7 percent in 1994.

The liberalisation policy and other export promotion measures have thus been favourable for the export of these crops. From the table it can also be noted that India's exports of non-traditionals like fish, meat preparations have also increased where as India's percentage share in coffee, tea, cocoa, tobacco infact have shown a decline.

A detailed breakup of the exports of some specific fruits (this information is not provided in the above table 4.6) like mangoes, grapes, banana, apples, shows that except in the case of mangoes, India's share in world exports is less than one percent. In 1990 mangoes accounted for 59 percent of the world production and 13.50 percent of world exports, grapes accounted for .70 percent of world production and .30 percent of world exports. Bananas accounted for 14.26 percent and 0.02 percent respectively and apples accounted for 2.68 percent of world production and 0.13 percent of world exports.⁴ In early 1990's, the value and share of major horticultural export items in total horticultural exports of India is given in the table 4.7 given below.

Table 4.7 Exports Of Major Horticultural Items From India. T.E 1992-93

Items	Value (Rs. million)	Share (percent)
Mangoes	382.3	9
Grapes	161.4	4
Other fruits	572.6	13
Onion	1378.2	32
Other Vegetables	217.4	5
Mango pulp	400.1	9
Other processed fruits & vegetables	1185.7	28
Total fruits and vegetables	2711.9	63
Total processed fruits and vegetables	1585.8	37
Total	4297.7	100

Source Gulati (1994) page 116.

As can be seen from the above table, mango exports dominate among the

⁴. see next page

fresh fruit exports at 9 percent of the total horticultural exports in 1992-93. Together, the fresh fruit exports constituted 26 percent of the same, (i.e. mangoes, grapes, and other fruits).

Though liberalisation seems to have had a definite positive impact on horticultural exports and though a potential is identified for fruits and vegetables, its long term success would depend on movement of relative prices of these commodities in the world and India. It could also be constrained by the country's ability to tackle the post harvest technology, transportation and marketing problems.

3. AN ACCOUNT ON EXPORTS OF GRAPES AND MANGOES

Since the focus of this study is on two major fruit crops, i.e. grapes and mangoes, a detailed account of the export profile of these fruits is provided below:

3.1 Grapes: The production of grapes in India is estimated at about 6 lakh tonnes, (according to the NHB estimates), covering an area of 32365 hectares in early 1990's. The world production of grapes was about 60 million tonnes. India accounted for about 0.4 million tonnes i.e. 0.7 percent of world production (FAO 1992). More than 50 percent of world production comes from Europe. The major grapes producers are Italy, France, Spain, U.S.A, and Argentina. Details of production and area under grapes in India are provided in table 4.6. Maharashtra leads in area as well as production, producing about 55 percent of the total grapes produced in the country, followed by Karnataka, Andhra Pradesh, Tamil Nadu. In Maharashtra the main grape growing regions are Nasik, Aurangabad, Ahmednagar, Beed, Solapur, Sangli and Pune. Though 30 varieties are produced, Thompson seedless and Sonaka are the main export varieties. Maharashtra produces about 1.25 to 1.50 lakh tonnes of seedless and 25,000 tonnes of seeded variety of grapes. India has shown a record level of productivity in grapes at 75 tonnes per hectare (i.e. in Hyderabad, this quality is however not preferred by exporters).

The state wise area, production, and yield of grapes for the period 1991-92 is provided in the table 4.8 given below. Maharashtra's share in area and production are the highest, accounting for 52.8 percent of the area and 55.3 percent of the total production of grapes in India (with 60000 tonnes being produced in Nasik alone annually.). It should be noted here that the state produces almost 1.50 lakh tonnes of seedless export quality grapes. Raisins are manufactured at Nasik, Solapur and Sangli.

⁴ Gulati (1994), page 115.

Table 4.8 Statewise Area, Production And Yield Of Grapes In 1991-92

STATE	AREA (Hectares)	PRODUCTION (Tonnes)	YIELD (Tonnes/ Hectares)	Share of states in Total grape production (%)
Andhra Pradesh	2232	5630	25.00	.91
Haryana	1129	19840	17.57	3.2
Karnataka	6490	141670	21.83	22.9
Maharashtra	17118	341539	19.95	55.30
Punjab	2238	60426	27.00	9.78
Tamil Nadu	2267	46770	20.63	7.57
Others	891	1698	1.09	0.27
All India	32365	617573	20.65	--

Source :Singhal (1995), Page 140.

Export Advantages Of India In Grapes

India has a climatic advantage of growing grapes in the season when other countries cannot grow it. Grapes are next to mangoes in the fruit export basket of India. The following table 4.9 gives India's exports of grapes for the period 1989-90 to 1995-96.

Table 4.9 Exports Of Grapes From India

YEAR	QUANTITY (Tonnes)	VALUE (RS. Lakhs)
1989-90	3842	623.00
1990-91	5348	855.08
1991-92	11147	1862.00
1992-93	10770	2165.43
1993-94	15000	2500.00
1994-95	16813.40	4048.98
1995-96	22287.8	N.A

Source: Singhal (1995) page 142. Economic Times 6th September 1996.

The exports from India have grown both in quantity and value terms. India's exports of grapes have increased from 3842 tonnes in 1989-90 to 22287 tonnes in 1995-96. The value of grape exports in 1994-95 was estimated at Rs.4048.98 lakhs, (figures on value of grape exports for 1995-96 are not available). In addition to grape exports in its fresh form, dried grape exports in early nineties amounted to Rs.25.59 lakhs in value. Thus, grapes both in its fresh and preserved form are emerging as a significant export item in the recent years.

The table 4.10 given below provides information on the export destinations of Indian

grapes for the period 1994-95.

Table 4.10 India's Exports Of Grapes (Fresh): 1994-95.

COUNTRY	EXPORTS	
	QUANTITY (Tonnes)	VALUE (Rs. Lakhs)
Baharain	323.74	73.96
Bangladesh	2399.10	250.01
Belgium	31.25	5.43
Canada	1.63	0.58
France	16.18	4.53
Germany FR	47.92	14.44
Hong Kong	266.01	60.41
Kenya	9.25	2.77
Kuwait	235.81	77.93
Maldives	18.40	2.81
Mali	0.47	0.15
Mauritius	81.72	19.93
Netherlands	532.32	150.31
Norway	13.25	4.14
Oman	23.69	5.87
Qatar	49.81	8.65
Saudi Arabia	962.75	219.12
Singapore	18.72	6.94
South Africa	61.69	16.01
Sri Lanka	286.02	58.22
Switzerland	1.69	0.25
United Arab Emirates	4368.77	1076.92
U.K.	7063.25	1989.59
Total	16813.40	4048.98

Source: Private data of center for Development Studies, Pune.

The above data reveals the following highlights regarding the export of grapes from India and its market destinations.

1. The total exports of grapes in 1994-95 amounted to 16813.40 tonnes and in 1995-96 it was 22,287 tonnes (These figures are not given in table 4.8)⁵. Grape exports increased by 32 percent over a period of one year despite stiff competition in international grapes market from Chile.
2. The major export trading partners in grapes are UK,UAE, Dubai, Bangladesh, Saudi Arabia. In value terms this amounted to Rs. 4048.98 lakhs in 1994-95. UK

⁵ Source: Economic Times 6th September 1996.

alone accounted for 42 percent of our grape exports and 49 percent of total value of exports in 1994-95.

3. The price of grapes in the international market however has shown a decline from a net average price of Rs. 24.10 per kilo in 1994-95 to Rs. 23.89 per kg. in 1995-96.

4. The United Arab Emirates share in our total exports of grapes is about 25 percent in quantity terms and accounts for 26.6 percent of the value of India's exports of grapes.

5. In the recent years attempts are on to diversify into European markets. For long Dubai has been a major exporting center for the country. The price received in the European market is however more favourable and attempts to concentrate on this market segment are underway.

NEW DEVELOPMENTS IN THE AREA OF EXPORT PROMOTION OF GRAPES

Though the grape exports show an increasing trend over the recent years, constraints in the form lack of modernised technology, inadequate chilling plants, inadequate post-harvest technology, quality specifications for grapes etc. have limited the exports of these crops.

With the view to promote exports of grapes and to encash on the comparative advantage of grapes that India enjoys a few developments in this area can be listed as given below:

i. Indo French Biotech Enterprises Ltd. entered into an agreement with NMTC of India and Agroxco Export Company of Israel for marketing India's fruit and fruit products abroad. The areas of assurance would be quality control and marketing and even undertakes a vineyard in Nasik for production of Thompson seedless variety with technical assistance from France. This includes production and exports of both dry and fresh grapes.

ii. Micro Plantae Ltd. and Phytotech Australia Private Limited has appointed Micro Plantae Ltd. Bombay as its exclusive licence for Indian Subcontinent to grow and market black 'Marroo' variety of seedless black table grapes for which a tissue culture facility near Pune is to be set up on 100-150 crores and 2000 areas under contract for growing Marroo mainly for exports - the targetted market would be Europe, Our competitor again being Chile and South Africa.

iii. Nath Seeds Project is to assist farmers to grow grapes on a commercial scale

in Aurangabad and to export grapes to Europe where there is a 70,000 annual market for grapes. The company would assist in production and export.

3.2 Mangoes:

The world production of mangoes in early 1990's was about 17 million tonnes with total area under mangoes at 10.50 lakh hectares. The Asian region alone contributes about 78 percent to the global output. India is the largest producer of mangoes with an annual output of 9 million tonnes accounting for about 60 percent of the total world production. Less than one percent are exported in its fresh form. India contributes 13.5 percent of the world mango exports, (Gulati 1994). The major exporters of mangoes are India, Venezuela, Pakistan, Kenya, Mexico and Brazil. India and Pakistan mainly exports to the middle East region, and Europe is supplied by countries of South America, Asia and Africa. Europe has been found to be the fastest growing market with an annual growth rate of 17.5 percent over a period 1997 – 1989, (Gulati 1994). The mango seasons lasts from March – July in India and this gives India the advantage of an early start as compare to Pakistan etc. The other major producers are Mexico, Indonesia, China, Brazil, Pakistan, etc. The state wise area, production and yield of mangoes for the period 1991-92, is given in table 4.11 provided below.

Table 4.11 State Wise Area, Production, Yield Of Mangoes 1991 - 92.

STATE WISE AREA, PRODUCTION, YIELD OF MANGOES 1991 - 92.			
State	Area (Hectares)	Production (Tonnes.)	Yield (Tonnes/Hectares)
Andhra Pradesh	207596	2491115	12.00
Bihar	146232	1462320	10.00
Goa	3600	36000	10.00
Gujarat	32000	320000	10.00
Haryana	3827	20600	5.38
Jammu & Kashmir	5956	13626	2.28
Karnataka	80803	677712	8.38
Kerala	75480	241054	3.19
Madhya Pradesh	20660	186000	9.00
Maharashtra	49873	280983	5.63
Orissa	53149	291800	5.40
Punjab	12134	72804	6.00
Rajasthan	7906	39530	5.00
Tamil Nadu	55824	336351	6.02
Tripura	4972	37150	7.47
Uttar Pradesh (Hills)	19350	65500	3.38
Uttar Pradesh (Plains)	240417	1722257	7.16
West Bengal	55060	440180	8.00
Others	2782	17152	6.17
All India	1077621	8752134	22.04

Source :Singhal, (1995) Page 144, Uppal, Abbas (1992-93).

Of the total 3.2 million hectares of land under fruits, mango occupies nearly 43 percent of area. Uttar Pradesh is the largest producer of mango. The total production of Mangoes increased from 79.07 lakh tonnes in 1987-88 to 87.52 lakh tonnes in 1991-92.

Table 4.12 gives the trend of India's exports of mangoes from the period 1975-76 to 1994-95.

Table 4.12 India's Export Of Mangoes

Year	Quantity (Tonnes.)	Value (Rs. Cr.)
1975-76	3000	2.11
1985-86	16539	19.44
1986-87	10500	12.0
1987-88	14900	17.30
1989-90	12008	16.75
1990-91	19380	31.22
1991-92	23104	35.46
1992-93	25850	45.99
1993-94	28000	50.00
1994-95	35000	60.00

Source: Singhal, (1995), Page 145.

As can be seen from the table 4.12 the exports of fresh mangoes in quantity terms increased from 30 thousand tonnes to 35 thousand tonnes between 1975-76 to 1994-95, and in value terms there was an increase from 2.11 crores to 60 crores.

In addition to the exports of fresh mangoes,(reported in table 4.12) India also has been exporting mangoes in various forms i.e. mango sliced and dried, mango slices in brine, mango pulp and mango juice. The total quantity of all this taken together amounted to 55771.48 tonnes valued at Rs.109.17 crores for 1992-93, the year for which these detailed figures are available.

The export quality Alphonso mangoes are in great demand in Gulf countries because of its excellent quality and flavour. Alphonso variety is grown mainly in Devgad, Shiroda, Vengurla, Malvan in Sindhudurg district and Ratnagiri districts of Maharashtra. Valsad district of Gujrat accounts for a small quantity. (the demand for mangoes is maximum during Ramzan). The table 4.13 given below provides information on India's exports of mango and mango products for the period 1992-93.

Table 4.13 India's Exports Of Mango And Mango Products 1992-93.

Product	Quantity (Tonnes)	Value (Rs.Crore)
Fresh Mangoes	25850.40	45.99
Mangoes, sliced and dried.	92.50	0.15
Mango slices in brine	1567.68	2.68
Mango pulp	27506.17	58.34
Mango juice	754.73	2.01
Total	55771.48	109.17

Source: Singhal (1995), page 146.

Mango is emerging as an important foreign exchange earner fruit crop in India. Alphonso, Neelam, Totapuri, Chausa being the main export varieties. The Indian exports markets for fresh mangoes are West Asian Countries, like UAE, Saudi Arabia, Kuwait, Bahrain, UK, France, and Holland. India exports also, dried mangoes to UK, Hong Kong, Bangladesh, Kuwait, Canada, Puree and paste to Saudi Arabia, USSR, Netherlands, Nigeria. Mango juice is basically exported to USSR, Ethiopia, USA. Mango presently constitutes 23 percent of total fresh fruits exports from India, total world trade in mango is of the order 1.5 lakh tonnes valued at US\$90 million, though India accounts for 63.5 percent of world production in mangoes its exports are only 19.5 percent of world trade in mangoes. The constraint in India is the time restriction of two months and inadequate post harvest and exporting technologies. There is also, presently a ban on imports of fresh mangoes from Japan and India also Sri Lanka has banned imports due to fruit flies.

Special efforts have been made by APEDA in 1993-94 to establish 100 pre-cooling units in different areas, for better post harvest management and marketing of mangoes. The Indian government is concentrating on the European market because of the higher price in this region as compared to the Gulf countries, (for example the price per kilo in the European market is Rs.75-80 where as in the Gulf it is Rs.35 to 40).

RECENT TRENDS IN EXPORTS OF MANGOES FROM INDIA 1994-95

From the detailed data available for 1994-95, given in table 4.14 it can be seen that the total exports of mango from India in 1994-95 in quantity terms amounted to 25414 tonnes and Rs.4502.73 lakhs in value terms. The major trading partners of India's exports for fresh mangoes are United Arab Emirates, Bangladesh, U.K, Bahrain, Kuwait. United Arab Emirates alone accounted for 10004.40 tonnes i.e. 39 to 40 percent of India's total fresh mango exports followed by Saudi Arabia,

Bangladesh and Bahrain. The European Union together accounted for 1596 tonnes of India's exports i.e. only 6.2 percent of the exports. India's mango exports have not made a headway yet in European countries or the USA. Market diversification would promote the mango exports and is an integral part of the current strategy of the government to promote mango exports.

Table 4.14 gives the details of the mango exports from India for the period 1994-95 in quantity and value terms, and also the export destinations of mangoes from India.

Table 4.14: India's Exports For Mango (Fresh) (1994-95)

Country	Exports	
	Quantity ('tonnes)	Value (Rs. Lakhs)
Australia	25.81	9.12
Russia	3.51	0.59
Baharain IH	112.34	213.75
Bangladesh	4906.98	385.15
Belgium	11.24	3.94
Bhutan	12.0	1.51
Canada	107.32	22.70
Finland	16.0	4.94
France	9.25	3.41
Germany FR	105.48	29.35
Hongkong	17.81	7.16
Indonesia	1.0	0.26
Isreal	67.54	16.09
Italy	48.12	13.53
Japan	0.53	0.17
Kenya	2.13	0.55
Korea RP	2.0	0.95
Kuwait	1053.57	197.33
Malaysia	166.09	34.33
Maldives	40.66	2.69
Nepal	15.36	2.11
Netherlands	293.50	73.92
Oman	39.11	8.97
Portugal	3.74	1.30
Quatar	454.96	52.16
Russia	1.0	0.38
Saudi Arabia	4961.11	936.40
Singapore	328.12	75.80
South Africa	3.56	0.63
Sri Lanka	11.40	1.38
Sweden	4.47	1.57
Switzerland	93.29	17.52
United Arab Emirates	10004.40	2108.77
UK	1218.15	215.80
USA	201.70	53.83
Total	25414.00	4502.73

Source: Private Data of center for development studies, Pune.

4. EXPORT PROJECTIONS

The international market holds promise for horticultural crops. It is estimated

that the world import demand for fruits is expected to grow at 3.1 percent per annum and for vegetables at 3.9 percent per annum during the period 1984-2000 AD. (Shah and Mitra 1997). The import demand for fruits and vegetables together by developing nations is expected to grow at a rate of 4-5 percent per annum where as for developed countries the import demand for fruits are expected to increase at 2.8 percent for annum and for vegetables at 3.85 percent per annum (Shah and Mitra 1997, Nurul Islam 1990). The projected import demand is also estimated to exceed export supply by 2003 AD. The world import demand for fruits and vegetables would be 95.48 million tonnes against projected export supply of 85.76 million tonnes. The APEDA has projected the quantity and value of exports from India of various horticultural commodities for the period 1996-97 and 2000 AD. These projections are reported in table 4.15 given below.

Table 4.15 Export Projections For Horticultural Products (From India)
(Quantity - '000 tonnes values Rs. in crores)

COMMODITY	1991-92		1996 - 97		2000	
	QTY	VALUE	QTY	VALUE	QTY	VALUE
Fruits	45	59	187	365	355	693
Vegetables	375	206	530	415	705	552
Cashew / Kernels	65	669	107	1096	161	1658
Spices	142	372	170	620	272	992
Mushrooms	N.A.	11	N.A.	17	190	32
Flowers	N.A.	12	N.A.	100	N.A.	200
Tissue Culture	N.A.	N.A.	N.A.	15	N.A.	30
Processed Fruits & Vegetables	45	107	130	345	247	656
Total	672	1436	1124	2973	1930	4813

Source: National Horticultural Board Technical Communications (1995a), page 22-25.

The projection show that in value terms the export earnings by the end of the 8th plan is expected to be Rs. 2973 crores. This amounts to increase of almost 200 percent over the year 1991-92. By the year 2000 A.D the total quantity of exports of horticultural crops are expected to increase to 1930, thousand tonnes with an estimated value of Rs. 4813 crores.

Among fresh fruits: mangoes, (of the varieties Alphonso, Kesar, Dasherri, Bangarapalli), and grapes, constitute bulk of the exports of fruits from India. Other fruits with high export potential are banana, Sapota, Pomegranate, Ber, Guava, Litchi, flowers and vegetables. The cashew industry is a major exporter and meets 50 percent

of global demand. The world market for tissue culture is estimated at 170 million plants, which is expected to reach 630 million plants by 1995-96. India presently has 20 tissue culture units with a production of 3 million plants -The major production centers in the world are UK, USA, Holland.

5. GOVERNMENT INCENTIVES TO PROMOTE EXPORT OF HORTICULTURAL CROPS

Horticultural crops have been recognised as a significant area of non traditional exports in the country. In order to enhance the production and spread of such crops in the country the government had increased the budgetary allocation of such crops to Rs. 1000 cr. In the 8th plan. (see chapter 2 section 4).

Agriculture in general and horticultural crops in particular have been given special emphasis in the new export - import policy of the government (introduced in 1993). In order to enhance the export capabilities of agricultural, horticultural crops, the government has initiated a number of policies, programs, and special incentives, especially in the recent years.

To begin with units engaged in agriculture allied activity, aquaculture, animal husbandry, floriculture, pisciculture, horticulture, processed fruits and vegetables, sericulture, can avail benefits of duty free imports under EQ/EPZ, units if they export only 50 percent of their product.

Secondly, the definition of capital goods has been enlarged to cover agricultural sector- which facilitates import of capital goods for agricultural at reduced duty rates.

With the introduction of convertibility on trade account a number farm-based products can become globally competitive, for example, rice, wheat, cotton, fruits and vegetables etc. In addition to this, reduction in import licensing, greater availability of export credits, low interest rates, restructuring import duties and strengthening infrastructural facilities, are the other measures undertaken to facilitate and promote export of horticultural and agricultural crops.

The highlights of the export promotion policy for horticultural crops initiated by the government are provided below.

- a) (A proposal to invest Rs. 545 crores to strengthen the infrastructure required for horticultural exports, for instance, transportation, cold storage units has already been put forth in 1990's.

- b) Rs. 12.8 crores has been allocated for improving the post- harvest technology and 38 units for storing, grading and waxing of fruits and vegetables are to be set up in various fruits and vegetables growing states e.g. Konkan in Maharashtra.
- c) 60 pre-cooling units are to be set up in major production areas and introduction of refrigerated transport, vapor heat treatment have also been proposed.
- d) Making available hybrid quality seeds specially to small and medium farmers.
- e) Introduction of modification of land ceiling laws.
- f) Promoting organic farming i.e. with the minimum use chemical fertilisers.
- g) Promoting research and development in horticultural crops.]

CONCLUDING OBSERVATIONS:

A study by Gulati(1996) has identified two major constraints to exports of horticultural crops specially fruits and vegetables. These include a) Policy constraints and b) Infrstructural and institutional constraints.

a) Policy constraints- The general policy towards exports of horticultural products is conducive, except for delays in registration with DGFT and ministry of commerce. The devaluation of 1991, (of 22%) would have harmful effects of increasing costs in terms of rupees and would make the crops internationally less competitive.

b) Infrstructural and institutional constraints- there are inadequate road transport facilities, cold storage units, and scheduling of trucks. As regards international transport the air and sea freight rates are very high relative to the rates from the other ports in Asia, Africa, South America. This transport cost disadvantage has to be minimised. Non availability of Vapor Heat treatment (VHT) for fresh fruits and vegetables has only been recently initiated by the APEDA with Japanese assistance. There is thus a need to develop transport, cold storage units, and cool chains for which liberal credit schemes are necessary. As regards institutional constraints, this by and large is related to the availability of credit, the rates of interest, and the quick sanction of loans.

One of the solutions for promoting exports of horticultural crops would be to encourage formation of co-operatives to undertake storing, packing, transporting, and marketing of fruits and vegetables. (on the lines of Mahagrapes in Maharashtra).

Grapes, mangoes, lychees., banana, sapota, onions, tomatoes, potatoes have been identified as the major horticultural crops in which India has a strong export advantage. Our Main markets for fruits and vegetables have been the middle east countries however Europe holds a strong promise for the above crops which is being given special attention in the export promotion policy by the Government. India also has a strong cost advantage in transporting crops to East Asia i.e. Singapore, Hongkong, Japan etc. which needs to be explored.

Thus the review of the trends in the export of agricultural commodities indicate an increase in potential for non-traditional commodities, of which horticultural products i.e. fruits and vegetables, both in its fresh and processed forms, holds significant promise of emerging as a major foreign exchange earner in the future. For fruits as a whole the domestic demand may outstrip the supply in the near future however the export potential will be concentrated upon those fruit crops for which there is a surplus, these include fruits like mangoes, grapes, bananas. Therefore, intense efforts are required to improve upon the quality and quantity of these crops. In addition to coping up with the problems of meeting import demand of such crops the other areas which need immediate attention are the technical and institutional constraints to export trade. These include post-harvest management, storing facilities, processing facilities, quality control, increasing shelf life of these commodities, maintaining international specifications and quality. These infact are the areas which have so far constrained expansion of India's trade specially in agricultural and related commodities like horticultural products.

CHAPTER 5

ECONOMIC VIABILITY OF AGRICULTURAL DIVERSIFICATION: A SURVEY OF LITERATURE

1. INTRODUCTION :

The success of any horticultural venture or programme and its associated subsidization will have to be judged in terms of the extent to which the beneficiaries make profit. Accordingly, a detailed cost benefit analysis is necessary. This chapter deals with a survey of literature on the cost-benefit analysis of some horticultural crops and has also reviewed the literature on the economic viability of agricultural diversification programs. As far as the vegetable crops are concerned the cost-benefit analysis presents no special difficulty because vegetable crops are short duration crops and revenue is realised in the same period as the costs are incurred. In the case of fruit crops, there is a decision of building of an asset, which will yield a series of return over its lifetime. It is therefore essential to make the cost benefit analysis considering the gestation period of the fruit trees, the fruit bearing life and the yield behaviour during the product life cycle. Thus, it is necessary not only to arrive at the cost- benefit ratio and profitability of such crops but also to estimate the break-even point of such undertakings. The literature on this aspect has therefore focussed on the discounted present value as well as cost-benefit analysis of horticultural crops.

Horticultural crops i.e. fruits in particular could give income of two types.

- a) Income from the main crops which usually accrues after a relatively long gestation and
- b) And incomes from inter-crops of much lower gestation period. These crops include some vegetable crops like pumpkin, other crops like mustard, spices, which can be grown along side the main horticultural crop during the gestation period.

Income from the main crops in any year can be calculated as:

Expected yield per tree X Nos. of living fruit bearing trees X Price of Product.

[Note : Yield of trees varies considerably over their life time, being low when trees are younger and growing progressively in the later years till they reach maturity after which it can be assumed that they yield maximum constant yield for a considerably long period of time. (The yield pattern would however differ between fruit crops)].

2. A REVIEW OF THE LITERATURE ON THE ECONOMIC VIABILITY OF HORTICULTURAL CROPS

This section covers some studies related to the cost and revenue analysis of fruit crops. The objective of such a review is to examine to what extent fruit crops can enhance the income of farmers along with providing stability of income.

Studies on the economic viability of agricultural diversification have typically adopted three approaches. The first approach (Group one), relies on the techniques of break-even period or pay-back period analysis. This involves making estimates of the variable and fixed costs from the stage of land preparation and planting to the stage of crop harvesting. The object of this analysis is to ascertain whether the recurring revenues obtained by selling the output are sufficient to cover the recurring costs.

The second approach (Group two), is the usual capital budgeting approach, which involves the computation of the Net Present Value (NPV) and or the Internal Rate of Return (IRR). The net present value if positive establishes that the farmer will be able to increase his wealth by adopting the new project rather than not adopting it. The IRR if greater than the rate of interest establishes that the farmer would do better to adopt the project rather than invest his funds at his opportunity cost of capital.

Of the above two approaches the capital budgeting approach is clearly superior to the break-even period approach, not only because it includes all results of the breakeven approach but also gives explicit recognition to the capital nature of horticultural projects. (For crops like vegetables that have a low gestation period the capital budgeting approach and breakeven approach lead to the same results.)

Both the break-even period analysis and capital budgeting approach suffer from one drawback i.e. they are unable to cast any light upon the manner in which diversification reduces risks and enhances stability of farm incomes. The breakeven analysis and the capital budgeting techniques are designed to establish the viability or otherwise of a particular project. How the project performs in comparison or alongside with other projects can not be ascertained through these approaches.

Therefore the third approach (Group three), adopted in the literature concentrates chiefly on the impact of agricultural diversification on the stability of farm incomes. Typically under this approach studies define the degree of diversification and attempt to show that the higher the degree of farm diversification the greater the income stability.

GROUP ONE

The first approach includes the following studies:

As early as in 1928, Cheema's study (1928) recognized the need of agricultural

diversification in general and in the state of Maharashtra in particular. Fruit farming was suggested as a viable option and the study worked out the costs of cultivating fruit crops and its returns which indicated that even a small holder can avail of the benefits of fruit farming.

The study gives the cost and income estimates for a few selected crops i.e. Figs, Pomegranate, Papaya and Banana. The following data are used for each crop

1. Cost of labour : Man 10 annas per day
Woman 5 annas per day
Boy 5 annas per day
Bullock 10 annas per day
2. Cost of Material : Farmyard manure - Rs. 2 cart load
Ash - Rs. 2-8 per cart load
Bonemeal - Rs. 85 per cart load
(2 Cart loads = 1 ton)
3. Supervision Charges
4. Marketing Charges
5. Assessment of land
6. Value of land : Valued at Rs.1800 per acre around Pune
7. Interest charged at 9 percent on sum invested

The estimates on the cost of cultivation and income per acre in the neighbourhood of Pune are provided in the table 5.1.

Table 5.1 Cost Of Cultivation And Income Per Acre Of Selected Fruit Crops

Years	Fig		Pomegranate	
	Cost Rs.	Income Rs.	Cost Rs.	Income Rs.
1 st	262.54	345.14	231.80	Nil
2 nd	197.64	410.12	221.0	52.13
3 rd	279.11	508.40	163.10	72.50
4 th	297.20	452.15	248.12	327.97
5 th	295.12	530.2	321.85	780.13
Total	1331.61	2246.01	1185.87	123.73
	Papaya		Banana	
Year	Cost Rs.	Income Rs.	Cost Rs.	Income Rs.
1 st	272.11	512.11	488.20	Nil
2 nd	387.10	729.11	342.80	1422.10
3 rd	326.15	1213.20	341.40	953.60
4 th	-	-	341.40	965.40
5 th	-	-	341.40	1252.20
Total	985.36	2454.42	1855.2	4593.3

Source : Cheema and Dani (1928) Page 3.

For Figs the total accumulated cost over 5 years works out to be about Rs. 1330/- and the gross income in 5 years works out to be about Rs. 2245. A net surplus

of Rs. 915/- per acre is thus obtained from this crop at the end of five years. This fruit crop generates a net surplus in the first year itself (See table 5.1). The total cost of pomegranate over five years is about Rs. 1185/- per acre and the gross income from pomegranate in 5 years is Rs. 1232/- per acre, i.e. by the 5th year the pay back period of this crop is attained. Papaya shows a high level of income at Rs. 2454/- per acre which accrues in three years, with cost of three years at Rs. 985/- per acre, this crop yields a net surplus of Rs.1440 per acre. Banana's total cost is Rs. 1855 in 5 years, the income from bananas accrues from 2nd year onwards by the fifth year the gross revenue amounts to Rs.4593 per acre. Banana shows maximum net surplus of Rs. 2738 over a period of 5 years. Papaya yields a net surplus of Rs. 1440 by the end of 3 years. The conclusion from this study is that fruit crops require heavy expenditure initially, which is partially alleviated by inter cropping. The study observes that the recurring expenses per unit of output reduce gradually, the income rises gradually. The study therefore concludes that fruit cultivation thus is a profitable proposition, yielding a net revenue per acre in the range of Rs.915 (figs) to Rs 2739 (bananas).

Another study Rana (1985) on the comparative costs of raising one hectare of orchard under different crops reveals some very interesting aspects of the benefits of fruit production. The study has estimated the per hectare cost of a few selected fruit crops i.e. Apples in Himachal Pradesh and other fruits in Ludhiana, for the period 1983. The study found that the per hectare cost of raising one hectare of Orchard is Rs. 7079 for apples, 5789 for guava, 6236 for orange, 4969 for pear and 4547 for mangoes. In all cases, material cost accounts for 60 to 70 percent of the total cost and among these crops maximum labour cost intensity is found in the case of apples. These details are provided in table 5.2.

The conclusions of the study in terms of annuity value of the selected crops and compound returns from selected crops provided in Table 5.2.

Table 5.2 Annuity Values, Selected Fruit Crops(Unit Rs./ hectares)

Fruit Crops	Productive Life	Net Present Value (NPV) @	Annuity Value
Apple	50	94053	11336
Guava	30	49397	6132
Orange (Kinnow)	25	74739	9529
Pear	50	35217	4240
Mango	50.	38441	4629

Note : @12.7 percent, Source : Rana (1985), Page 297.

The study observes that:

- i) Cash inflows start some years after planting the crop, they increase initially with age of

plant and then become almost constant after achieving full bearing age in 10 to 12 years time.

The full development year would however differ between crops.

ii) The study found apples to have the highest Net Present Value (at 12.5 percent discount factor) per hectare at Rs. 94053 (see table 5.2). For the other fruits like guavas, oranges, pears, mangoes, the NPV (at 12.5 percent rate) per hectare ranges between Rs. 35217 to Rs. 74739.

The study finds that sometimes the returns from fruit crops are as high as 10 to 11 times that of field crops indicating a strong possibility of augmenting income from fruit crops whenever it is conducive depending on the agro-climatic conditions.

Even though such a direct comparison between returns from fruit crops with field crops does not bring out the differences between the gestation period, initial and recurring expenses, yet the fact remains that fruit cultivation can become a viable subsidiary activity not only for increasing incomes but also for more optimum utilisation of land.

However 2 points should be noted here:

- a) A comparison between field and fruit crops in such a manner may not be really meaningful because fruit crops have a longer gestation period.
- b) The period of the two group of crops compared are also different.

A detailed study by the APO (1985), on fruit production and marketing, gives an insight into some crucial aspects of economics of horticulture based on an analysis of 10 member countries (Republic of China, Indonesia, Thailand, Korea, Japan, Nepal, Pakistan, Philippines, Sri Lanka, Bangladesh). The study was conducted for the period 1980-83.

The fruits considered are oranges, apple, pear, banana, pineapple. The study has estimated the net revenue in two ways :

- a) Net revenue per hectare without including family labour and self supplied farm manure per hectare and
- b) Net revenue including family labour and self supplied farm manure per hectare.

The following results about (b) are arrived at by the study for the following fruit crops.

ORANGES: The study found that the net revenue from oranges ranges between \$656 to \$3230 per hectare for the group of countries studied i.e. Japan, Nepal, China, Thailand and Philippines. The highest net revenue was found in Japan.

APPLES: The net revenue from apples was found to range between US\$ 2708 to US\$

14245 per hectare. For the group of countries Japan, Korea, Nepal.

PEARS: In the case of Pears the net revenue was found to range from US\$1815 to US\$9593 per hectare, in Japan, Korea and Republic of China.

BANANAS: The net revenue from this crop was found to range between US\$758 to US\$2185 per hectare with Pakistan showing a very high yield. *PINEAPPLE:* In the case of this crop the net revenue was found to be in the range of from US\$199 to US\$2606.

The cost of establishing the orchards however varies from country to country depending upon mostly labour and material costs which was found to range between US\$ 258 per hectare for mangoes in Philippines to US\$ 8367 per hectare for oranges in Republic of Korea. Even between a given country/provinces the costs differ significantly. The study states that the economic contribution of fruits has clearly been recognised by these countries. For example in China in Qixia county, Shandong province income from apple production was about 16 percent of the total agricultural income. In South China, in Dongguan county, the total area under fruits increased from 5672 hectares in 1978 to 38,000 hectares in 1986, and accounted for about 35% of the total agricultural income of that country. Fruit farming thus contributes positively to income, employment, and productivity. In addition to this, the study also highlighted the export potential of such crops.

GROUP TWO

A study M.Sudha, Reddy, Shetty (1989) on the economic evaluation of some dry land horticultural crops like ber, pomegranate, mango, cashew, guava, was undertaken for the period 1985-86 to 1986-87. The study covers some of the southern districts of Andhra Pradesh and was based on data from 47 cultivators of mango, 40 cultivators of guava, 21 cultivators of cashew, 4 sweet lime and acid lime producers. Table 5.3 provides a detailed cost break-up of producing various selected fruit crops, in terms of the initial year capital expenses as well as average annual cost of maintenance.

It is evident from the table that fruit crops require heavy initial year capital expenditure ranging between Rs.2031 (for cashews) to Rs.23835 (for sweet lime) per hectare. The recurring annual expenses per hectare ranges between Rs.1240 (for mangoes) to Rs.7705 (for sweet lime). This aspect is extremely crucial for making a decision to adopt fruit cultivation.

Table 5.3 Cost Of Establishing / Maintaining Trees Rs./ hectares

Cost Item	Mango	Cashew	Guava	Acid Lime	Sweet Lime
A. Cost Establishment					
Land Preparation	427	363	1157	625	2928
Manuring	372	220	417	3335	10386
Sapling/Planting	1270	160	1111	58	1706
Fertilisers	888	-	233	1698	666
Watering	2968	1122	644	3121	3028
Interculture	408	124	742	738	2427
Plant Protection	-	-	-	1020	786
Watch & Ward	1498	42	1368	-	1560
Miscellaneous	-	-	537	-	-
Total	7831	2031	7211	10586	23885
B. Average annual cost of maintenance					
Fertiliser/Manuring	186	104	243	2232	3662
Irrigation	390	-	640	1060	575
Interculture	97	90	301	413	934
Water & Ward	504	1114	1086	-	328
Misc.	114	43	420	901	2266
Total	1240	1351	2690	4606	7705

Source: M. Sudha, Reddy, Shetty (1989), Pages 615-619.

The study has also made a detailed analysis of the BCR, payback period, annuity value, IRR, in order to evaluate the economic viability of fruit crop cultivation. It has also considered the returns from arable inter crops, in order to evaluate the agro-horticultural system. Results of these are reported in table 5.4 and 5.5.

Table 5.4 Average Annual Returns From Fruit Trees (Rs. per hectare)

Years	Mango	Cashew	Guava	Acid Lime	Sweet Lime
1st harvest	1210	370	585	7000	2053
6-10 years	5655	1264	4848	20513	9207
11-15 years	11300	3800	8525	32584	13044
16-20 years	11600	4000	10095	21340	9452
> 21 years	8525	1990	9745	2030	8000

Source: M.Sudha, Reddy, Shetty (1989), pages 615-619.

Table 5.5 Economic Evaluation Of Agro Horticultural System

Name of the Tree	With Intercrop			Without an Intercrop		
	Annuity Rs/ha	BCR	IRR percent	Annuity Rs/ hectares	BCR	IRR percent
Mango	4228	3.21	36	3896	2.27	28
Guava	4526	2.18	55	3722	2.08	35
Acid Lime	9581	3.04	51	9645	3.16	55
Sweet Lime	3307	2.89	29	3255	1.59	23

Source: M.Sudha, Reddy, Shetty (1989), pages 615-619.

The following major results can be noted from the above tables 5.4 and 5.5.

- a) The average annual return from all trees are initially low and reach a maximum at the peak maturity period of the crop and then begins to decline as the life of the fruit trees extend from 1 to sometimes more than 20 years (Table 5.4).
- b) The Benefit-Cost Ratio (BCR) without inter crops was highest for mangoes at 3.21 compared to the other dry land fruit crops, whereas the annuity value for acid lime was highest at Rs 9581 per hectare.
- c) The IRR in case of all fruits was higher (ranging between 23 to 55) than the commercial rate of borrowing (i.e. 18 percent in banks) thereby showing a definite profitability of fruits (see table 5.5).
- d) The study also estimated the IRR, BCR and annuity for the four selected crops with inter-cropping (see table 5.5). All indicators show a much higher level with inter-cropping when income from the inter-cropping is included. The IRR shows a definite improvement for example - for mangoes without inter-cropping the IRR is 28 percent and with inter-cropping it is 36 percent. The IRR increases on an average by about 6-10 times with inter-cropping. The IRR works out to be almost 8-10 percent more in case of crops like mango and guava when inter-cropping is done and about 4-5 percent in case of sweet lime and acid lime (table 5.5)
- e) A strong case for inter-cropping can be made specially in the first three years when such inter-cropping increases yield income and improves fertility, this is also the period when returns from fruits are yet to come in due to the long gestation period of such crops.

The conclusion of the study is that though investment in initial years is higher for fruits, growing fruits is economically viable and profitable and also leads to a more optimum allocation of resources like land, labour capital and water.

Two studies examining the costs and returns from grape farms were conducted in early 1990's. Gadam's study (1992) has evaluated a Grape cultivation scheme of

NABARD in Nasik district, Maharashtra, the study has covered a sample of 67 farmers from 18 villages (under the NABARD scheme). The study found that due to the adoption of grape farming under the scheme, the average incremental income was Rs. 27132 per acre during the full development year of the grape farm. (i.e. when the farm attains its full maturity period yield normally by the 5th year). The average income was found to vary between Rs. 914 per acre per annum at the lowest level to Rs. 105862 per annum per acre at the highest. The study has further calculated the IRR using the usual technique of calculating IRR, for the representative grape farm. (see chapter 9 for calculation of IRR). The IRR was found to be 27.99 percent excluding family labour, (which was lower than that expected by the scheme i.e. at 37%). The study has also calculated the IRR including the family labour, which was found to be 26.93%. Grape farming being a labour intensive activity, the study found that 185 days of additional employment per annum per acre could be generated by this activity. The study has also fitted a Cobb-Douglas function, which indicates increasing returns to scale in grape farming. The general conclusion of the study is that grape farming enhances income, employment.

More recently a study by NABARD (1993) was carried out for a representative grape garden in Nasik District of Maharashtra. The study has worked out the financial and economic viability of grape gardens in the above-mentioned district. All inputs and outputs are valued at 1990-91 prices. The cash flow and Financial Rate of Return (FRR) have been worked out on the following assumptions.

1. Economic life of viticulture (grape-vine) is 15 years for Thompson seedless variety.
2. The grape vines come into fruit bearing in the second year. The full development yield is achieved from fifth year onwards and is assumed to remain at that level till the 13th year.
3. Likewise the cost of cultivation/maintenance is assumed to remain the same from the fifth year onwards irrespective of the inter-year variations in the yields.
4. Residual value of investment is assumed at 50 percent of the Trellis System (Pandal), 10 percent of spray pump and zero for drip irrigation equipment.
5. Accounting year for purpose of annual cash flow is May to April. This part of the analysis deals with estimating the returns to investment incurred in grape gardens.

The study has estimated the cash outflow/ inflow and financial rate of return, (FRR) on the representative grape farm in Nasik the details of annual stream of cost and benefits and the FRR are provided in tables 5.6 and 5.7. This study has attempted to

assess whether the grape farm, on its own merits, is financially viable. It has taken two situations one without the project of the grape farm and the other 'with' the project of the grape farm. It however has not related the grape farm costs and revenue to the earlier existing traditional cropping pattern. Ideally, the NABARD study should have considered whether the 'with project' costs and revenue was on otherwise fallow land or partially utilised land. The details of 'without project' cropping pattern has however not been provided in the study.

**Table 5.6 Annual Stream Of Income And Costs of Grapes (Per hectare)
(Yield in quintals & Price per quintal.)**

No	Year	Yield	Price (Rs.)	Gross value (Rs.)	Investment Cost(Rs.)	Maintenance Cost Rs.	Net Income Rs.
1.	1 st	-	-	-	56665	-	-56665
2.	2 nd	22.57	792	17875	13035	-	4840
3.	3 rd	54.31	792	43014	-	24826	18188
4.	4 th	69.62	792	55139	-	29833	25306
5.	5 to 13 th	82.30	792	65182	-	39284	25898
6.	14 th	75.32	792	59653	-	32984	26669
7.	15 th	60.00	792	47520	-	32984	14536

Source: NABARD (1993).

Table 5.7 Cash Flow For Grape Gardens (Per Acre In Rs.)

<u>Particulars</u>	<u>Years</u>						
	1	2	3	4	5 to 13 (per year)	14	15
A. Outflow							
i. Investment cost	56665	13035	-	-	-	-	-
ii. Maintenance Cost	-	-	24829	29833	32984	32984	32984
iii. Net Income	6205	6205	6205	6205	6205	6205	6205
Without project							
Total cash outflow	62870	19240	31034	36038	39189	39189	39189
B. Inflow							
i. Gross value	-	17875	43014	55139	65182	59653	47520
ii. Residual Value	-	-	-	-	-	-	21275
Total cash inflow	-	17875	43014	55139	65182	59653	68795
C. Net Cash Flow	-62870	-1365	11980	19101	25993	20464	29606
D. F.R.R.	26 percent						

Source: NABARD (1993)

In the cost benefit analysis of the representative grape farm undertaken by NABARD (see tables 5.6 & 5.7), the procedure followed is:

- (i) The investment cost of grape cultivation is considered on a year to year basis,

the initial investment costs is assumed to be spread over 1st two years cultivation alone, approximately in the proportion of 75 percent in the 1st year and 25 percent in the of 75 percent in the second year, (see table 5.7).

(ii) During the first two years the maintenance cost is negligible and taken to be absorbed in the initial investment cost. It increases in the 3rd and 4th years and then has been taken to be stable till the 15th year.

(iii) The net income of the representative farmer (in the specified district), who does not adopt grape cultivation is averaged at Rs 6205 per acre (see table 5.7 item iii). Presumably this is an average based on sample of farmers with purely traditional cropping pattern. This amount has been considered as the equity capital investment, which the farmer makes for his grape farm cultivation when he adopts grape cultivation. It is in effect the net surplus available to the farmer to invest in his new venture of grape farming. Therefore Rs. 6025 is taken as the farmers equity contribution to the 'project' cost.

(iv) The total project cost has been calculated by considering the capital investment cost, in the maintenance cost and the equity contribution of the farmer. This total cost has been worked out for over a period of 15 years which is assumed to be the life-time of the grape farm.

The total cash out flow thus arrived at is compared with the total cash inflow to finally arrive at the financial rate of return (see table 5.7). The cash inflow has been arrived at on the basis two assumptions.

(i) In the first year when the Trellis system is installed the gross value (i.e. the cash inflow.) is taken to be nil.

(ii) From the second year onwards the revenue slowly increases till it reaches a maximum between the 5th to the 13th year and then shows a marginal decline.

(iii) The residual value of steel angles, wire mesh, iron rods etc. have been estimated in the 15th year. (The basis for this has not been revealed in the analysis.)

The financial rate of return worked out on the basis of the above cash outflow and inflow has been calculated as 26 percent indicating financial viability of the schemes. [This is calculated using the usual formulae for calculation of the IRR see chapter 9].

The study has further considered the composite investment cost i.e. inclusive of

plantation cost, drip irrigation system, investment cost of spray pump unit. (The cost of the spray pump unit has been taken as a part of the initial years cost and that of the drip irrigation system has been included in the 2nd year by assumption.)

Using the cash outflow figures (calculated inclusive of the composite investment cost) and the cash inflow, the study has worked out the financial rate of return (see table 5.8).

Table 5.8 Cash Flow For Composite Investment (Per Acre In Rs.)

<u>Particulars</u>	<u>Years</u>						
	1	2	3	4	5-13	14	15
A. Outflow							
i. Investment Cost	56665	13035	-	-	-	-	-
ii. Investment Cost of drip irrigation system	-	12180	-	-	-	-	-
iii. Investment Cost of Spray Pump unit	6315	-	-	-	-	-	-
iv. Maintenance Cost	-	-	24829	29833	32984	32984	32984
v. Net Income without project	6205	6205	6205	6205	6205	6205	6205
Total	69185	31420	31034	36038	39189	39189	39189
B. Inflow							
i. Gross Value with Project	-	17875	43014	55139	65182	59653	47520
ii. Residual Value	-	-	-	-	-	-	21906
Total	-	17875	43014	55139	65182	59653	69426
C. Net Cash Flow	- 69185	-13545	11980	19101	25993	20464	30237
D. F.R.R.	21 percent						

Source: NABARD (1993).

The financial rate of return to composite investment in the representative grape garden has been estimated to be 21 percent (using the IRR formula, see chapter 9 section 2) which means that even including the composite investment grape farming is financially viable activity.

Sensitivity Analysis: The study using the sensitivity analysis tested the project with some changes in variable factors like a 10 percent fall in price of grapes and 10 percent rise in cost of maintenance over the life of the project. The FRR arrived at was 19 percent in first case of a 10 percent fall in prices of grapes and 22 percent in latter case of a 10 percent rise in the cost of maintenance for plantation alone.

For composite investment, the FRR worked out to 15 percent and 18 percent respectively for the same changes. All these indicate that grape gardens are financially viable even at 10 percent fall in prices of grapes and also at a 10 percent rise in

maintenance cost of the garden.

A more recent study, Singh (1990) has made a detailed study of the returns from various fruit crops in some states of India. The details of the returns from the selected crops are provided in the table 5.9. given below.

Table 5.9 Returns From Selected Crops In India

Crop	Returns Rs./ hectares	State	Reference Year
<u>Field Crops</u>			
Rice	1884	Punjab	1978 - 79
Sorghum	209	Maharashtra	1978 - 79
Pearl Millet	451	Gujrat	1978 - 79
Maize	341	Himachal Pradesh	1975 - 76
Wheat	340	Punjab	1979 - 80
Grain	526	Madhya Pradesh	1978 - 79
<u>Vegetables</u>			
Potatoes	1581	Uttar Pradesh	1979 - 80
<u>Fruits</u>			
Apple	11326	Himachal Pradesh	1983 - 84
Mango	4629	Punjab	1983 - 84
Orange (kinnow)	9529	Punjab	1983 - 84
Guava	6132	Punjab	1983 - 84
Pear	4240	Punjab	1983 - 84

Source: Singh (1990), Pages 3-4.

As can be seen, fruits provide a net revenue per acre ranging between Rs.4240 per hectare (for ber in the Punjab state for the period of 1983-84) to Rs. 11326 per hectare (for Apples in Himachal Pradesh for the year 1983-84.) Fruit production can thus be a viable option to enhance incomes to a large extent. The study also has estimated the returns from field crops in various states during 1978-1980 and has found that the revenue form field crops per hectare ranges from Rs.209 (for Sorghum in Maharashtra) to Rs.1884 for Rice (in Punjab).

However, to directly compare the returns from the field and fruit crops is not very meaningful due to the differences in the gestation period involved, the yield pattern of the crop and other technical differences. The conclusion of importance to be noted is the tremendous capacity of fruit crops to earn incomes, which can become an additional source of income support and stabilisation for the farmers.

A study by Viva Tech-Com (1992) on the benefits and spread effects of the micro-watershed management and horticultural development in village Kalwade (Taluka Karad, district Satara, Maharashtra), has made a detailed evaluation of some

horticultural crops. The study team obtained the list of beneficiaries of the extension programme of the Kalyani Gorakshan Trust,¹ which to promote development of horticultural crops in village Kalwade. The study is based on a sample of 98 farmers of which 56 farmers were beneficiaries of the trust extension programme.

A very important observation found in the study is that, at least partially, horticultural crops tend to be adopted faster by those farmers who have considerable proportions of low quality lands which cannot otherwise be utilised in regular commercial or cash crops. Further on such land water availability is low so farmers have preferred cultivation of horticultural crops that require comparatively less water.

The study also reveals that apprehensions regarding marketing outlets for horticultural product and lack capital are major causes for farmers not adopting horticultural crops.

The study has calculated the net discounted present value of the yields from each tree for 7 fruit crops adopted by the beneficiaries of the Kalyani project. The same has been done for the different fruit orchards and also for the entire horticultural orchard. The discount rate was taken as 10 percent and the lifetime of the trees has been taken as 25 years. Table 5.10 provided below reports the Discounted Present Value (DPV), per tree as well as the DPV of the orchard. (The DPV of the orchard is calculated by multiplying the DPV per tree by the number of living trees). The total area covered by the entire orchard is 60 acres.

Table 5.10 Discounted Present Value (Net)

Crop	Discounted Present Value Per Tree(Rs.)	Nos. of Living Trees	Discounted Present Value Of the Orchard (Rs.)
Mango	4568	1012	4622816
Pomegranate	515	494	254410
Guava	600	572	343200
Sapota	2176	83	180608
Ber	1810	637	1152970
Custard Apple	1702	336	571872
Cocomuts	1235	400	494000
Total			7519876

Source : Viva Techom Consultants (1992), Page 28.

As can be seen the DPV of the orchard ranges between Rs. 254410 to Rs. 4622816 for mangoes. The DPV of the entire 60 acres of horticultural venture taken

¹ The Kalyani Gorakshan Trust is a registered public trust with noted industrialist Dr. Nilkanth A. Kalyani of Pune as its Chairman Trustee. This trust had undertaken a horticultural demonstration farming project on its land admeasuring 400 acres of which 100 acres is barren hills at Kalwade, Taluka Karad, Dist. Satara, Maharashtra.

together is Rs. 7519876. In addition to this, the present value of inter-crops has been estimated at Rs. 821000 over 25 years for the entire horticultural venture. The total capital cost of this 60 acres has been worked out to be Rs. 76000, to which total discounted recurring costs of Rs. 33000 per annum has been included to give Rs. 330000 i.e. approximately Rs. 400000. Thus the benefit-cost ratio estimated by the study works out to 20 for private farmers who have adopted the horticultural ventures.

GROUP THREE

This group of studies focuses on the impulses of diversification and the impact of agricultural diversification on enhancing and stabilising farm incomes. The main constraints to such a diversification process have also been highlighted. These studies are based on farm level/primary data investigation from various states/regions of the country.

Maria Saleth's study (1996) has examined the various areas of small farm diversification, based on which, an effective strategy for agricultural diversification can be evolved. The various areas of agricultural diversification, include crop diversification, diversification into livestock, animal husbandry and also to non farm occupations.

The study addresses itself to 3 basic problems (a) the land use and cropping patterns (b) The income, cost and net returns both in crop and livestock enterprises and c) The relative employment income significant enterprises i.e. crop and live stock enterprises. Based on these, the study identifies the important policy implications for an effective strategy for small farm development.

The study is based on 218 households covering 866 acres from Tiruchirapalli district in Tamil Nadu, representing four villages of different agro climatic zones. 30 percent are small and marginal farmers with less than 2 acres of land, 3.2 per cent are medium farmers (with 2.6 acres of land) and the rest are large with more than 6 acres of land. 50 percent of the net sown area is rain-fed. The study conducted a detailed analysis of the cropping pattern of above mentioned 218 households, the results relevant to this study are provided given in table 5.11 given below.

The major conclusions of the study observed from the table 5.11 are reported below:

1) Farmers with less than 2 acres devote over 50 percent of the gross cropped area to foodgrains (cereals) whereas those with land holdings of 4-8 acres devote about 50 percent of gross cropped area to non-foodgrains which include commercial crops, oil seeds, pulses, vegetable crops, horticultural crops and spices.

2) Vegetables and horticultural crops are confined mainly to farms above 2

acres.

3) Small farms have a tendency for cereal dominant farming.

The study has emphasised on the importance of irrigation in shaping regional cropping patterns. The major observation relating to this (see table 5.11) are:

- a) coarse cereals, have a dominant share of gross cropped area in well- based rain-fed regions.
- b) Commercial crops, (like bananas and sugarcane) are confined mostly to water-wise better endowed canal and tank irrigation.
- c) Vegetables and horticultural crops which are either non-significant or negligible both in the canal and rain-fed regions are relatively more significant in the tank and well irrigated regions. Therefore to encourage such high value crops may pose a danger for cropping pattern to shift to such crops from the traditional food grain crops.

Table 5.11 Crop Composition Across Farm Groups And Irrigation Types

Farm size/ Irrigation Status	Gross Cropped Area (Acres)	Percentage of Gross Cropped Area Under			
		Cereals	Commere cial crops	Vegetable crops	Horticultural crops
Farm size (acres)					
0 – 1	36.14	57.44	26.33	0	0
1 – 2	63.50	51.76	17.86	0.53	0
2 – 4	221.85	38.45	17.20	2.82	0.32
4 – 6	192.35	34.45	37.82	0.42	1.46
6 – 8	190.04	28.09	35.04	1.20	0.00
8 – 10	144.50	50.52	8.65	0.69	8.30
10 +	444.60	39.23	13.16	2.29	0.79
Irrigation status					
Canal	302.62	29.06	69.22	0	0
Tank	90.1	31.95	42.77	4.44	0
Wells	371.81	44.41	5.65	4.06	4.57
Canal + Well	9.30	11.83	76.34	0	0.0
Tank + Wells	41.60	39.18	0.00	2.40	4.81
Rainfed	511.64	43.29	0.00	0.20	0

Source: Maria Saleth (1996), page 126. Note: Briefly in the context of our sample, cereals include paddy, cholam (jowar), cumbu (bajra) and ragi; Oilseeds include groundnut, gingerly sunflower, and soyabeans. Commercial crops include banana, sugarcane, cotton and korai; Pulses include redgram, black gram, green gram, horse gram. Vegetables include brinjal, tomato, sweet potato, lemon and flowers; and spices include chilly, onion and corriander horticultural crops would include lemon, oranges and flowers.

Some very significant implications about crop composition observed by this study (not

reported in table 5.11 or 5.12) are:

- a) For the sample as a whole, foodgrains account for 41 percent of the gross cropped area, 27 percent is accounted for by oilseeds and 16 percent by commercial crops only about 3 percent is under vegetables and horticultural crops.
- b) Seasonal crops dominate in all categories and range between 52.47 to 72% (to maintain income flow).
- c) Small farmers and also in the case of large farmers it was found that cereal based specialisation, specially in rain-fed regions dominance.
- d) A very important aspect observed and raised by this study is that small farms do not in the study region focus on cultivation of fruits and vegetables or other horticultural crops and even large farms devote a very small proportion of their gross cropped area to such crops (unlike that emphasised in the current crop diversification debates).
- e) The study also states that vegetables horticultural crops and spices are more significant in the tank and well irrigated areas and therefore to encourage such high value crops may pose a danger for cropping pattern to move against food grain production.

The study has further analysed the net returns and income - cost ratio in crop enterprises which is provided below in table 5.12.

Table 5.12 Net Return And Income Cost Ratio In Crop Enterprise

Crops Group	Net Return Rs./acre					Income Cost Ratio				
	0-2	2-4	4-6	6-10	10-12	0-2	2-4	4-6	6-10	10-12
Farm Size (acres)										
Food grains	1220.70	2027.19	3368.49	4627.72	1838.40	1.4	2.7	4.7	6.3	3.6
Oilseeds	1709.17	427.71	2160.82	338.48	1843.82	3.0	0.8	2.6	1.1	3.1
Pulses	154.14	1444.94	34.70	1356.42	5703.12	2.27	5.59	1.10	4.93	16.90
Comm. Crops	3894.95	6917.29	6953.16	8180.56	4598.61	2.75	5.18	3.07	4.60	3.39
Vegetables	258.10	2475.24	7316.50	6200.94	3044.08	1.58	2.07	26.78	4.03	3.15
Hort. Crops	0.00	11909.4	622.50	8919.12	21995.0	0.00	7.98	0.67	19.15	12.75
Spices	527.11	4020.19	932.73	8585.38	9849.70	1.07	2.36	2.24	5.20	5.88
All	1109.17	4052.37	2877.70	5462.66	6981.83	1.71	3.80	5.88	6.47	69.76

Source: Maria Saleth (1996), Page 129. Note : 1. The total income per acre in each case covers the income from main crops, intercrops and residues. Total costs per acre cover all cultivation expenses including owned labour but exclude the rental value of owned land. 2) The income cost ratio is the return per rupee spent and captures the effects of input use efficiency and scale of economies.

Table 5.12 provides the net return and income-cost ratio for the sample. It was found that in the case of smaller farmers in (0-2 acres) the comparative advantage lies in cultivation of oilseeds specially ground nut (going by net returns) and commercial

crops. Horticultural crops like lemon, flowers, mangoes were found to be profitable farms with 6-10 acres holding (going by net returns) the income-cost ration indicates that the largest farm size group has a comparative advantage in pulses followed by horticultural crops.

The study finally concludes that the ability of small farms to move towards high value crops would depend upon (a) the extent to which food and fodder requirements can be met economically through alternative means (b) presence of favourable institutional environment for adopting high value crops like vegetables, fruits and flowers (c) alternative forms of employment which would provide an income cushion (like from non crop enterprises and activities). The study found that the marketing and processing facilities are likely to benefit the large farmers. Group and contract farming hold some promise for promoting high value crops among small farm groups. The study however finds that it is easier to advocate diversification into livestock and other non-farm occupations, for the small farmers. This is due to the fact that such schemes and programs can be more direct. Inducing the small farmers to change their crop composition may be more difficult especially due to lack of institutional/ technical arrangements to support this process.

The large farm groups is having land holdings between six to twelve acres show maximum potential for horticultural crops. Yet only less than 3 percent of the gross cropped area was under horticulture, limited by marketing and institutional setup. Promotion of horticultural crops in water scarce regions on large farms hold maximum potential.

The final policy implication is that agricultural diversification policies need to be conceived and implemented in a much broader context than mere crop diversification per se.

Maji & Rahim (1996) have made an investigation into small farm diversification in the state of West Bengal. 90 percent of the farm households in West Bengal have land holdings less than two hectares, occupying 64 percent of the operational area in the state. This category of farmers (i.e. the small and marginal farmers) therefore is of special concern in this state. The study has investigated how the income of these non viable farms can be raised by switching the emphasis from low value subsistence oriented cereal crops to high value commercial crops like vegetables, fruits and other enterprises such as dairy, poultry, livestock, etc. There are suggestions that high value crops could be taken up by small and marginal farmers. The study emphasises that this is possible where there are no production constraints and free access to markets.

Diversification into the above crops, fisheries, livestock, poultry all depend on agro climatic conditions resource endowment and socioeconomic condition of the farmers. A farm diversifies its activities not only to increase income and employment but also to reduce risks. As the farm size decreases, the cropping pattern gets more and more intensified and oriented towards high value crops - to maintain, if not increase income levels and also to guard against risks, where as the large farms tend to specialise.

The study's objective is (a) to analyse the extent of agricultural diversification on selective number of small, marginal farms, (b) to analyse costs and returns particularly of high-value vegetable crops, (c) to examine the price spread between producers and consumers (d) To identify constraints and problems and to suggest measures to overcome them.

The study was based on 12 small and marginal farmers in Bolpur Sriniketan Development Block of West Bengal. Using the index of diversification (based on the same lines as the Herfindahl index 'H' and index of diversification 'D' used by this study, see chapter 2 section 6). The study establishes a positive relationship between diversification and increases in income, strengthening the case for diversification.

The study found that vegetables in general and particularly brinjals, tomatoes, cucumber are highly profitable. Vegetable crops were also found to be labour intensive and also are favourable to retaining soil fertility. Yet due to the continuous attention and skilled labour that vegetables require at various stages, the area under vegetables in the sample covered was found to be restricted.

The concluding observations of the study are that the extent of diversification was found to be dependent on financial, physical resources and the management resource. What is needed is a strong organisational support and public intervention mechanism for the disposal of the product. In absence of which a glut could occur in the market, since with better technologies and use of hybrid seeds, the supply of the crop generally increases very rapidly. Therefore, marketing infrastructure and a guaranteed price would become crucial factor for diversification. Access to agro processing industries and trade should be strengthened. Around 30 - 40 percent of our vegetable production gets damaged before it reaches market. Cold storage units quality control, standardisation and effective organisation for linking productions marketing industries are required. Research is necessary to enhance productivity, and for quality control. Only then a programme of successful diversification for small and marginal farmers would become viable.

Ramesh Chand's study (1996) deals with the possibility of increasing employment and income with high value horticultural crops in this region. The study covers the Western Himalayan region and eight districts of Uttar Pradesh hills. The region is economically underdeveloped and ecologically fragile. The Cropping pattern is dominated by traditional and low productivity crops which occupy about 99 percent of the crop area. Domination of traditional crops and low productivity has kept the incomes at very low levels in this region. The region however has climatic conditions conducive for production of high value horticultural crops to increase income and employment. Diversification into off-season vegetables seems to possess great potential in most of the areas in both temperate and non-temperate belts of Western Himalayan regions.

The study concludes that agricultural diversification through vegetable crops has a huge potential for employment and income generation in western Himalayan region. Vegetable cultivation being labour intensive is more beneficial for marginal and sub marginal holdings where family labour availability per unit of land is higher compared to bigger size holdings. The findings of the study reveal that one per cent shift in area from other crops to off season vegetables would lead to 1.20 percent to 1.60 percent growth in existing level of labour employment depending on whether the shift takes place in irrigated or unirrigated area. It further states that infrastructure, access to road, marketing and irrigation determines, the success and profitability of diversification. The final policy implication of the study is that wherever economic incentives are available farmers allocate area based on relative profitability, irrespective of foodgrain requirement of family which can be easily met through purchases of the same.

The study has based its conclusions on 75 farm households. The survey work was carried out during December 1993 to February 1994 and reference period was November 1992 to October 1993. The study found that vegetable cropping increased net income by 2 to 23 times as compared to other crops in irrigated areas and 3 to 40 times higher in unirrigated areas. There is a greater possibility of enhancing income through agricultural diversification in dry areas, which are generally unsuitable for cultivation of the regular crops.

Varadrajan and Elangovan (1996) examines the scope of commercialisation of small farm agriculture; based on primary data from Madurai district of Tamil Nadu. The study states that the process of development in India in general and agriculture

specifically has failed to take care of the small and marginal farmers problems. This category of farmers still constitutes a dominant segment.

For the state of Tamil Nadu the small and semi medium farmers (with holdings up to 4 acres) accounted 96.1 percent of the number of farmers and 71.42 percent of the area operated. In the Madurai district of Tamil Nadu it was 96.26 percent accounting for 76.62 percent of the area. The all India average is given as 89.97 percent and 51.3 percent respectively. As regards the cropping pattern the study found that paddy, jowar, black gram, were the dominant food crops and groundnut, onion, chilli, sugarcane and cotton are the commercial crops. The share of non-food crops in the gross cropped area of the farms is shown in Table 5.13 given below:

Table 5.13 : Share Of Cash Crops In Gross Cropped Area.

Six Groups	Nos. of Farms	Gross Cropped area (ha)	Cropping Intensity (%)	Area Under food crops (ha)	Area under Cash crops (ha)
Small (<= 2ha)	168	152.77	122.73	137.68 (90.11)	15.11 (9.89)
Medium (2-4 ha)	20	59.00	129.95	44.40 (72.25)	14.60 (24.75)
Large (> 4 ha)	12	85.26	139.97	50.94 (59.75)	34.32 (40.25)
Whole Sample	200	297.05	128.70	233.02	60.03

Source: Varadraj and Elangovan (1996), page 195. Note: Figures in brackets are percentages to GCA.

The share of foodcrops in gross cropped area was as high as 90 percent in the small farms compared to 59.75 percent in the case of large farms (see table 5.13), indicating that small farmers still prefer to produce food crops mainly to meet subsistence requirements. Cash crops on the other hand accounted for only about 10 percent of the gross cropped area in the case of small farms whereas for large farms it was 40.25 percent. The study gives a few suggestions to improve the conditions of small and semi medium farmers, by adopting cash crops. The results of the study show that commercialisation of farming significantly contributes to increasing the net farm income. However, the study found that the size of the farm was not a constraint to diversification, in fact, capital scarcity and market size were the real constraints. The study identifies horticultural crops and allied activities as a means to enhance income. The other policy instruments to improve the condition of the small and marginal farmers would be to continue subsidies to this group of farmers and in the long run to encourage farmers of cooperatives or collective farming.

Samar K. Datta (1996) has also strongly argued for cooperatives for small producers

and a thorough reengineering of the existing cooperative structure. The study is based on 8 case studies of co-operatives in various districts of West Bengal, Gujrat, Andhra Pradesh and Maharashtra. These cooperatives relate to vegetables, fruits, sugar, etc. In a specific case of the Grape Growers Cooperative Society of Solapur, Maharashtra (1992), the study found that the net return from grapes ranges from Rs. 17600 per hectare (in case of small farms) to Rs. 62000 per hectare (in case of large farms). The other horticulture crop i.e. tomatoes yields a net return ranging between Rs. 11000 to Rs. 46000 per hectare.

The study infers that diversification into such horticultural crops can help to enhance income and also more importantly reduce risks. The study emphasises the importance of cooperatives in promoting adoption of horticultural crops.

From the 8 case studies of the cooperatives the study concludes that the cooperatives which were started as non profit organisation of large and affluent farmers have shown the trickle down effect benefiting the small farmers. However, in the other 7 cases much success was not witnessed, because of lack of coordination in activities and other problems like bringing together tribal classes etc. The study argues that there is no alternative to forming genuine co-operatives of small producers and a thorough re-engineering of the existing co-operative structure for the success of the same.

R.P. Singh's study (1996) has investigated three issues related to diversification:

- (i) The determinants of crop diversification.
- (ii) Impact of agricultural diversification on the level of income.
- iii) Impact of crop diversification on inter-temporal stability and volatility of farm income.

The study is based on farm level data from three distinct agro-climatic regions covering a period of 5 years, to understand the causes and consequences of inter-regional and inter-village diversification behaviour. These regions include Mehbubnagar, Solapur, and Akola district of Maharashtra.

In general, the study finds that the level of crop diversification within and across villages depends upon (a) site specific ecological characteristics of household and availability of water. (b) crop rotational requirement (c) Household consumption needs (d) Peculiar market access conditions of locality, (e) the farmers decision to maximise income. (f) Risk adverse nature of farmers and (g) experience and education of farmers, and (h) availability of draft-power.

The major conclusions of the study related to the issues raised in the beginning are reported below:

The following conclusions are valid across the three regions of the study;

- i) The resource base i.e. mainly availability of bullocks and land, significantly determines the level of crop diversification, yet large changes in house hold resource endowments are required to have a marked influence on diversification.
- ii) The study did not find a strong correlation between mean levels of household net crop income.
- iii) Plot diversification does not offer significant protection against instability in gross crop returns.

The study observed the following inter-regional differences;

- i) The impact of irrigation on crop diversification and income stability depends on the cropping pattern, existing level and type of irrigation, the level of development of irrigation facilities and specific locational factors. Some times improvements in irrigation leads to greater specialisation in crop production (when irrigation takes place for example in rainy season paddy production areas). In dry land regions on the other hand expansion of well irrigation leads to further crop diversification. Therefore crop diversification can become a means of self insurance in such areas and enhance income stability.
- ii) Crop diversification effectively imparts stability to net crop returns in dry land farming of Sholapur and Akola villages. In the more highly irrigated Mahbubnagar village income instability and crop diversification are not significantly associated.

Subramanyam and M. Sudha's study (1996) have examined the current status of cultivation of horticultural crops by small cultivators vis-a-vis other categories i.e. medium and large. The study indicates that the present situation of liberalisation has led to substantial growth in hitherto neglected fields of agriculture like horticulture. Some earlier studies by these authors have also shown that horticultural crops in general are labour extensive and introduction of them in the cropping patterns would help to increase the farm incomes. The study is based on 62 farmers from Chickballapur and Malur Talukas in Kolar district of Karnataka. The group of farmers belong to various land size categories i.e. 40 farmers were found to belong to the small category (below 2 hectares), 16 were in the medium category i.e. (2 -5 hectares), and 6 were found to be belong to the large category (more than 5 hectares). The reference period

of the study was 1992 - 1993.

From detailed data on cropping pattern the study found that small cultivators use their land more intensively as compared to the other two categories, having nearly 135 percent cropping intensity as compared to 117 percent and 115 percent in case of medium and large farmers respectively. The percentage of area allotted to cereal crops by the small farmers is higher due to food security reasons. It has also been observed by the study that small farmers have adopted more seasonal horticultural crops and the medium and large farmers have devoted a higher percentage of area (25 percent and 31 percent respectively) for perennial horticultural crops. The small farmers favoured seasonal horticultural crops like (vegetables and flowers) because of greater flexibility as well as for enhancing their incomes. The cropping pattern corresponding to categories of farm sizes is presented in Table 5.14 given below :

Table 5.14 Cropping Pattern Followed By Different Size Of Farms (Percent Area Allotted)

Particulars of crops	Sample Size Category of farms			
	Small	Medium	Large	Overall
1. Cereals (Maize & Ragi)	35.54	35	27.09	31.58
2. Pulses	49.48	56.25	6.90	3.08
3. Oil seeds	38.21	27.92	51.95	21.91
4. Horticulture crops	8.20	-	17.64	25.48
a. Seasonal vegetables fruits and flowers	3.09	3.33	1.28	4.65
b. Perennial (Banana, Sapota, Grapes and Mangoes)	8.87	25	31.75	24.64
5. Other Perennial (Mulberry, Eucalyptus)	27.68	18.54	21.32	21.70
6. Cropping Intensity (%) (Including perennial crops)	121.60	109.79	107.26	111.14
7. - Cropping Intensity (%) (Excluding perennial crops)	134.05	117.34	115	120.75

Source: Subramaniam and M. Sudha (1996), page 181.

As regards crop rotation it was found that most popular crop rotation of the small farms was cereal followed by vegetables, whereas in case of medium and large size groups, the crop rotations were mostly vegetables followed by vegetables. A very few farmers were found to have grown cereals in their cropping pattern.

The major conclusions which emerge from the study are that small farmers are aware of the potential of horticultural crops in enhancing their incomes, therefore it is necessary not only to protect these farmers from any price risk involved in adopting horticultural technology but also to protect them from seasonal gluts and perishability of horticultural crops. For this the study suggested linking processing with production and marketing and also providing price support, providing adequate credit arrangement facilities would also be required.

CONCLUDING OBSERVATIONS

A review of the literature on the economic viability and cost benefit analysis of horticultural crops in general and fruits in particular reveal the following major issues.

Fruit crops do require relatively higher capital expenditure initially, however generally, the recurring expenses per unit of output reduces gradually as a result income increases with time.

A comparison between selected field and food crops from various states of India also reveals that returns from fruit crops are as high as 10 to 11 times the field crops indicating a strong potential of fruit crops for enhancing incomes of the farmers. [This observation has given rise to a doubt regarding whether horticulture will in the long run prove inimical to food security. The appendix to this chapter is devoted to a discussion of this issue]. It is quite evident that such a direct comparison between returns from fruit and field crops is not really applicable given the difference in gestation period, investment pattern, life time of these crops. However, the fact remains that horticultural crops like fruits can increase income, bring about a more optimum utilisation of land and can make positive contribution to efficiency and productivity.

Another very important observation is that at least partially, horticultural crops tend to be adopted faster by those farmers who have considerable proportion of inferior quality lands which cannot otherwise be utilised in regular commercial or cash crops. On such lands the water availability is low and hence is preferred for growing those horticultural crops which require less water. It was also found that generally wherever economic incentives are available farmers do allocate land based on relative profitability irrespective of requirement of family which can be easily met by purchase of the same.

A significant observation by number of studies is that there is a greater possibility of enhancing incomes through crop diversification into high value crops in the unirrigated/dry areas, which are generally unsuitable for the cultivation of regular crops. In fact agricultural diversification in such areas also imparts a greater stability to the income.

It was also found that small farmers ability to move towards high value crops depends on food subsistence/food security requirements, institutional arrangements, marketing & processing facilities, irrigational facilities, all these are extremely crucial to the diversification programmes. In almost all the studies related to agricultural diversification into horticultural crops, inadequate infrastructural facilities, marketing, processing, storing, transport facilities, were found to be the major constraints to adopting horticultural crops.

APPENDIX TO CHAPTER 5

SOME REMARKS ON THE RECENT DEBATE REGARDING FOOD SECURITY AND AGRICULTURAL DIVERSIFICATION

While the necessity and viability of agricultural diversification is indisputable, there have been in recent years especially in the post liberalisation scenario, doubts about the desirability of encouraging “unrestrained” diversification. “Unrestrained” in the sense that a very major shift of farm activities from relatively less profitable foodgrains production towards more profitable horticultural crops and /or non farm diversification, (animal husbandry, Forestry, fisheries, etc.) will result in a declining growth rate of foodgrains production. By itself, and on its own terms, there could be nothing objectionable about this tendency to shift farm resources away from foodgrains provided it fulfills its basic objective of raising farmers’ incomes and would therefore represent a more rational allocation of resources. After all, in principle, if incomes rises so will the capacity of the economy to import foodgrains from countries which have the comparative advantage. However, in an economy which has conscientiously followed a policy of achieving foodgrain self sufficiency, the prospect of a declining growth rate in foodgrains production can be frightening both to agricultural economists and the policy makers. Indeed there is historical evidence to show that countries that are not self sufficient in foodgrains and have balance of payments problems along side, are always susceptible to international political pressures, which at times can undermine the very sovereignty of such nations. Hence, the case for food self sufficiency has prima facie merits that go beyond considerations of the rational allocation of farm resources.

A study of total production trends in India however, shows that the prospects for food security may not be as serious as they seem. Foodgrains production in Indian agriculture has grown at an average rate of 2.8 percent per annum over a period of about 30 years. These statistics and the associated inferences mentioned above conceal some important facts, viz the trends in the area and production under various food crops. If we observe these trends it is seen that the area under superior cereals namely wheat and rice has been increasing whilst that under coarse cereal namely millet, sorghum has been declining. (See chapter 2, section 6)

The increase in wheat and rice production at the cost of coarse cereals

within the category of foodgrains is the direct result of the working of natural market forces. Both the superior and inferior cereals have been subsidised in the same manner for the last several years. However due to an increase in overall per capita income in both rural and urban areas of India the demand for superior cereals has naturally risen as compared to inferior cereals. Thus the allocation of land has followed the pattern of income elasticity of demand. This has two implications for food security (a) the first is based on market trends and (b) the second is based on the response to government support and subsidy programmes. As per capita incomes grow and preference shifts towards superior foodgrains a part of increased demand for superior foodgrains will manifest itself in the form of increasing market price. If the supply of these crops are elastic with reference to market price, it is obvious that the supply will grow sufficiently to meet the increasing demand. This effect may need to be encouraged by conscious policy for the simple reason that under diversified agricultural conditions it is not easy to say in which direction the land allocation patterns will move. It is at this level that the agriculturists' response to agricultural support policy becomes relevant. If the Government continues to provide an adequate measures of assistance in the form of (a) price support (b) assured procurement (c) subsidised credit (d) easy off take, the farmers will respond positively (as they have in the past) by increasing supply of foodgrains. Thus, the use of market based and trend based strategic intervention by the Government can go a long way in ensuring self-sufficiency in foodgrains.

A number of recent studies have discussed some crucial issues related to food security and agricultural diversification, which are reviewed very briefly in the following sections.

Pandey and Sharma (1996) have analysed the trends in growth in area under food grains and non-food grains for two periods 1967-68 to 1980-81 and 1980-81 to 1994-95. The table A1 reveals that during the first period, i.e. between 1967-68 to 1980-81 for both food grains and non-food grains a marginal increase in area was seen. However, in the later period i.e. between 1980-81 to 1994-95 a marginal decrease in area under food grains and a substantial increase in area under non-food grains was witnessed, indicating an area diversification towards non-food grains in the later period. The area under non-food grains for the period 1967-68 to 1980-81 grew at a rate of 0.94 percent per annum, and during the later period between 1980-81 to 1994 it grew at a rate of 1.88 percent per annum. (see table A1).

Table A.1 All India Compound Growth Rates of Area, Production and Yield of Principal Crops. (Percent per annum)

Commodity /Group (1)	1967-68 to 1980-81			1980-81 to 1994-95		
	(2) Area	(3) Production	(4) Yield	(5) Area	(6) Production	(7) Yield
Rice	0.77	2.22	1.45	0.49	3.48	2.98
Wheat	2.94	5.65	2.62	0.68	3.70	3.01
Coarse Cereals	-1.03	0.67	1.64	-1.90	0.54	2.31
Total Cereals	0.37	25.61	1.70	-0.34	3.06	2.90
Gram	-0.55	-1.02	-0.48	-0.88	0.52	1.41
Tur	0.38	0.56	0.19	1.56	0.77	-0.78
Total Pulses	0.44	-0.40	-0.67	-0.31	1.67	1.85
Total Foodgrains	0.38	2.15	1.33	-0.34	2.89	2.77
Sugarcane	1.78	2.60	0.80	1.87	3.86	1.36
Total Oil Seeds	0.26	0.98	0.68	2.37	5.89	2.52
Cotton	0.07	2.61	2.54	-0.22	3.88	4.10
Total Fibbers	0.19	2.53	2.31	0.48	3.47	3.94
Potatoes	4.29	7.78	3.35	3.00	4.64	1.59
Tobacco	-0.08	2.22	2.30	-1.09	1.23	2.35
Total Foodgrains	0.94	2.26	1.19	1.88	4.31	2.27

Source: Pandey and Sharma (1996) page 645.

This, however, according to the study, as yet, has not created any conflict with food self sufficiency, though there is a fear that agricultural diversification, specially crop diversification to non foodgrains, while it can increase incomes of small farmers and agricultural labour may lead to a trade off with foodgrains production. This conflict can be solved through (a) high rates of growth of productivity in foodgrains.

(b) increase in total cropped area. (c) increasing cropping intensity. (d) bringing under cultivation the fallow land and culturable waste lands which together account for about 39 million hectares in the country.

With the total annual foodgrains requirement is at a level of about 190 million tonnes (including human consumption needs, feed, seed, wastage, etc.) currently and for a country with population above 900 million the study argues that only market forces cannot be relied upon to guide the crop mix which might create a food crisis. Therefore the self sufficiency in foodgrains cannot be ignored at any stage. However, the optimistic aspect is the trend of behavior of foodgrains production and productivity which has shown a positive trend in both periods (1967-68 to 1980-81 and 1980-81 to 1994-95. (see table A1).

Another aspect considered by the study is that the issue of self-sufficiency embodies elements of both food requirement and availability. The question of requirement has been subject to a lot of debate. However if the per capita net

availability shows a stable trend without significant imports of foodgrains this could be interpreted as food self-sufficiency to some extent. The per capita availability of foodgrains has increased from 165 Kg per annum in 1980 to 174.5 Kg in 1995 (see table A2).

The study also observed that for the past 15 years since 1980-81 the country did not import any foodgrains except occasionally.

Table A.2 All India Per Capita Net Availability of Foodgrains.

Commodity	Per Capita Net Availability (Kg/ annum)			
	TE 1970 (2)	TE 1980 (3)	TE 1990 (4)	TE 1995 (5)
(!) Rice	68.7	68.5	74.9	78.6
Wheat	36.4	46.9	53.9	56.5
Course Cereals	41.7	34.8	28.7	26.4
Total Cereals	146.8	150.2	157.5	161.4
Total Pulses	18.9	14.7	14.5	13.1
Total Foodgrains	165.7	165.00	172.00	174.5

Source: Pandey and Sharma (1996) page 647.

The two main staple foods, i.e. rice and wheat which account for 54.7 percent of the cropped area and 75.1 percent of the total area under foodgrains during 1994-95¹ have shown high productivity growth rates and improvement over time, this aspect is extremely crucial for maintaining food self sufficiency in future.

The study argues that only about 58 percent and 68 percent of potential yields in the case of rice and wheat respectively has been achieved so far. Both the irrigation and fertilizer inputs have scope for fuller utilisation. Hence in the next decade or so there are good prospects of maintaining high growth rates in productivity of rice and wheat. The government has to take a lead role in maintaining food self sufficiency and formulating a crop diversification program. It will have to devise a set of regulatory measures and incentives and guide the market forces till adequate flexibility in market is attained. The strategy to be followed according to the study, for crop diversification is a) encouraging new varieties of rice and wheat and to encourage export of superfine rice and durum wheat. b) encouraging vegetables in irrigated areas and fruit crops in fallow and waste lands, c) encouraging exports in areas of comparative advantage like onions, tomatoes, bananas, grapes chikoos and lichis.

Yet another study Stayasai and Viswanathan (1996) has analysed the issue of diversification of Indian agriculture and food security and come to the following major conclusions:

- A) That Indian agriculture has witnessed diversification with improvements in shares of livestock and fishery sectors in total income from agriculture (the share of livestock in total agricultural increased to almost 19 percent in 1990-91 from only 8.36 percent in 1950-51.
- B) Within the crop sector, patterns of diversification is characterised by growth of non-foodgrain crops as a group. In the foodgrains category superior cereals replaced coarse cereals. The percentage share of fruits, vegetables, oilseeds in gross cropped area under non foodgrains shows an increase and is also documented in this present study (see table 2.4 chapter 2).

The study has interpreted the concept of food security not only to include making available sufficient quantities of food supply but also emphasises that it is the Gross Calorie Content (GCC) of food crop production which is equally important. The study found that the GCC of food grains production has increased by 3.7 times from 2.35 lakhs billion calories in 1950-51 to 8.74 lakh billion calories in 1993-94 both the crop and livestock sector have contributed to this growth having recorded a growth rate of 2.79 and 3.05 percent respectively. The per capita GCC was found to have increased 1920 calories between 1950-51 and 1993-94 considering the daily requirement of 2400 calories for rural adult and 2100 calories for an urban adult, the food self sufficiency in terms of calories showed significant improvement. This GCC grows along with Agricultural Diversification. At this point is pertinent to note that there has been a substantial increase in per capita consumption of milk, fruits, vegetable in both rural and urban areas between 1977-87 (Kumar 1996).

Table A3 provides the per capita gross calories content, food item group wise.

Table A.3 Per Capita Gross Calorie Content (GCC) Food Item GroupWise (calories)

Crop group	1950-51	1970-71	1990-91	1993-94
Cereals	1112	1711	1817	1793
Pulses	222	211	160	139
Oilseeds	209	256	293	313
Fruits and vegetables	59	101	121	136
Sugarcane	164	245	296	264
Oilcrops	1777	2535	2700	2660
Milk	136	108	183	194
Crops and livestock	1914	2645	2891	2862

Source: Satyasai and Viswanathan (1996) page 678.

The above table 8.3 reveals that relatively more calories are derived from items like oil seeds, fruits, vegetables, milk compared food grains.

¹ Pandey and Sharma (1996) Page 648.

Another study by Dhawan, Singh et.al (1996) strongly cautions against the possibility of foodgrains security in view of the recent agricultural diversification. The population and foodgrains projections for the year 2000-2005 A.D. shows the following trend. Foodgrain production projections in 1991, 2000 and 2005 are 176.30, 233.97 and 240.46 million tonnes respectively. Population projections are 846.30, 906.30, 1070 million for the same periods. The foodgrain requirements are estimated at 219.28, 265.36 and 287.26 million tonnes for the corresponding periods. The study concludes on the basis of analysing the cropping pattern and area growth that the present foodgrains production is not enough to meet our requirements infact there are possibilities of severe imbalances and therefore efforts to increase production and productivity of foodgrains must be further intensified.

Concluding observations.

The pace of diversification in the Indian economy are similar to that taking place in a number of developing countries i.e. faster growth of non crop subsector within agriculture, faster growth of non food crops, faster growth cereals. The pace of diversification is still slower as compared to other developing countries (Haque 1996, Vyas 1996), and diversification is still in its initial stages, yet the trend is quite strong. However for future agenda of diversification in view of the 'food security' the following issues at of crucial importance;

- a) Technological change especially related to water management.
- b) Substantial changes in institutional capabilities (for inputs and credit) for different sections of the farmers.
- c) Economic policies and government support policies for creating conducive conditions for foodgrains production.
- d) Role of private sector in research, extension, marketing etc.
- e) Investment in rural infrastructure.

A few studies Maria Saleth (1996), Maji & Rahim (1996) etc. have found that farmers still give priority to food security and subsistence requirements in the pattern of land allocation. In spite of high return and profitably in fruits and vegetables, only about 3 percent of the total land was found to be devoted to such high value crops.

All the above indicates that 'food security' and self sufficiency are undoubtedly crucial issues, but food security and agricultural diversification as, in the present conditions that obtain in India, are not yet conflicting goals either from the supply side or from the demand side.

CHAPTER 6

HORTICULTURE IN MAHARASHTRA: SCOPE, POLICY AND SPREAD

1. INTRODUCTION :

The purpose of this study as outlined in the introduction is three – fold. First, to review the experiences with agricultural diversification in various countries including India, for augmentation and stability of agricultural incomes. Second, to conduct micro level studies of the experiences of farmers who have diversified their farm activities by using horticultural technology. Third, to assess the qualitative and quantitative impact of policies that promotes the adoption of horticultural technologies.

For conducting micro level studies and assessing the impact of policies for promoting horticultural ventures, the state of Maharashtra was naturally chosen for three reasons.

- a) The state of Maharashtra contains a great degree of topographical and climatic diversity conducive for growing a variety of horticultural crops.
- b) The government of Maharashtra has implemented two major schemes to promote horticulture in the state viz., The Capital Subsidy Scheme (CSS) and the EGS linked horticultural development scheme in early 1980's and 1990's respectively.
- c) There are a number of organised efforts in the nature of co-operatives, in order to promote horticultural ventures specially marketing of horticultural crops in Maharashtra.

In what follows, we present an account of the spread of horticulture in Maharashtra with special reference to the initiatives made during the decade of the eighties. The material in this chapter would serve as a backdrop for the sample survey findings presented in chapters 7 to 10.

In this chapter we begin with a detailed survey of:

- a) The geographical and agro-climatic features of the State of Maharashtra.
- b) The pattern of land utilisation in the state.
- c) The pattern of land holdings in the state.

From this survey we bring out the scope, importance and the necessity of agricultural diversification as a method of economising on scarce water and fertile land resources and using excess underemployed resources like domestic farm labour and land. This is followed by a detailed trend analysis of the cropping pattern from 1960-61 to 1994-95 with

a view to bringing out the magnitude and rate of adoption of horticultural technology.

The chapter concludes with the discussion of the incentives provided by the government in the plans especially the 8th plan and 2 major schemes introduced by the government of Maharashtra to accelerate the process of horticultural diversification. The impact of the government's initiatives is assessed in the final section of this chapter.

2. THE GEOGRAPHICAL AND AGROCLIMATIC FEATURES OF THE STATE OF MAHARASHTRA

The state established in 1960, has four major areas, Western Maharashtra, Vidarbha, Marathwada, Konkan. There is a great deal of variation in rainfall in the state and agriculture is mainly rainfed. The state has an average rainfall of about 100 cm. The western Ghats, Konkan, Thane, Ratnagiri receive 300 cm rainfall, areas like Nasik, Pune, Ahmednagar, Dhule, Jalgaon, Satara, Sangli, Solapur and parts of Kolhapur receive about 60 cm to 75 cm rainfall. Aurangabad, Parbhani, Beed, Nanded, Osmanabad get 75 to 100 cm rainfall and Bhandara, Chandrapur, Nagpur get on an average 100 cm with Amravati, Yeotmal, Buldhana, Akola receiving about 75 cm rainfall. The state has four types of soil, red- laterite, black, alluvial, and black- alluvial soil. The red soil is exclusively prevalent in western ghats and coastal areas, where-as the other types of soil are prevalent almost in all regions of the state.

With only about 15 percent of its cultivable land being irrigated as compared to the national average of 33 percent, Maharashtra's agro-climatic condition favours promotion of less water intensive crops, like horticultural crops, mainly fruits.

The fact finding committee for survey of water scarce areas in the state (GOM 1973) has identified 12 drought prone areas - Ahmednagar, Solapur, Pune, Nasik, Sangli, Satara, Aurangabad, Beed, Osmanabad, Dhule, Jalgaon, Buldhana, which account for 60 percent of the states net sown area.

It is estimated that even if the irrigation potential is completely utilised around 60 - 70 percent of net sown area in the state would continue to remain dependent on rain. The alternative to sustain agriculture and enable this sector to make a positive contribution to the state as well as the nation's income is to diversify the cropping pattern into high value crops like horticultural crops. This has been recognised both by the state as well as the central government. The idea that agricultural diversification via fruit cultivation is a desirable and viable option is not new. As early as in the 1920's, Cheema and Dani (1928), made a pioneering study of the comparative benefits of fruits *vis-à-vis* sugarcane and the other traditional crops. The study found that the most promising crop of the state,

sugarcane, proved to be a disappointment and fruit cropping was suggested as a viable option. The study concluded that, even a holder of a very small area can derive benefits from fruit farming.

Maharashtra's soil, topography and climate show a definite potential and scope for various horticultural crops. Given the agroclimatic and geographical profile of the state, and the land holding distribution pattern, agricultural diversification i.e. both diversification in cropping pattern as well as vertical diversification i.e. promotion of agroprocessing units, rural based industries as well as allied activities has been recognised as an inevitable compulsion to supplement and enhance rural incomes. A number of horticultural development programmes have been launched by the state, namely the capital subsidy scheme, the EGS scheme, and various other government schemes, along with productions and export incentives. The above programmes have been launched with the following objectives.

- conversion of cultivable wasteland into productive lands,
- providing a remunerative subsidiary activity for the farmers to augment their incomes,
- to make optimum use of the unutilised land resource,
- generation of employment and
- generation of export surpluses to earn foreign exchange (since the state enjoys an advantage in case of the export quality mangoes and grapes).

On the basis of its agro-climatic zones, therefore four well-defined fruit zones in the state have been identified. (also see table 6.1 for districts with their fruit crop specialisation.

- a) Konkan (coastal) where the dominant fruit crops produced are mangoes, cashewnut, coconut, arecanut and pineapples.
- b) Jalgaon/ Dhule: In this area the major fruit crops are- bananas, citrus and lime.
- c) Nagpur - Specialises in Oranges.
- d) Ahmednagar, Aurangabad, Pune, Satara, Sangli, Beed and Nasik - Which is famous for grapes and sweet limes (mosambies).

Table 6.1 Main Fruit Areas Of Maharashtra

FRUIT	DISTRICT
Banana	Dhule, Jalgaon, Thane, Parbahani, Ratnagiri, Aurangabad, Amravati, Akola
Oranges	Amravati, Nagpur, Vardha, Akola
Cashew	Ratnagiri, Kolhapur, Sindhudurg
Mango	Sindhudurg, Ratnagiri, Raigarh, Thane
Mosambi	Aurangabad, Jalgaon, Ahmednagar, Pune
Guava	Nasik, Pune, Jalgaon, Bhandara, Satara
Grapes	Nasik, Pune, Nagar, Sangli, Satara, Amrawati, Aurangabad, Jalgaon, Solapur
Kagazi Lemon	Nagar, Jalgaon, Pune, Solapur
Chikoo	Thane, Pune
Pomegranate	Nagar, Pune, Osmanabad, Solapur
Custard apple	Pune, Aurangabad

Source : Dastane (1995), Page 80.

2.1 Land Utilization Pattern

The total gross cropped area of the state is about 21404 thousand hectares (i.e. 21.4 mill hectares) of which the net sown area is 1806 thousand hectares i.e. 18 million hectares. Only 3292 thousand hectares i.e. 3.2 mill hectares is irrigated which amounts to about 15.4 percent of the cultivated area. (See Table 6.2)

Table 6.2 Land Utilisation Pattern In Maharashtra (Area in '000 hectares)

ITEM	1960-61	1980-81	1993-94	1995-96
Net Sown Area	17878	18299	18065	17911
Gross Cropped Area	18823	19642	21404	21327
Gross Irrigated Area	1220	2415	3292	3287
Percentage of Gross Cropped Irrigated area to gross cropped area	6.5	12.3	15.4	15.4

Source : Government Of Maharashtra (1996-97), Economic Survey of Maharashtra page 9.

It is also estimated that if all sources of irrigation are utilised even then only 8.4 million hectares can be eventually irrigated. This amounts to only 46 percent of the net sown area in 1993-94 and about 39.2 percent of the gross cropped area for the same year, this has not changed significantly in the year 1996-97. In spite of the tremendous expenditure of the Government of Rs. 56.21 billion on irrigation approximately 60 percent of the gross cropped area would continue to remain dependent on rainfall. Thus, there is a need to encourage less water intensive crops and crops that have a better capacity to survive in moisture-stress conditions. Horticultural crops, specially fruits, have been

identified as one such major potential area.

Regarding the overall land utilisation data, of the total 30.7 million hectares (307.58 lakh hectares) about 17.0 percent has been classified as forest area. The details of the land utilisation pattern in the state, are provided below in table 6.3.

Table 6.3 Land Utilisation Pattern In Maharashtra

Land use	Area (lakh)	Percentage
1. Total Area	305.00	100
2. Area fit for Cultivation	210.00	69
3. Area under Cultivation	181.00	61
4. Cultivable waste (2-3)	29.10	8
5. Fallow pastures forest area	52.00	17
6. Area unfit for cultivation	42.50	14

Source : Horticultural Development Programme (EGS Linked) (1992).

Note – For the year 1995-96 the total area is estimated to be 307.71 lakh hectares.

The barren cultivable and culturable wasteland is 8.9 percent of the total land. Current and other fallow land account for 17.0 percent. Therefore about 29 lakh hectares in the state is wasteland not suitable for conventional agriculture which could be diverted towards horticultural crops.

2.2. Pattern Of Land Holdings And Size Distribution

The imperative of horticultural diversification as mentioned in chapter one rests on the imbalance between resource endowment and resource use. Areas which are scarce in water are unable to utilise the excess labour depending on them and low fertility soils. Areas where land holdings are fragmented and or dispersed cannot raise the incomes of those who own and work on it, if the traditional technology of agriculture is used. We have seen in the preceding section how large parts of Maharashtra have unirrigable lands. These areas have obvious potential for horticultural diversification. We shall now turn to the size distribution of land holdings to examine the existence of small and marginal holdings, which have been identified as the target group for the development of horticultural crops. As per the early 1990's estimates of agricultural census of Maharashtra, there are 94.70 lakh operational holdings in the State (i.e. 9.47 million) covering 209.25 lakh hectares (i.e. 20.9 million hectares.) The average size of holdings however have decreased over the years between 1985-86 to 1990-91 from 2.64 hectares to 2.21 hectares. In 1970-71 the size of land holding was double i.e. 4.28 hectares. The increase in the

number of small and marginal farmers in land holding of less than 2 hectare have increased by 31 percent with a corresponding decline in number of holding of size above 10 hectares.

The small/ marginal category of farmers account for 63percent of total land holdings in 1990-91 (in 1985-86 they accounted for 57 percent) The percentage of area under such holdings increased from 22 to 27 percent during the same period. In 1990-91, the number of holdings in the category of 10 hectares and above was 1.8 percent and the area under such large holdings was 12 percent, which in the year 1985-86 was 17 percent. There has been hardly any significant change in this land distribution pattern in the later years. The data on the land distribution pattern indicates a dominance of small and marginal farmers for whom, production of horticultural crops are being considered as an alternative supporting technology to enhance their levels of income.

Agriculture as a sector contributes about 22.9 percent to the net SDP of the State (the national average is at 32 percent). 61 percent of the population is still dependent on this sector for their sustenance, with 45 percent of the population in the rural areas still below the poverty line. The agricultural sector has witnessed an average growth rate on 1.34 percent between 1960-61 to 1985-86, as against which the secondary sector which grew at 3.33 percent and territory sector which grew at 5.08percent, the SDP grew at approximately 3.5 percent per annum.

3. CROPPING PATTERN IN MAHARASHTRA : A TREND ANALYSIS OF AREA UNDER DIFFERENT CATEGORY OF CROPS

The study of agro-climatic features of the state of Maharashtra and the pattern of land holdings was intended to bring out the need and potential of horticulture in the state. We now turn towards a survey of the extent to which this potential has been utilised. Accordingly, we shall study the cropping pattern in Maharashtra during period 1960-61 to 1993-94. In the initial period i.e. in 1961 to 1980-81, the changes in the cropping pattern towards horticultural crops was hardly significant and there were hardly any policy initiative and schemes to support the same. There have however been significant changes in the cropping pattern during 19980's and 1990's, mainly on account of the state government's various policy initiatives to promote the cultivation of high value crops.

The following table 6.4 deals with the cropping pattern in Maharashtra for the period 1960-61 to 1993-94 and the changes in the cropping pattern that have occurred during this period. (Though data was available on the gross cropped area for the year 1995-96, reliable data on the area under fruits and vegetables was available only for the period 1994). Hence the detailed analysis of changes in the cropping pattern has been done

for the period 1993-94. It should be however be noted that in the later years also the trend of the early nineties has continued, with increasing area being devoted to high value crops like fruits and vegetables.

As can be seen from the table 6.4 given below, between the period 1960-61 and 1993-94 there has been an increase in area under kharif and rabi pulses, sugarcane, fruits and vegetables and oil seeds. It is estimated that in future this trend of allocating additional land towards oilseeds and horticultural crops, would continue. These crops are not only high value crops but also have a significant export potential. The export potential would however depend on the comparative advantage determined to a large extent by international price movements. Around 29 lakh hectares of wasteland in the state has been targeted for development of horticulture.¹

Table 6.4 Cropping Pattern In Maharashtra Area under Principal crops in '000 hectares.

	1960-61	1980-81	1993-94
Total Grossed Cropped Area	18823	19642	21404
Net Sown Area (State)	17878	18299	18065
1. Rice	1300 (7 %)	1459 (7.42%)	1550 (7.24%)
2. Wheat	907 (4.8%)	1063 (5.4%)	753 (3.5%)
3. Jowar	6284	6469	6155
4. Bajra	1635	1534	1791
5. All Cereals	10606	10976	10755
All foodgrains (Cereals + Pulses)	12955 (68.8percent)	13691 (69.7percent)	14188 (66.2percent)
6. Sugarcane	155	319	411
7. Cotton	2500	2550	2479
8. Groundnut	1083	695	659
Subtotal of 6+7+8	----- 3736 (19.8percent)	----- 3564 (18.1percent)	----- 3549 (16.5percent)
Fruits & Vegetables	162 (0.86percent)	278 (1.4percent)	497 (2.3percent)

Sources: 1. Government of Maharashtra, (1994-95 and 1996-97), Economic of survey of Maharashtra

2. Government of Maharashtra (1992-97), 8th Five Year Plan,

3. Singhal (1995)

Note: figures in the bracket indicate percentage of area under specific crop category to total area.

Oil seeds : 4 lakh hectares; Sunflower : 1 lakh hectares Soyabeans : 6.4 lakh hectares.

The following major trends in the cropping between the period 1960-61 to 1993-94 can be observed from the above table.

i. In 1993-94 about 66 percent of total gross cropped area was allocated to food grains (including cereals and pulses.) In 1980-81 this was 69.7 percent and in 1960-61 it

1. see next page

was 68.8 percent. There has been a decline in the area under the total foodgrains category over the period under study.

ii. The area under cash crops i.e. sugarcane, cotton and groundnut together in 1960-61 accounted for 19.8 percent of the gross cropped area, this declined to 16.5 percent in 1993-94. Of these, groundnut and cotton show a slight decline. Sugarcane however shows a marginal increase from 1980-81 to 1993-94.

iii. The area under fruits has increased from 0.86 percent of the total gross cropped area in 1960-61 to 1.4 percent in 1980-81 and further to 2.3 percent in 1993-94. The area under fruits and vegetables between 1980-81 to 1993-94 has thus recorded an increase of about 1.7 times.

iv. The crop wise changes in the cropping pattern indicates that the area under rice, which was about 7 percent of gross cropped area in 1960-61 increased to 7.42 percent in 1980-81 and showed a slight decline to 7.24 percent in 1993-94. The area under wheat which was 4.8 percent in 1960-61 increased to 5.4 percent in 1980-8 and declined to 3.5 percent in 1993-94.

Jowar is still the single dominant crop occupying about 28 percent of cropped area in 1993-94 whereas cotton, bajra, sugarcane occupy 11.58, 8.36 and 1.9 percent of the gross cropped area, respectively for the same period (these percentages have not been reported in the table 6.4).

For the later years (for which figures are not presented in the above table 6.4) i.e. 1995-96 the total gross cropped area increased to 21327 thousand hectares, of which area under the total foodgrains category had declined from 14188 thousand hectares in 1993-94 (as given in table 6-4) to 13275 thousand hectares. The area under sugarcane and cotton increased to 670 thousand hectares and 3065 hectares respectively.² The area under fruits alone in the state estimated at 7.61 lakh hectares in 1994-95. These later estimates also reveal an increasing trend towards high value crops.³

The following table 6.5 provides a detailed break-up of the percentage of area under different crops over the time period 1980-81 to 1993-94, which is the more significant period from the point of view of agricultural diversification in the state.

The major inference that can be drawn from the table 6.5 given below, is that the area under fruits and vegetables in the state has increased from 1.41 percent in 1980-81 to

¹ Dev & Mungekar, (1996).

² Government of Maharashtra, (1996-97), Economic Survey of Maharashtra.

³ Commissioner Agriculture, Maharashtra state, (1997), page 33.

2.3percent in 1993-94, of the total gross cropped area without significantly affecting the area under staple foodgrains crops. In fact it seems, (and is also supported by evidence) from primary data that the hither-to wasteland, fallow land has been brought under fruit crop cultivation to a large extent. Fruits and vegetables have therefore been recognised as a source of supplementary income without drastic and adverse effects on food-grains and other crops. It may be also inferred that sometimes horticultural diversification has in fact been witnessed by marginal shifts in land from sugarcane in late 80's early 1990's mainly due to acute water scarcity (inference drawn from the primary data analysis).

Table 6.5 Trends In Crop-Wise Allocation Of Land (1980-81 To 1993-94) Percentage Of Area Under Different Crops

CROP	1980-81	1993-94
1. Rice	7.42	7.24
2. Wheat	5.41	3.50
3. Jowar	32.93	28.70
4. Bajra	7.80	8.36
5. All Cereals	55.00	50.20
All Foodgrains	69.00	66.20
6. Sugarcane	1.62	1.90
7. Cotton	12.90	11.58
8. Groundnut	3.50	3.00
Subtotal of 6+7+8	18.1	16.5
Fruits & Vegetables	1.41	2.32

Source : Based on information in Table 6.4

4. HORTICULTURAL DEVELOPMENT IN THE STATE: INCENTIVES & SCHEMES

The government of Maharashtra's initiatives to encourage the adoption of horticultural crops fall into two categories. The first category pertains to the initiative motivated by the central governments efforts in the same direction under the 5 year plans in particular the 8th five year plan. The second category consists of the state government's own additional initiatives. For reasons explained earlier, the government of Maharashtra has given particular attention to horticultural expansion in the state. Further more, the state government has traditionally followed progressive policies towards the agricultural sector. Being one of the richest states financially, it has been possible for the government to translate its progressive policies into concrete plans of agricultural expenditure, extension, and subsidisation.

The following deals with the 8th plan initiatives to develop horticulture and also with the details of its to special schemes i.e. the Capital Subsidy Scheme and the EGS linked horticultural development scheme.

Till 1981, horticulture was an activity of the Agricultural Department of the state. In 1982 a separate Department of Directorate of Horticulture was created with a separate Deputy Director of Horticulture. Though the state has yet to achieve food self-sufficiency in food-grains and oil-seeds,⁴ fruits and vegetable crops are being encouraged, considering the limited irrigation potential of the state. Maximum emphasis has been given on horticultural development in the 8th plan during the 1992-97 period.

The 8th five year plan (1992-97) of Maharashtra, has emphasised on the need for agricultural diversification, has one of the major objectives - "To promote diversified cropping pattern based on oil-seeds, pulses on the one hand and horticulture and vegetables on the other to reduce under employment and generate employment in the farming sector."⁵ The state with its diverse agro-climatic conditions as seen is suited to produce a variety of fruits, vegetables, spices, flowers etc. Maximum emphasis is thus being laid on horticultural development in the 8th Plan, on account of mainly 3 reasons:

- a) Horticultural development is seen as an important element of anti-poverty strategy. it has been found that in drought prone conditions farmers with perennial tree crops earn better income than those dependent on seasonal crops.
- b) High value crops like grapes, bananas, add to the total value of agricultural crops.
- c) The possibility of processing horticultural crops increase profitability and industrial employment.

Given these reasons, the plan emphasises on the promotion of the following crops-

- 1) Rain-fed horticulture i.e. Ber, Pomogranate, Mangoes, Custard Apple etc.
- 2) Irrigated horticultural cash-crops (Grapes, Bananas, Chikoo, vegetables, coconut, Mangoes, and other crops).
- 3) Crops for exports and processing (Mangoes, Cashew, Grapes, Cut flowers etc.) The strategies for developing the above would obviously differ.

Under the 8th plan an allotment of 25 crores for horticultural development activity has been made, (in addition to this 625 crores has been separately allotted for the EGS linked horticultural development program.) The government has made special efforts to increase the area under and the production of horticultural crops, as a result there as been a significant increase in both area and production of these crops this indicated tables 6.6 and 6.7 given below.

⁴ Government Of Maharashtra (1992-97), 8th Five Year Plan part I.

⁵ Ibid. Page 115

Table 6.6 Area Growth Under Horticultural Crops

Item	Area Coverage (Hectares)			
	End of 7th plan 1985-90 Actual	1990-91 Actual	1991-92 Actual	End of 8th plan 1992-93 Actual
Fruits	242100	306000	425000	1000000
Vegetables	154700	170000	185500	250000
Condiments / Spices	185800	195000	210000	300000
Flowers	3000	4000	5000	25000
Total	585600	675000	825500	1575000

Source: Government of Maharashtra (1992-97), 8th Five Year Plan, page 140.

Table 6.7 Production Estimates ('000 TONNES)

Item	Production Estimates ('000 TONNES)			
	7th plan	1990-91	1991-92	End of 8th plan 1992-97*
Fruits	2726.80	3130.38	3912.02	10230
Vegetables	1331.68	1684.70	2080.92	2477.50
Condiments / Spices	48.78	50.70	54.60	78.00
Total	4107.26	4865.57	6047.54	12785.50

* Estimated ,

Source: Government of Maharashtra (1992-97), 8th five year plan, page 140.

According to the state governments estimates documented in the eighth plan (see tables 6.6 & 6.7), the area under horticultural crops i.e. fruits, vegetables, condiments, and spices has increased from 585600 hectares in 1985-90 period to 825500 hectares in 1991-92 and is estimated to increase to 1575000 hectares by the end of the 8th Plan, (1992-97). During the same period production of horticultural crops increased from 4107.26 tonnes to 6047.54 tonnes and is estimated to increase to 12785.50 tonnes by the end of the 8th Plan. Table 6.8 shows the expected employment (measured in mandays) which would be generated from the various horticultural development programmes of the State government during the 8th plan period (1992-97). It is estimated that horticultural crops would generate 1765.55 lakh mandays of employment by the end of 1997. Horticulture has thus been

given emphasis in the plan not only due to its potential of augmenting incomes, using unutilised area but also due to its labour intensive nature.

A number of fruit crops have a higher labour intensity. For example for some horticultural crops (grapes) the requirement has been estimated at 275 mandays per hectare annually, whereas for foodcrops it is on an average 100-115 mandays per hectare annually⁶.

Table 6.8 Estimated Generation Of Mandays In 8th Five Year Plan 1992-1997

Name of the fruit	Mandays (Lakh)
Mango (Grafted)	370.52
Mango (Seedling)	282.56
Cashew (Grafted)	53.82
Cashew (Seedling)	166.21
Coconut	71.81
Chikoo	132.08
Citrus	178.90
Mosambi	83.40
Guava	79.46
Pomegranate	88.82
Ber	106.44
Others	171.53
Total	1765.55

Source: Horticultural Development programe, EGS linked (1992).

As regards augmenting incomes through horticultural crops it is estimated that many fruits have a high income potential per hectare ranging from 0.9 lakh for oranges (sweet), 1.40 lakh for banana, 1.83 lakh mango, 3.0 lakh for grapes. Returns from conventional crops range from Rs. 4000 to Rs. 9000 per hectare. Thus, fruits and vegetables can make high value additions to agriculture, and can become a supportive activity to enhance incomes from agriculture.⁷ In addition, the yield from conventional crops ranges on an average between Rs. 4000/- to Rs.12000/- per hectare and the yield of fruit crops range from Rs. 0.75 lakhs for oranges, to 1.69 lakhs for bananas, to 2.07 lakhs for mangoes, and to 3.40 lakhs for grapes. These crops therefore would add to the gross value of production from agriculture⁸

On all these counts, horticultural crops are being given, special emphasis by the government of Maharashtra. The state government has thus undertaken the following

⁶ Dev and Mungekar, (1996) page A 43.

⁷ Government of Maharashtra (1994-95) Economic Survey of Maharashtra Page 35-36.

⁸ see next page

activities for the development of horticulture, in the state.

- a) Increasing area under plantation.
- b) Conversion of inferior mango, ber trees into superior quality.
- c) Production and supply of quality planting material.
- d) Plant protection technology.
- e) Establishment development of horticultural estates.
- f) Processing and marketing of horticultural crops.
- g) The Capital Subsidy Scheme.
- h) EGS linked Horticultural development scheme.
- i) Development of dry land.

4.1 The Capital Subsidy Scheme (CSS) : 1981-82 Of The Government Of Maharashtra

The Government of Maharashtra and the department of Horticulture have initiated two major schemes in early 80's and 90's i.e. the Capital Subsidy Scheme (CSS) and the EGS linked Horticulture development scheme. To develop Maharashtra into a leading horticultural state. (These schemes have been discussed at length in the following sections.) The government of Maharashtra introduced a pioneering scheme in 1981-82(i.e. the capital subsidy scheme vide Government of Maharashtra resolution) which was to be implemented and put into force in the year 1982-83. The government of the state identified horticultural crops i.e. mainly fruits and vegetables as being highly suitable to the state's agroclimatic conditions as well as an alternative to raise the economic status of the small and marginal farmers.

The objective of this scheme was to promote horticultural development in the state with an objective to "provide complementary avenues for small, marginal farmers and weaker sections to augment their incomes."⁹

Under this scheme, priority was given to poorer sections in rural areas i.e. the Schedule Castes, Schedule Tribes, agricultural labourers, small and marginal farmers to bring them above poverty line. The development agencies were to be merely catalysts and the beneficiaries of the scheme were to take the initiative and responsibilities for developing the fruit crops promoted under the scheme.

⁹ Government of Maharashtra, (1996-97), Economic Survey of Maharashtra, Page 37.

⁹ Government of Maharashtra Horticultural production plan (1982-83), Pg. 1.

The scheme intended to develop selected horticultural crops by identifying areas suitable for specific crops on the basis of agro-climatic and soil conditions. The fruits to be promoted under this scheme were- Alphonso mangoes, other variety of mangoes, chikoo, kagazi lime, custard apple, cashew, sweet lime, pomegranate, guava, coconut and oranges. Alphonso Mangoes were given priority in the development scheme taking into consideration both its domestic as well as export demand potential.

The details of the scheme are provided below:

Under the CSS “ the government decided to sanction capital subsidy for small, marginal farmers who take up cultivation of fruit crops for which loans from nationalised banks, co-operative banks, and development banks are availed. The rates of capital subsidy are 50% of the total cost for mangoes and 33 1/3 percent of total cost for others”.¹⁰

The capital subsidy against loan shall be admissible to a beneficiary farmer only for plantations upto 1 hectare of irrigated land or 2 hectares of unirrigated land.

BENEFICIARIES OF THE SCHEME: The beneficiaries of the programme shall be the small farmer defined - a) as in IRDP scheme i.e. having less than 1 hectare of irrigated land or 2 hectares of unirrigated land.

b) Small farmer defined in the project of mini-watershed area development as in the government regulation of planning department dated 8th September 1981.

c) As calculated by ARDC as those who cultivates lands providing pre-development net returns to farm resources to such farmers and his family not less than RS3600 per annum.

The responsibility of identifying the small farmers', marginal farmers' and weaker sections is entrusted to the District Deputy Director of horticulture in specific areas.

Only the above mentioned category of farmers are eligible for this scheme, besides those mentioned in the IRDP scheme. Once these farmers are identified they can avail of the subsidy benefits of the scheme for cultivating the specific horticultural crops mentioned above. The subsidy varies between various fruit crops, being 50 percent of the total cost of production for mangoes and 33.33 percent of the total cost for the other fruit crops identified under the scheme.

ORGANISATION DETAILS

For the implementation and promotion of this scheme in 1981-82, the 14 different districts were to have a Deputy Director of horticulture for the respective districts. By the

¹⁰ I.bid. page 1.

end of 1982 all districts were to have such a department of horticulture with a Deputy Director. Each district was to have a Deputy Director of horticulture for the overall responsibility for development of the same in that particular district. A regional level/State level independent Director of Horticulture was to be appointed for the overall monitoring. The field organisation, implementation and follow up were to be undertaken by the staff of horticultural department in close liasion with district regional development agencies, zilla parishad, and other agricultural development officers and project officers.

PROCEDURE FOR AVAILING THE CAPITAL SUBSIDY SCHEME:

A) Details Of Loan Application And Sanction:

Once the prospective farmers are identified the Technical Officer in the office of the District Directorate of Horticulture obtains loan applications from the farmers, scrutinises the same and forwards it to the financial institutions with recommendations for sanction of the loan. The technical officer is responsible for sanction and disbursement of the loan. (For which he has to maintain close contact with the Deputy Registrar of Co-operatives who is a member of the Board of Directors of the land development banks.) All loan applications have to be forwarded through the District Deputy Director via the Technical Officer. The loan is thus sanctioned and disbursed in stages against which, in total, a 50 percent subsidy is given by the Government of Maharashtra through the department of horticulture. (The details of the scale of finance, loan disbursements and method of releasing subsidy are provided in table 6.10, see section on scale of finance page 23 & 24)

B. Institutional finance for horticultural crops.

The scheme as stated, was intended to raise the economic status of the small marginal farmers and weaker sections of the rural society. For this purpose, credit was to be secured for the farmer through co-operative banks, land development banks or nationalised banks. The capital subsidy was basically introduced to achieve the objective of augmenting the incomes of the above mentioned category of farmers and to lessen the debt burdens of fruit cultivation due to the long gestation period of fruit crops.

A detailed scale of finance for various crops was prepared based on the suggestions made by the Agricultural Refinance and Development Corporation (ARDC) which is now the NABARD in since 1982. This scale of finance is taken as a ceiling of cost per hectare for producing a particular crop for admissibility of loan and subsidy under the programme. The banks which sanction the loans can however consider special cases and give a higher scale at its discretion however such excess cost/finance would not be eligible for the loan or

subsidy. According to the scale of finance the total cost of cultivating one hectare of different fruit crops is worked out, the banks releases the loan of the total amount of finance in stages. (details of which are given in table 6.9).

A subsidy of 50 percent for Alphonso mangoes and 33 1/3 percent for other fruit crops (mentioned earlier) is then released by the department of horticulture. The bank loan and the related subsidy is however released on basis of performance of the individual farmers success of the horticultural venture. If at any stage the bank officials or the department officials find a failure on the part of the farmer as regards survival of the horticultural plantation, the subsidy is no longer continued.

The details of the scale of finance for Alphonso mangoes as given in the Horticultural and social forestry department resolution no. HRT, 22027 dated 16th July 1982 is provided below in table 6.9.

(Such a scale of finance was worked out for all the above mentioned crops and these estimates were again revised in 1986).

As table 6.9 shows the total finance required for cultivating one hectare of Alphonso mangoes works out to be Rs. 14100, of this, 50 percent i.e. Rs. 7050. The state government grants 50 percent of the total amount as a subsidy on a the year to year basis with the remaining 50 percent in the form of a loan.

Table 6.9 : Statement Showing Scale Of Finance And Cash Flow Per Hectare For Mango (Alphonso)

Part I

[Number of trees per hectare (100)]

Item	Annual break-up of scale of Finance (Years)							Total
	1	2	3	4	5	6	7	Rupces
1. Preparation of land and filling pits	600	-	-	-	-	-	-	600
2. Fencing	3000	-	-	-	-	-	-	3000
3. Planting Material (10percent for gap filling)	1100	-	-	-	-	-	-	1100
4. Manures, Fertilisers, Plant Protection	550	350	450	500	500	650	700	3700
5. Irrigation	600	700	800	-	-	-	-	2100
6. Staking / Pruning and Mulching	600	700	500	-	-	-	-	1800
7. Watching & Fire Protection	600	600	600	-	-	-	-	1800
8. Total Finance	7050	2350	2350	500	500	650	700	14100
9. Capital Subsidy 50percent component	3525	1175	1175	250	250	325	350	7050
10. Loan component	3525	1175	1175	250	250	325	350	7050
11. Interest at end of gestation period at 10.25percent	3454	935	739	119	85	70	36	5438
12. Capital amount comprising of loan component plus interest at end of gestation period (8 equal annual instalments)	-	-	-	-	-	-	-	12488
13. Annual equated instalment (RS. 189.15 per Rs.1000)	-	-	-	-	-	-	-	2362

Table 6.9 Continued: Annual Cash Inflow**Part II (Amount in Rupees)**

Item	Years									
	8	9	10	11	12	13	14	15	16	
II Cash Inflow	8	9	10	11	12	13	14	15	16	
1. Fruits per tree in Kg.	20	30	40	50	50	50	50	50	50	
2. Fruits [per hectares(tonnes)	2	3	4	5	5	5	5	5	5	
3. Rate of fruits per tonne	3000	3000	3000	3000	3000	3000	3000	3000	3000	
4. Annual gross income	6000	9000	12000	15000	15000	15000	15000	15000	5000	
5. Annual recurring Expenses	2000	2000	2000	2000	2000	2000	2000	2000	2000	
6. Loan Installment	2362	2362	2362	2362	2362	2362	2362	2362	Nil	
7. Total Outgo	4362	4362	4362	4362	4362	4362	4362	4362	2000	
8. Net Income	1638	4638	7638	10638	10638	10638	10638	10638	3000	

Source : Government of Maharashtra, Horticulture and Social Forestry Department. The capital subsidy scheme (1982). (Pg 71/C).

The interest calculation has been shown in a some what awkward manner. The figure in the first column showing interest costs for the first year (see item 11 in column 1 of table 6.9 part I) has been arrived at as follows:

$$\text{Rs. } 3525 [(1.1025)^7 - 1] = \text{Rs. } 3454,$$

The interest costs shown in the second column is calculated as (see item 11 in column 2 in table 6.9 part I:

$$\text{Rs. } 1175 [(1.025)^6 - 1] = \text{Rs. } 935,$$

and so on.

It should be explicitly noted that this manner of showing interest cost in a statement of cash out flow is not correct. The figures shown in the row of interest is not the interest payable in that year. The figures shown in table 6.9 part I item 11, is the accrued interest (till the end of the seventh year) on the loan amount released during that year. Since the farmer is not required to actually pay the interest during the first seven years under the CSS, the accrued interest is added to the total amount of loan released to him till the 7th year. The total loan released plus the total accrued interest at the end of 7 years per hectare is Rs 12488 (see item 12 last column in table 6.9 part I). In effect this is the total loan burdened that he has to bear. What is of important is the total figure given in the last column namely Rs. 5438. In effect, the farmer takes a loan of Rs. 7050, (principal) plus the accumulated interest over seven years i.e. Rs. 5438, which gives a total figure of Rs. 12488. The farmer is then required to discharge this amount over the following eight years in the form of Equated Annual Installments. The computation of EQA will obviously contain interest element on reducing balance at the rate of 10.25 percent on a loan of Rs. 12488. The loan installment as shown in table 6.10 payable from the 8th to the 15th year

works out to be Rs. 2362. This is worked out as given below:

$189.15/1000 \times 12488 = 2362$. (see formula for calculation of EQA item no 13 in part I of table 6.9. This amount has to be paid as the loan installment till the 15th year (see item 6 in table 6.9 part II).

The calculation of interest, EQA etc. as worked out under the CSS, however, is very complicated. The estimated NPV (Net Present Value) per hectare calculated from the above scale of finance, provided in the table, works out to be about Rs. 80,000 (i.e. Rs. 81247.02) per hectare or Rs. 32893.5 per acre. (this has been worked out on the basis of information provided in table 6.9 using the usual NPV formula, see chapter 9).

The revised scale of finance for mangoes and other selected crops is provided in table 6.9a given below.

Table 6.9(a) Revised Scale Of Finance Per Hectare For Selected Fruit Crops.
(number of trees per hectare 100)

Fruit	No. of trees per hectare	Total finances (Rs./hectare) (1982) A	Total finance Rs./hectare (1986) B
Mango (Other varieties)	100	14000	14000
Coconut	200	16000	16000
Chikoo	120	17620	17700
Cashew	277	7220	6850
Guava	277	9250	10500
Oranges	277	12840	5668
Kagazi Lime	277	7900	15000
Custard Apple	300	6895	6895
Pomegranate	300	15800	---

Source: A) Source: Government of Maharashtra, Horticulture and Social Forestry Department. The capital subsidy scheme (1982). (Pg 71/C).

B) Government of Maharashtra, Horticulture and Social Forestry Department. The capital subsidy scheme (1986) page 1-18.

PLANTING MATERIAL:

Under the scheme the district deputy directorate prepares a plan of supply of planting material from various nurseries (Government fruit nurseries) in order to ensure supply of the same. The farmers can get the planting material at a rate fixed by the government after they have acquired the Bank's letter of authority. For this purpose a number of government nurseries have been promoted in the state and under this programme 135 horticultural nurseries have been established by state government to produce and supply genuine planting material of various fruit crops to the cultivators.¹¹

¹¹ Government of Maharashtra, (1994-95), Economic survey of Maharashtra.

WATER FACILITY:

Since the fruit crops are perennial in nature, the importance of water and irrigation cannot be neglected. The CADA, (Command Area Development Authority) officer along with officials of the irrigation department and the chief executive officers are to ensure timely availability of water in the areas taken up for horticultural development under the scheme. However finance for digging of wells is not given under this scheme. (This is restricted only to certain crops.)

INPUTS OF FERTILISERS AND PESTICIDES:

The loan component for fertiliser and pesticides is released only in kind. The district deputy director of horticulture is to ensure that agencies of Maha-agro industries development corporation (MADA), and Maharashtra state co-operative marketing federation (MSCMF) maintain stocks of fertilisers and pesticides. Farmers with sanction of credit for inputs shall be issued with authorisation to buy requirement only from the above agencies. The cost of these inputs is debited to the loan accounts.

PLANT PROTECTION :

Plant protection is the combined responsibility of the agricultural Development officer of the Zilla Parishad along with officers of MSCLDB or nationalised bank which are to ensure timely spraying and protection of the plants.

HORTICULTURAL EXTENSION SERVICES:

The scheme provides for timely training visits and all other horticultural extension services to ensure success of the horticultural ventures undertaken under the scheme. This includes technical assistance, managerial assistance and other advice related to the fruiting, maturing, and cultivation of the plant. The Chief Executive Officer with the other officials of the department has to ensure this follow up, which is extremely essential for a new venture and its success. For the effective implementation and follow up of the scheme, the department, the agricultural development officers, the local officials, the bank officials are also to work in close co-ordination and liason. It was also stated that the scheme could be linked to IRDP,NREP, SFDA,EGS wherever possible to maximise the benefits of the scheme.

The success of the scheme can be seen from the fact that upto the end of 1990-91, 39000 hectares had been brought under horticultural crops, benefiting almost 31883 cultivators.¹² The balance subsidy (i.e.spill over) of this scheme in the 8th plan amounts to Rs.105 lakhs. New area of 7500 hectares is to be brought under the horticultural

12. see next page

plantation during the 8th five year plan as scheduled under the scheme. A sum of Rs.200 lakhs has been earmarked during the 8th plan for the implementation of this scheme.

As per the Department of Horticulture, Pune, the spread of the scheme in terms of area covered is given below in table 6.10.

**Table 6.10 Area Under Horticultural Crops - Maharashtra State
(Covered Under The Capital Subsidy Scheme 1981-82)**

Year	Area Under Horticultural Crops (hectares)
1982 - 83	714.46
1983 - 84	1576.76
1984 - 85	2474.86
1985 - 86	3147.17
1986 - 87	4612.86
1987 - 88	7161.20
1988 - 89	8204.36
1989 - 90	6411.99
1990 - 91	7368.31
1991 - 92	6289.12
Total upto 1992	47961.09

Source: Private publication of the department of Horticulture, Pune district.

As per the information provided by the department of horticulture, Pune district, between 1982-83 to 1991-92 a total of 47961.09 hectares were brought under horticultural crops through the capital subsidy scheme.

4.2 The EGS Linked Horticulture Development Scheme.

The Maharashtra Government introduced the Employment Guarantee scheme in the state in 1972 to provide gainful employment to the weaker sections of the rural sector. By end of March 1991 the scheme had provided employment to 2.54 lakh workers through various schemes of irrigation, soil, conservation, tree plantation etc. involving an expenditure of Rs.2000 crores. Keeping in view the fact that almost 85 percent of the land is rain-fed and that there is a need to provide an alternative means of livelihood specially for the small, marginal and weaker sections of the agricultural sector, the government of Maharashtra has stressed the importance of promoting horticulture in the state.

By end of 7th plan (1985-1990) about Rs. 5,85,600 hectares was under horticultural crops, (see table 6.6). Of this, 2,42,100 hectares was under fruits and the remaining was under vegetables and other horticultural crops (see table 6.6 of this chapter.) Further, the wasteland and land not utilised for cultivation was estimated at 29.10 lakh hectares which could be used for horticultural plantations (see table 6.3.) In 1990-91 the

¹² Government of Maharashtra, 8th five year plan (1992-97), page 141.

EGS Scheme was linked with the horticultural development programme.¹³ with the following objectives:

- a) to improve the economic condition of the small and marginal farmers the scheduled castes and scheduled tribes,
- b) to develop drought prone area utilisation of wasteland (estimated at 29 lakh hectares),
- c) to provide an alternative or supporting means of income to the farmers dependent on rain-fed agriculture(estimated to be 70 percent in the state),
- d) to provide employment in the rural areas, and
- e) to cater to soil and water conservation.

It was recognised that, not only do the fruit crops have a greater potential for generating income but fruits like grapes, mangoes, bananas oranges also have a tremendous export potential. The EGS linked horticultural development scheme is to benefit dry-land area farmers in the small and marginal category, i.e. weaker sections of the farmers. It is directed towards diversifying cropping pattern in areas identified for the purpose of rural upliftment, prosperity and stability in agriculture.

FRUITS TO BE PROMOTED UNDER THE SCHEME:

After a detailed understanding of the agroclimatic requirements, water requirements, capital requirement - the following 22 fruits were chosen for promotion under this scheme- alphonso mangoes, jackfruit, cashew, custard apple, sweet lime, oranges, chikoo, guava, ber, coconut, pomegranate, fig, tamarind, ramphal, gooseberry, kavith, jamun, kokum charoli, lichi, pineapple. Fruits identified for rainfed horticulture are ber, mango, pomegranate, custard apple and gooseberry. The irrigated cash crops are identified as grapes, bananas, chickoo, vegetables, coconut, mangoes and oranges. Crops for export processing are mango, cashew, grape and cut flowers.

BENEFICIARIES OF THE SCHEME:

The benefits of the scheme can be achieved by any category of farmers. However, the main beneficiaries of the scheme or the target group are the small and marginal farmers, the weaker sections i.e. schedule caste, schedule tribes, there was however, no restrictions on land holding of the beneficiaries.

The small and marginal farmers are defined according to the norms of definition of the NABARD. The NABARD has given two definitions of the "small farmer", based on a)

¹³ Source : Rojgar hami yojana: Phalotpadan vikasachi Mahatvakankshi Yojana. Information and Broadcasting publication, Mumbai 1992-93 , Page 1-14.

the income and b) the area. The income criterion is applicable on an All-India basis according to which a small farmer has been defined as "farmers cultivating land providing a pre-developmental net return to family resources, to such farmers and his family not exceeding Rs. 11,000 per annum at 1991-92 June/July prices¹⁴". This criterion is subject to change.

According to the area criterion these norms have been prepared state/zone/region wise and also according to the agroclimatic zones. For the Pune district in A zone which includes Khed, Maval, Mulshi, Velha, and Bhor the 'small farmer' has been defined as those owning 20 acres of unirrigated land and 6 acres of irrigated land. In transition B zone which includes Junnar, Ambegaon and Poona, the same norms are as above are applicable. In the Scarcity zone which includes Shirur, Haveli, Dhound, Purandar, Baramati and Indapur farmers with 29 acres of unirrigated land and 7.50 acres of irrigated land belong to the small farmer category. The EGS scheme provides subsidies to such farmers under the above mentioned scheme for cultivation of horticultural crops. Such a definition is provided for all districts.¹⁵ This area criterion is however not subject to change frequently as the earlier criterion.

AREA SPECIFICATIONS

The scheme would be made available for fruit plantation for a minimum of 0.20 hectares and a maximum of 40 hectares (for the Konkan area it would be applicable for a minimum of 0.10 hectares and a maximum of 4 hectares)

THE SUBSIDY ELEMENT:

a) The beneficiaries in the category of small and marginal farmers, schedule cast, schedule tribes, nomadic tribe would be eligible for 100 percent subsidy/grant for both labour as well as material cost. This subsidy would be released in three installments. In the first year, 50 percent subsidy would be released, 25 percent in the second year and the remaining 25 percent in the third year.

b) The beneficiaries in the category of large and medium farmers would however be eligible for only 75 percent of the material cost but could get 100 percent subsidy for labour cost. The total subsidy even in this case would be released in three installments (50 percent, 25 percent and 25 percent).

The subsidy would be stopped in the following conditions:

¹⁴ NABARD (1992), Circular No. NB,DPD,IFS,23/92-93, dated 24 June 1992.

¹⁵ NABARD (1984) Circular No. Reference No. NB. EAPD 1950, SF 03 84/85 dated 3rd July 1984.

- a) non-survival, of plantations,
- b) failure of plant protection, and lax of plantation,
- c) less than 75 percent survival of trees in the second year.

For this purpose strict follow-up of the scheme by the officers of the horticulture department was emphasised.

CONDITIONS OF THE SUBSIDY

- a) The land on which the plantation was to be undertaken should be in the name of the beneficiary.
- b) Written undertaking by the beneficiary to undertake the work in the plantation.
- c) Any excess cost of cultivation in surplus of the scale of finance prescribed by the scheme to be borne by the beneficiary.
- d) The plantation is to be done on plain land and not on 'bunds'.
- e) The beneficiary was entrusted all the responsibility functions related to development of the fruit plantation i.e. digging of pits, preparation of land, planting the saplings, case, plant protection, giving fertilisers, etc.
- f) The subsidy amount would be credited in the name of the beneficiary for which he has to open an account with the respective co-operative bank or nationalised commercial bank.
- g) In case of non co-operation of the beneficiary the subsidy amount along with interest is liable to be withdrawn.

RESPONSIBILITIES OF THE BENEFICIARIES:

- 1) The beneficiary institution must make a resolution to participate in the scheme
- 2) The president and the secretary of the institution (co-operative society/Trust) or the sarpanch and Gram sevak (if Gram Panchayat) must sign an agreement with the horticultural department.
- 3) All the required documentation and the project proposal should be submitted by the beneficiary institution . The beneficiary will be required to submit on a bi-annual basis a statement of the portion of the Work completed and received the grant on a proportional basis.
- 4) If the project is unsuccessful, the concerned institution would be liable to the subsidy amount with interests.

METHODS OF IMPLEMENTATION:

The EGS linked horticultural development scheme is implemented under auspices of the Department of Agricultural education and extension programme, the irrigation

department and the horticultural department. The department of horticulture and or the agricultural university and the notified private nurseries are responsible for providing the sapling, planting material and fertilisers, insecticides and pesticides.

The procedure that will be followed in the course of implementing this scheme on farms owned by individual agriculturists is as follows:-

- a) The farmer consent will be taken before the scheme is implemented on his farm.
- b) After his consent is taken, the proposal for the entire project will be prepared in consultation with the farmer. The project proposal will contain the following details:
 - i) the name of the farmer,
 - ii) the survey number/numbers which his land belongs,
 - iii) the details of the fruits undertaken to be grown,
 - iv) the area devoted to various fruits,
 - v) the annual expenditure that he will be required to incur and
 - vi) other details pertaining to the maintenance , case etc. of the plantations.
- c) sanction of the subsidy will be granted for expenses of the initial three years at the outset.

The chief agricultural executive officer of the agricultural and educational programs, the departmental irrigation officer, and district Deputy Director Horticulture, will give their consent on technical grounds and the district collector will give his administrative consent. The administration, financial and technical responsibility and control on the expenditure under the scheme will be vested with the Additional Director, Agricultural Educational And Extension Services And Deputy Director Agriculture And Horticulture.

FRUIT PLANTATION AND EGS SCHEME:

To ensure the success of the horticultural development scheme, which is to be implemented under the auspices of the EGS, some restrictive provisions of the EGS will need to be relaxed as follows:

- a) The beneficiary would not be required to sign the EGS muster however the beneficiary will be required to declare the names (and other details) of the members of his family and the approximate duration of the work effort that they would devote.
- b) The medical health and welfare facilities for beneficiaries of the EGS scheme will not apply to the beneficiaries EGS linked.

Horticultural development scheme (i.e. facilities like a shelter, first aid kit and medicines).

c) Separate coupons for purchase of rations will not be issued under this scheme.

d) The performance of the beneficiary will be monitored on a monthly basis and the assessed amount due to the beneficiary will be deposited in this bank account. However at the end of every year the entire sum on account of labour charges will be paid to the beneficiary in his bank account.

COMMITTEES FOR MONITORING THE PROGRAMME.

To monitor the progress of the activities undertaken in pursuance of this scheme on a periodic basis committees have been constituted at 3 levels namely, block, district and state. The district level committee is presided over by the Guardian Minister.

PROGRESS OF THE SCHEME

In the year 1990-91 and 1991-92 the total amount spent by the state government on this scheme amounted to Rs.27 crore and Rs.47 crores respectively. The total number of beneficiaries covered by this scheme till 1991-91 are 2.74 lakhs; spread across 29316 villages. It is estimated that 4 crore man-days of additional work would be generated by this scheme alone upto the end of the 8th plan. The department had targeted to bring 1.20 lakh hectares under fruit plantation between 1990-91 to 1991-92. By 1991-92 a total of 1,96,594 hectare's was brought under fruit plantation. 113881 farmers participated in the programme and 18609 villages were covered. In 1992-93, 1.20 lakh hectares was scheduled/planned to be developed for horticultural plantations under the scheme and already 115000 hectares was underway. By the end of the 8th plan i.e. 1997 was proposed to bring 10 lakh hectares under fruits under the scheme.

The various schemes and horticultural development programmes of the government of Maharashtra has resulted in a significant increase in area under fruits and other horticulture crops specially in 1990's. Table 6.11 provides information on the new areas brought under food crops in the recent years i.e. between 1992-93, to 1996-97, in the State of Maharashtra as a result of the various horticultural development schemes.

Table 6.11 New Areas Brought Under Fruit Crops

FRUITS	1992-93	1993-94	94-95	95-96	96-97 till Oct '96
Fruits under unirrigated area (Hectares)					
Mangoes					
a) Grafted trees	22473	25473	24021	30493	29999
b) Others	23727	6291	3356	2271	1269
Cashewnuts					
a) Grafted trees	2309	3309	7748	10809	13695
b) Others	11442	11559	-	-	-
Bor	11896	12808	6538	7432	4746
Custard Apple	2875	2079	1937	2635	2622
Awala	164	238	344	419	562
Tamarind	1356	1134	874	1651	1625
Jackfruit	128	104	70	81	61
Others	304	290	-	-	-
Total I	76674	63285	44808	55808	52579
Fruits under irrigated area (Hectares)					
Orange	13528	12323	10459	14706	13562
Sweet Orange	7707	10640	8308	9052	6824
Chikoo	4874	5556	4267	5000	5748
Coconut	2915	2492	1962	2031	1864
Pomegranate	4326	6509	7453	9624	6871
Guava	2321	2332	2396	2519	2280
Others		108	105	3382	6606
Total II	35671	39960	34950	46314	43755
Total I + II	1123045	103245	79039	102122	96334

Source: Government of Maharashtra (1994-95, 1996-97), Economic Survey of Maharashtra, page 35-36.

A recent study has analysed the trend in the growth of area and production of fruit crops between 1989-90 to 1994-95 and has made future projections of the same for the year 2004-2005 in the Maharashtra state. This information is provided in the table 6.12 given below.

Table 6.12 Area And Production Of Various Fruits Crops In Maharashtra , Area (Lakh Hectares), Production (Lakh Tonnes)

Name of the crop	1989-90		1994-95		2004-2005	
	Area	Production	Area	Production	Area	Production
Mango	0.35	1.95	2.40	4.08	4.96	22.40
Orange	0.34	1.34	0.85	6.00	1.94	18.00
Cashewnut	0.16	0.10	0.70	0.25	0.42	1.43
Banana	0.06	17.82	0.65	24.05	0.80	32.00
Ber	-	0.23	0.61	2.01	1.19	7.28
Sweet Orange	0.06	0.23	0.42	1.00	1.13	11.31
Pomegranate	0.08	0.46	0.36	5.32	1.13	5.46
Grapes	0.10	1.50	0.20	4.00	0.37	6.72
Others	0.73	3.60	1.42	10.74	3.06	21.30
Total	1.88	27.23	7.61	57.45	16.00	125.90

Source: Commissioner Agriculture, Maharashtra State (1997), page.33.

According to this study, by 1994-95, 7.61 lakh hectars in the state was under fruit crops, which is projected to increase to 16 lakh hectares by the year

2004-2005. The production which was 57.45 lakh tonnes in 1994-95 is projected to increase to 125.90 lakh tonnes by 2004-2005 of the fruit crops it can be seen from the table that the area under mangoes between 1994-95 to 2004-2005 is expected to more than double. All these fruit crops are being promoted under the various schemes of the state government.

OBSERVATIONS:

The foregoing review can be summarised as follows:-

1. The state of Maharashtra is characterised by an imbalance between the resource endowments and the ability to use them. (a) Agro-climatically there are a large areas with poor soil and lacking in irrigational facilities and potential. Institutionally the state has numerous small holdings of small and marginal farmers whose family labour resources are disproportionately larger than those required by their holdings. b) almost the whole of Maharashtra receives adequate sunlight and is not exposed to extreme temperature.
2. The state government of Maharashtra has not only taken initiatives parallel with the central government's plan directions in promoting horticulture, it has also taken special initiatives of its own by formulating the Capital Subsidy Scheme and the EGS linked horticultural development programme.
3. On account of these initiatives there has been a definite increase in a) the consciousness of farmers that horticulture represents a promising avenue for the augmenting their incomes and b) an increase in the area and output of these crops.

This completes one part of the study. In this part we have reviewed the need, the scope and the preconditions that must be satisfied for horticultural diversification. We have seen large areas at the national level as well as large areas at the Maharashtra state level qualify for implementing a strategy of rapid agricultural diversification. The secondary data seems to indicate, prima facie, that such diversification is successful in augmenting the incomes of the farmers and enabling them to utilise their hitherto under utilised resources. In the remaining part of this work we propose to go down to the micro level i.e. the level of the individual farmer in order to study how his resource endowments, the agro-climatic peculiarities of his area, his economic condition, his family labour supply and the subsidies and incentives that he receives can affect his decision to adopt horticultural crops. We shall further explore the rates of his success or failure in experimenting with horticultural technology and make cost –benefit

analysis of his result. This kind of study should be able list the insights that have been gathered from the review of literature on development economics in relation to agriculture, the thinking and policies adopted at the national and state level and the experiences of other developing countries that have undertaken agricultural diversification programmes. At the same time a micro level analysis may help to explore additional features of the process of diffusion of horticultural technology.

CHAPTER 7

A PROFILE OF THE REGIONS, RESPONDENTS, CROPS COVERED AND THE SALIENT FEATURES OF THE STUDY REGIONS

1. BACKGROUND OF THE SAMPLE SURVEY :

In order to make an assessment of the costs and benefits, the problems, the successes and failures, the attitudes of farmers towards crop diversification and the effectiveness and reach of policy initiatives, it was thought necessary to conduct a sample survey representing a cross section of farmers who attempted to diversify their cropping pattern by adopting horticultural crops.

It was recognised that the cross section to be covered should be diverse i.e., differentiated in terms of the size of holding, the availability of water, the regions, the status of the farmer i.e. whether he is a beneficiary of the Government policy or a beneficiary of a family tradition in horticulture.

2. **COVERAGE OF THE SAMPLE SURVEY:** Western Maharashtra and its contiguous regions contain a diversity in terms of the criteria mentioned above. The Konkan region falling in Western Maharashtra is already well known for its crop diversification. Cultivation of coconuts, Alphonso mangoes, cashewnuts, kokamb, jackfruits, etc. have been in practice in the Konkan region for the last three centuries. The Konkan region is also known for the vagaries of monsoons, the soil fertility is very poor and land holdings are of small size and employment opportunities outside agriculture are very meagre, (Some of these conditions are likely to change with starting of Konkan railway and projects like ENRON, etc). Considering these features there is nothing particular in crop diversification that needs investigation in the Konkan region. Hence, in our study we have not considered this region.

The Western Maharashtra region, as an economic region consists of the western parts of the Nasik, Ahmednagar, Pune, Satara, Sangli and Kolhapur districts. This part of Maharashtra has the advantage of fairly good rainfall on account of the Sahyadri ranges and fairly fertile soil conditions i.e. black and fertile soil. [However from the standpoint of agriculture this Western Maharashtra strip is quite narrow. The strip ranges in width from between 5 Km to 35 Km of the Sahyadri ranges]. Some areas of this narrow strip is more or less waterfed throughout because of minor and medium irrigation projects strewn across most seasonal rivers that flow on the

eastern slopes of the Sahyadris. The area immediately adjoining this narrow strip ranges from medium dry to completely dry regions. Indeed, the availability of water improves in the Marathwada and Vidarbha which lie further to the east of this region.

Western Maharashtra and its contiguous areas therefore offered us a convenient yet interesting area from which to choose an appropriate sample for our survey. Besides, the Maharashtra Government has been a pioneer in rural development through its various schemes viz. Employment Guarantee Scheme (EGS), The Capital Subsidy Scheme (CSS), The EGS-linked Horticultural Development Scheme and various other rural development schemes. Accordingly, the evaluation of policy initiatives is best done in this part of Maharashtra state. Various areas from the Western Maharashtra region was chosen for the purpose of this study. The details of which are provided below:

2.1 Regions Covered: The regions covered in this study (as mentioned in Chapter I, Section 4), are (a) the Mulshi- Maval region, i.e. the Mulshi Taluka which includes the Kule-Bhalgudi villages and the Belewade village. (b) the Junnar- Maval region i.e. the Junnar Taluka, which covers the villages of Bori- Budruk, Parunda and Vaishnawadi and (c) the Shirur region of the Pune District in Western Maharashtra. These three regions have been chosen to represent the Maval hills, the irrigated plains and river basins with black soil and the dry and arid regions respectively. As a result it was possible to study the horticultural development under diverse agro-climatic conditions. (For the location of these regions in Western Maharashtra see Annexure 5).

2.2 Farmers Covered: The primary investigational survey in order to have a completely unbiased data base has relied dominantly on the list of beneficiaries of the Capital Subsidy scheme of 1981-82 which was obtained from the Department of Horticulture, Pune District, Pune. The list of beneficiaries for the three regions of Western Maharashtra i.e. Mulshi, Junnar and the dry regions of Shirur was collected from the above mentioned department. The list of beneficiaries was taken from those who have adopted the scheme mainly between 1983-86, to be able to carry out a detailed cost-benefit analysis of the chosen fruit crops. This period was chosen since, fruit crops have a long gestation period and its results can only be known after specific time lag.

In the course of the survey, however, few individual farmers who had not availed of the benefit of the scheme were also included.

Though data were available on the beneficiaries of the EGS linked Horticultural development programme of the Maharashtra Government, a detailed study of such farmers has not been considered for the primary investigation because the scheme commenced in 1991-92 and hence the fruit bearing age of the trees was yet to be achieved. However, in the course of the sample survey a few such beneficiaries who provided information on their horticultural ventures under this scheme have been considered, in the discussion of their experiences with agricultural diversification.

2.3 Fruit Crops Covered: The main fruit crops of the study are mangoes, grapes, and oranges. (However very detailed information regarding cost of production, revenue etc was not available from the dry region of Shirur, the reasons for this are discussed in chapter 8 section 5). The above mentioned crops have been chosen keeping in view the suitability of Western Maharashtra for these crops, (i.e. mangoes, grapes and oranges), as well as, the export potential, of specially, mangoes and grapes. Mangoes have also been earmarked by the Department of Horticulture, Government of Maharashtra as an important crop under both the Capital Subsidy Scheme (1981-82), as well as the Employment Guarantee Linked Horticultural Development Scheme (1991-92). In the course of the investigation for the primary data collection, it was found that farmers had diversified into a variety of other fruit crops as well as vegetables. The latter part of the field data analysis thus provides a comparative picture of the yield and cost per acre of some selected horticultural crops, i.e. fruits and vegetables.

A detailed cost-benefit analysis for the two major fruit crops *mangoes* and *grapes* based on field investigations, has been carried out, the same has also been done for *oranges* but on the basis of limited data.

The region-wise and crop-wise break up of farmers covered in the primary data analysis is provided below:

Mulshi Region	-	21 farmers (Mangoes).
Junnar Region	-	24 farmers (Mangoes), and 6 farmers (grapes).
Shirur Region	-	22 farmers (Oranges and other dry area crops)

In all, therefore a total of 73 individual farmers, i.e. 45 for Mangoes, 22 farmers for oranges, and 6 farmers for grapes have been covered in this study. For the purposes of the field investigation an interview cum questionnaire method was used. (see Annexure 6 for the questionnaire given to the respondent farmers).

Though the total number of farmers covered in the study is 73, not all of them were in a position to provide detailed estimates of the costs and the revenues. The Cost, Volume, and Revenue analysis and the Cost- Benefit analysis for mangoes, grapes and oranges in the three study regions thus been undertaken for a lesser number of farmers. This is also because the other remaining farmers either have very recently planted mangoes under the EGS scheme or have grown fruit crops other than mangoes, or on enquiry were found to have reported complete failure of the crop. For such beneficiaries the question of undertaking a cost- benefit analysis therefore did not arise. All the 73 beneficiaries have, however been included in the initial part of the study i.e. while analysing the salient features of the study regions and their experiences with agricultural diversification.

3. ORGANISED EFFORTS IN GRAPE FARMING: In addition to the study of six individual farmers producing grapes (mentioned above), a detailed analysis of two grape growers co-operative societies has been covered in the primary data investigation. These include

- i. The Abhinav Grape Growers Co-operative Society, Aagar, Taluka Junnar, District Pune.
- ii. The Vighnagar Grape Growers Society, Narayangaon, Taluka Junnar, District Pune.

For the purposes of collection of data from the above societies an interview cum questionnaire was used. (see Annexure 7 for the questionnaire provided to the societies)

The analysis related to these two societies covers the following aspects:

- a) The general profile and horticultural spread of the member farmers of the societies with special reference to the main horticultural crop i.e. grapes.
- b) The profile of grape exports of these societies, which include a study of the total exports, the storing and processing facilities, the problems and prospects related to export of grapes.
- d) A cost-benefit analysis of grape cultivation based on data provided by the Vighnagar Society representing 70 members.

The two co-operatives have been chosen for the study on account of the following reasons -

- (1) The co-operative societies have played the role of nodal agencies in the process of the diffusion of horticultural knowledge and practices amongst the member farmers.

(2) Being corporate bodies they have collected and maintained detailed records on their members, the areas that they have devoted to grapes and other horticultural crops, the costs that they have incurred under various heads, the rates of crop failure, the output realised by their members, the prices received by them in both local and foreign markets etc. This information maintained in an organised way proved to be extremely useful for the study.

(3) The cost-benefit analysis based on such organised data can serve as a benchmark for the somewhat haphazard figures reported by the individual farmers.

(4) Besides the above mentioned reasons there is an intrinsic interest in studying group efforts towards diversification. This is founded upon 3-4 important considerations. Firstly, any sizeable diversification effort would tend to be successful only if undertaken collectively on account of economies of scale in the purchase of inputs, in sharing of knowledge and experience, and in marketing of the produce at the best possible prices. Secondly, cooperativisation as a form of organising group efforts has had a substantial tradition in India and certainly in Maharashtra. Thirdly, cooperativisation has a potential to bring in its wake a variety of "external economies" like bank credit, subsidies, crop insurance arrangements, centralised information on market prices etc.

(5) Finally, individual farmers specially, of the size categories that we have studied are extremely unlikely to be able to make export arrangements for their crops. When co-operative effort is undertaken, the size out of the output, the grading of the output and its selection, the centralised collection of the output, its packaging and transport enable the realisation of much better export-revenue.

4. SALIENT FEATURES OF THE STUDY REGIONS.

In what follows we shall discuss the salient features of each of the three study regions i.e. the Mulshi region, the Junnar region and the dry region of Shirur. The succeeding chapter (i.e. chapter 8), deals with an evaluation of the costs, Volume and Revenue (i.e. CVR) from mangoes, grapes and oranges in the three study regions. Chapter 9 gives a detailed Cost-Benefit analysis i.e. relating to the Net Present Value (NPV), Internal rate of return (IRR) and the Benefit Cost Ratio (BCR) of mangoes and grapes. Such a detailed Cost-Benefit analysis has not been undertaken for oranges for reasons mentioned in chapter 8 (see chapter 8, section--)

4.1. Salient Features Of The Mulshi Region.

Introduction: The list of beneficiaries of the Capital Subsidy Scheme (CSS) provided by the department of Horticulture (Pune) in regard to the Mulshi region consisted of 28 farmers. Of this, 15 beneficiaries were covered from Kule-Bhalgudi villages of the Mulshi region (These villages include a cluster of villages which include Kule, Bhalgudi, Nandgaon, Sathesai etc, for the purpose of this study these set of villages have been referred to as Kule-Bhalgudi villages). Of these, 15 beneficiaries one had availed of the EGS linked horticultural development programme in 1992-93 and therefore his case is not included in the Cost, Volume and Revenue analysis or the Cost-Benefit analysis because of the mango trees being still in the gestation period, as a result it was not possible to obtain information regarding fruit bearing of his mango plantation. However, his case has been considered in the initial analysis related to the salient features of the region and experiences with diversification. A separate group of six farmers was also covered from the Belewade village of the Mulshi region, which has a more prosperous and traditional mango cultivation. All these six farmers have availed of the benefits of the CSS. Therefore, in total 21 farmers were covered from the Mulshi region. [Enquiries about 8 other beneficiaries were also undertaken, however since the survival rate of mango plantation of these beneficiaries were zero, mainly because of water shortage and lack of timely care in the nursing stages of the mango tree, no further details needed to be obtained regarding their horticultural venture].

The Kule-Bhalgudi villages of the Mulshi region, (though it has had some traditional mango plantation), is a relatively new area identified as suitable for mangoes (Alphonso) and a few other fruits like chikoo, under the CSS (1981-82) and the more recent EGS linked horticultural development programme of 1990. This area has a very low percentage of irrigation and its traditional rabi and kharif crops, i.e. wheat, rice, jowar, gram have hardly provided any significant incomes to the farmers. Diversification into horticultural crops, specially mangoes was therefore introduced in this region. The region was chosen for mango plantations due to (a) its peculiar agro climatic conditions suitable for mango cultivation, (b) less water availability, and (c) as a means of utilising the wasteland and uncultivated land in this region productively. The Mulshi region has thus been earmarked as a suitable agroclimatic zone for developing mangoes.

The total number of respondents thus covered from the Mulshi region are 21 i.e. 15 from Kule-Bhalgudi villages and 6 from Belewade village. Of these 21 farmers only 20 have been considered in the detailed CVR analysis (for reasons mentioned earlier).

In what follows we present to begin with, a detailed profile of the 21 farmers, their size of holdings, the crops grown, the irrigation facilities, the experience of the farmers with horticultural diversification, the cropping pattern in the pre and post diversification period in the Mulshi region. The same sequence has been followed for the other 2 study regions i.e. Junnar and Shirur in sections 4.2 and 4.3 of this chapter.

OBSERVATIONS ON DATA RECEIVED FROM 21 RESPONDENTS OF KULE-BHALGUDI, AND BELEWADE VILLAGES OF MULSHI REGION.

Table - 7.1 Classification of Respondents On the Basis of Age

Age Group(years)	Nos. Of Respondents	Percentage to Total
20 – 30	1	4.76
31 – 40	4	19.4
41 – 50	14	66.6
51 – 60	1	4.76
61 and above	1	4.76
Total	21	99.98

Of the 21 respondents 14 belong to the age group of 41 - 50 years accounting for 66.6 percent, (the largest share among all the age groups), followed by the age group 31 to 40. We found one respondent each from age groups 51 to 60 years, above 61 years, and below 30 years who have also joined in the new experimental ventures of horticultural diversification in the region.

Table - 7.2 Classification on the Basis of Educational Status of the Respondent

Level of Education	Nos. Of Respondents	Percentage to Total
Primary	9	42.85
SC Level	2	9.52
Graduation	1	4.76
No Education	9	42.85
TOTAL	21	99.98

Out of the 21 respondents 9 had no education at all, their percentage share in the group is 42.8 per cent. 9 respondents have primary level of education their share being at 47.6 per cent. Two respondents have finished their education upto SSC level, their share being only 9.5 per cent. There was only one graduate farmer. The Mulshi region was found to be both economically and educationally backward inspite

of its nearness to Pune. (being only about 50 km from Pune city). It also lacks in adequate transport facilities. No positive correlation between educational status and agricultural diversification into horticultural crops was found i.e. lack of educational background did not seem to be a constraint to the recent horticultural diversification process in this region. Illiterate and uneducated farmers also could pre estimate the potential benefits of cultivating fruits i.e. particularly Alphonso mangoes, which is a relatively new crop in this region identified by the horticultural department, Pune.

Table - 7.3 Classification of Respondents on The Basis of Family Members

Family Size(No. of Members)	Nos. Of Households	Percentage to Total
1 – 2	2	9.52
3 – 5	4	19.04
6 – 8	1	4.76
9 – 11	-	-
12 & above	1	4.76
Rest	N.A.	-

The dominant size of the family household was found to be between three to five members. From the queries regarding the size of the family it was also observed that some horticultural crops are also conducive to small size family since they do not require very intensive labour throughout the year for e.g. mangoes.

Table - 7.4 Classification Of Respondents On The Basis Of The Size Of Land Holdings

Size of land holdings (acres)	Nos. Of Respondents	Percentage To Total Nos. Of Respondents
0 – 5	3	14.28
6 – 10	5	23.80
11 – 15	4	19.04
16 – 20	6	28.57
21 AND ABOVE	3	14.28
TOTAL	21	99.97

The respondents were found to be more or less uniformly spread over all size group of farms. The respondents with size of land between 16 to 20 acres were found to be the single dominant group of farmers, (numbering 6, accounting for 28.57 percent of the respondents). The small and medium group of farmers i.e. with holdings between to 10 acres of land together accounted for 38.08% of the total group of respondents. Since all the respondents had availed of the benefits of the subsidies of the state government, all of them had allotted about 1 to 1.5 acres for mango

plantation (as stipulated under the scheme). As such no relation could be established between the size of the holding and diversification, from the sample considered.

The break-up of the total land of the respondents from Kule / Bhalgudi villages of Mulshi is as follows : Irrigated land was found to be 22 per cent, the rainfed land i.e. non irrigated land accounted for 46.5 per cent of the total land and the waste land was found to be 31.3 per cent. The percentage of irrigated land is very low and the percentage of wasteland to total land holdings was found to be extremely high in the case of this group of Mulshi villages.

Table - 7.5 Classification of Land Holdings Respondent-wise on the Basis of Irrigation Facilities

Respondent No.	Total Area (Acres)	Irrigated Area (Acres)	Non Irrigated Area (Acres)	Wasteland (Acres)
KULE – BHALGUDI GROUP				
1	10	4	3	3
2	18	6	9	3
3	20	5	10	5
4	8	3	4	1
5	1.5	-	1.5	-
6	5	-	5	-
7	20	4	8	8
8	11	2.5	4	4.5
9	12	3	7	2
10	4	1	2	1
11	20	-	15	5
12	4	-	4	-
13	15	-	10	5
14	10	5	-	5
15	25	7	3	15
SUBTOTAL GROUP	183.5	40.5	85.5	57.5
BELEWADE GROUP		(22%)	(46.5%)	(31.3%)
1				
2	20	14	4	2
3	25	16	8	1
4	40	20	20	-
5	14	9	2	3
6	20	4	6	10
SUBTOTAL OF GROUP	25	18	6	1
GRAND TOTAL	144	81(56.3%)	46(31.9%)	17(11.8%)
	327.5	121.5	131.5	74.5

Note: Figures in brackets indicate percentage of irrigated, unirrigated and wasteland to total area of the respective subgroup.

As regards the other sub- group in this region i.e. in the Belewade village of the Mulshi region a higher percentage of irrigated land was found at 56.2 per cent of the total land holding. Which was due to the percolation tank constructed in the

village as early as in 1970's. (The Sarpanch of the Village, who was the Vice-President of the zilla parishad during that period built the lift irrigation system and distributed water to the fellow villagers by means of a pipeline). Around 31.9 per cent of the land was found to be rain-fed, the percentage of wasteland amounted to only 11.8 per cent. Belewade is one of the special villages in Maval as far as the irrigation facilities are concerned. Many farmers of this village had adopted progressive cultivation methods as well as horticultural crops as early as 1930's because of leadership of grandfather of the present village chief (Satyasheel Dhamale). Alphonso mangoes have been grown in this village since 1930's. The village also has a very large number of traditional mango trees (Raiwal). The villagers therefore get a sizeable income by selling raw mangoes, (useful for pickles) and Alphonso as well as a variety of quality mangoes (Payari, Keshari, Rajapuri, etc.) This village has been regularly supplying quality mangoes to both Pune and Bombay markets.

Recently i.e. in post 1980's the villagers have further diversified into vegetable crops which have an ever ready market in Pune. The Belewade village has thus been chosen for the study on two counts.

- a. Extremely progressive mango cultivation through dependence mainly on their own techniques of grafting mango trees.
- b. Significant success due to the advantage of the irrigation facilities possible due to the benefits of the percolation tank.

Table 7.6 Classification of Respondents on the basis of Source of Irrigation

Source of Irrigation	Nos. Of Respondents	Percentage to Total Nos. Of Respondents
Pump sets/PVC Pipes and Wells	21	100
Sprinklers	6	28.5
Drip	-	-
Earthen Pots	1	4.76
River	-	-
Physical Transportation Of Water	12	57.14
Total	21	-

Note : a number of farmers have shown more than one source of irrigation, therefore the percentage will not add up to hundred and the number of respondents will not add up to twenty one.

While studying the new plantations of mango trees in this area we found that 12 respondents (who had adopted mango cultivation in 1984 - 1985) i.e. 57.14 per cent have physically transported water and given dosages of water for the initial year as well as the first couple of years. This practice is followed even today. Many of the respondents have converted their wasteland into mango plantations. These wastelands had no irrigation facilities, even if water facility of well was available, the respondents have used that water for other irrigated crops and cash crops prudently and have carried water on their heads in order to help survival and growth of the mango trees. It was also found that horticultural ventures have, in fact, speeded up the process of development of irrigation facilities in this area. In the post 1986-87 period the farmers in this region have been motivated to install electric pump sets and PVC pipe lines as well as lift irrigation systems. (Lift irrigation was however found to be exclusively available in the Belewade village). Pump sets and PVC pipelines have become universally common. Drip irrigation system was not found either in the Kule-Bhalgudi group of villages nor in the Belewade village. The Sprinkler system of irrigation has been developed recently by 6 respondents.

Table - 7.7 Classification of Respondents on the Basis of Soil Type and Quality

Soil Type	Nos. Of Respondents	Percentage of Respondents To Total Respondents
Red	6	28.57
Black	5	23.80
Ash Grey with Limestone	1	4.76
Brown	-	-
Fertile	-	-
Poor quality	1	4.76
Red and Bhurkad (Brown)	8	38.09
TOTAL	21	99.98

The most common type of land in this region was found to be of the red and bhurkad (i.e. brown) variety, owned by close to 38.09% per cent of the respondents. This type of soil is dominantly found in the eastern slopes of the Western Ghats, to which the Mulshi region belongs. The problem with this type of soil is that it is of a rocky variety and requires more water. 6 respondents i.e. 28.57 percentage of the total respondents were found to have red soil, this type of land is fertile, however it also requires relatively larger doses of water and fertilisers. The total of these two groups of

respondents having red and red brown soil therefore amounts to 67 per cent. Black soil was reported by about 24 per cent of the respondents belonging to the Belewade village. This type of land is extremely fertile. The other two respondents have ash- grey with lime stone and hard rocky soil which is most unsuitable for cultivation. However, this did not deter them from adopting mango crops. It can thus be observed from the sample that the land of the respondents studied belong to a diverse range of soil quality and that provided, timely care and adequate doses of water and fertilisers are available horticultural crops can be adopted on various types of land.

Table - 7.8 Classification of Respondents on the Basis of Selected Fruit Crops

Fruit crop	Nos. Of Respondents	Percentage to Total
Mango	21	100
Cashewnut	1	4.76
Peru	2	9.52
Chiku	-	-
Coconut	1	4.76
Custard Apple	1	4.76
Ber	1	4.76
Any other	-	-

(Note : A number of farmers grow more than one fruit crop and therefore the percentage will not add up to 100 and number of respondents will be more than 21)

All the 21 respondents have opted for the cultivation of Alphonso mangoes. Two respondents were found to have grown guava trees which provides them a return twice a year. One progressive farmer (and also leader of fellow farmers from 17 villages), has in the recent years cultivated cashewnuts, coconut and ber successfully. The Mulshi region has been identified by the department of horticulture as possessing conducive agro-climatic conditions for promotions of horticultural crops, and hence such diversification has been initiated by the department in this region only recently i.e. in 1980's.

Table - 7.9 Classification of Respondents on the Basis of Cash Crops Adopted

Cash crops	Nos. Of Respondents	Percentage to Total
Onion	18	85.7
Groundnut	12	57.1
Pulses (Dal, Gram)	1	4.76
Sugarcane	1	4.76

Note: A number of farmers have reported to have grown more than one cash crop and hence the total percentage adds up to more than to 100.

Onion seems to be the most popular cash crop, grown by 8 respondents i.e. 85.7 per cent of the respondents followed by ground nuts which have been grown by (12 respondents) i.e. 57.1 per cent of the farmers. Gram and pulses was found to be grown by only one respondent. Sugarcane, also was found to be grown by a single farmer on an experimental basis.

Table - 7.10 Classification of Respondents on the Basis of Reasons for Adopting Horticulture

Reason	Nos. Of Respondents	Percentage To Total
1. Water saving and conservation	17	80.95
2. Optimum and intensive land utilisation	18	85.71
3. Use of underemployed labour	14	66.66
4. Increase in productivity of land	10	47.61
5. Own initiative of self interest and profit expectation	17	80.95
6.* Incentive of capital subsidy scheme	20	95.23
7.* Incentive of EGS linked horticultural development scheme	2	9.52
8. Assistance from private organisation	No	-
9. Extension services from agricultural department	No	-
10. Any other	No	-

* Of the total 21 farmers in Mulshi region one farmer has availed of the benefit only under the EGS linked horticultural scheme and one farmer has availed of the benefits of both the Capital Subsidy Scheme as well as EGS scheme. In this manner two farmers have been reported under the EGS scheme.

While examining the reasons for adopting horticulture, namely, new plantations of Alphonso mango trees, 85.71 per cent of the respondents have quoted the possibility of optimum and intensive land utilisation has being the main reason for adopting horticultural crops. 80.95 per cent of them favoured horticultural crops mainly due to two reasons namely (a) as a means of conserving the scarce water and as a means of saving labour and (b) due to the possibility of enhancing profits from such crops. Attractive incentives of the CSS of the Government of Maharashtra and the optimum use of underemployed labour were the reasons given by 95.23 per cent and 66.66 per cent of the respondents respectively. Around 47 per cent of the respondents favoured horticultural crops as a means to increase productivity of land. The respondents have given more weightage to optimum land use, water use and labour use as well as to the consideration of potential gains rather than the considerations of attractive incentives of Capital Subsidy Scheme for adopting horticultural crops, although they have admitted

that Capital Subsidy Scheme and other Government schemes have definitely speeded up the process of the adoption of horticultural crops in the region. It is really commendable that even an illiterate farmer of the remote hilly regions of Mulshi has been able to estimate the benefits of horticultural crops in terms of enhancing incomes, better utilisation of land and other resources.

Table - 7.11 Classification of Respondents on the Basis of Source of Finance

Item	Nos. Of Respondents
1. Capital Subsidy Scheme	20
2. Any other subsidy or grant	EGS (2)
3. Subsidy and personal investment	3

(Note : Some farmers had availed both the capital subsidy scheme as well as the EGS linked horticultural development scheme and hence the total number of respondents adds up to more than 21)

20 out of the 21 respondents have availed of the benefit of the CSS of 1981 – 82. 2 respondents have availed the benefit of the recent EGS scheme of 1990-91. Of these two respondents one has been beneficiary of both the CSS and the EGS schemes. 3 respondents have grown mango trees by relying on their own resources initially and have availed the CSS in the later years. These respondents have had mango plantations as a family tradition and had been motivated to produce to such crops due to the high income and profit potential of these crops. In spite of the potential of enhancing incomes through horticultural crops, i.e. mangoes in this region, a number of farmers were not found to be very enthusiastic to expand the plantation under the EGS scheme because of acute water shortage and lack of the technical knowledge, research, and cultivation of these crops.

General Observations:

In response to our queries related to the selection of land sites for horticultural expansion, most of the respondents registered their unanimous complaint against the provisions of growing trees in specifically reserved plots of at least 1 hectare stipulated by Capital subsidy scheme. This prohibits them to make alternative uses of the reserved land for recurring cash flow incomes of seasonal crops. They therefore have pressed their demand that new schemes of the Government should release their existing conditions of reserved plantation plots and should allow the farmers to grow mango trees on bunds and borders of the existing cultivable land plots. A few respondents were however of the opinion that ‘bund’ areas are hollow and they are vulnerable to the nuisance of white mice which generally eat away the roots of Alphonso mango trees,

therefore according to them land plots are preferable to bund areas. This group is in minority. We also found that most of the respondents have allocated their wasteland plots for mango plantations. About 25-33 percent i.e. 1/3 to 1/4 of the land of the respondents in this region was found to be allocated for mangoes.

4.2 The Pre And Post Diversification Cropping Pattern In Mulshi Region. (Kule- Bhalgudi, Belewade villages)

Tables 7.12 A and 7.12 B give the detailed break up of the pre and post agricultural diversification cropping pattern of the group of farmers in the Mulshi region.

A. Kule – The cropping pattern in the Kule village of the Mulshi region prior to diversification was dominated by rice, *vari*, *nachani* and *kulith* in the kharif season. In the rabi season the 2 dominant crops were wheat and gram. The major cash crops of this region are sugarcane, onion and groundnuts (see table 7.12 A.) Diversification into horticultural crops was found to be a very recent phenomenon of the 1980's and 1990's. Diversification in favour of vegetables was found to be negligible mainly due to water scarcity. However, the respondents of this region have diversified into Alphonso mango cultivation and a few other fruit crops in the 1980's and 1990's, mainly due to the subsidy schemes of the Government of Maharashtra. The new cropping pattern in the post diversification period therefore includes vegetables to limited extent and fruits specially Alphonso mangoes to a significant extent. This decision of the respondents, to adopt mango cultivation has been guided mainly by the need to enhance and stabilise their farm incomes.

B. BHALGUDI: In this village of the Mulshi region the major kharif crops prior to the diversification were rice, bajra, *kulith*, *nachini*, *math* and the major crops of the rabi season were wheat, jowar and gram. The main cash crops of this region include sugarcane, groundnut and pulses, most of the farmers of this region have very small holdings of about 4-6 acres in hilly undulated areas with low fertility soil and water shortage. Though this village has a percolation tank it is not of much use to the Bhalgudi farmers because their land holdings is above the altitude of the catchment area. In spite of constraints of water, irrigation and soil, these farmers in the very recent years i.e. mainly 1980's & 1990's diversified into vegetables and fruit crops in order to increase and stabilise their incomes and use their wasteland.

The cropping pattern of these farmers in the post diversification period includes the traditional crops as well as vegetables like tomatoes, brinjal, capicum, chillies, and fruits i.e. mainly Alphonso mangoes and chikoo, ber, jackfruit to some extent. Only one

farmer was found to have grown cashewnuts on an experimental basis. (See table 7.12 B respondent number 15). Diversification into Alphonso mangoes in this region again has been promoted by the government of Maharashtra under its the subsidy scheme of early 80's. The soil, and climatic condition of this village was found to be suitable for mango cultivation by the department of horticulture, Pune district.

Intercropping was found to be undertaken by only one farmer in the Kule- Bhalgudi group of villages, (respondent No. 2) the inter crops grown were fodder & maize. Knowledge of intercropping to ensure a flow of income in the gestation period of fruit crops was found to be absent in this region.

C. BELEWADE: The traditional cropping pattern in this village is dominated by rice, nachani, pulses, bajra in the kharif season, and the main rabi crops are wheat, gram and jowar. This region has been having mango plantation since 1960's - 1970's. (i.e. both Raiwal and Alphonso mangoes). The diversification in cropping patterns in this region was found to be towards vegetables like brinjal, cucumber, tomato, onions, green peas, lady finger, potato, grafted superior quality Basmati rice and guava. As already mentioned this region has the advantage of irrigation from the percolation tank.

**Table 7.12 (A) Pre-Diversification Cropping Pattern: Mulshi Group
(Kule, Bhalgudi, Belewade Villages)**

Respondent No.	Kharif	Rabi
KULE BHALGUDI SUB GROUP		
1	Rice	Wheat, Gram
2	Rice, Vari, Nachani, Kulith	Jowar, Gram
3	Rice	Wheat
4	Rice, Kulith, Matha	Wheat
5	Rice, Vari, Nachani	Wheat, Gram
6	Rice	Jowar, Wheat, Gram
7	Rice, Nachani	Jowar, Wheat
8	Rice, Bajra, Kulith, Groundnut	Wheat, Gram, Jowar
9	Rice, Bajra, Nachani	Wheat/Jowar
10	Rice, Bajra, Math, Kulith	Wheat/Gram
11	Rice, Bajra, Math, Kulith	Wheat, Gram
12	Rice, Vari, Bajra	Wheat, Gram, Jowar
13	Bajra, Rice, Math	Jowar, Gram, Wheat
14	Rice, Vari, Nachani	Jowar/Wheat
15	Rice, Bajra, Math, kulith	Wheat/Gram
BELEWADE SUBGROUP		
16	Rice, Masur, Nachani	Wheat/Jowar/Gram
17	Rice, Nachani	Wheat/Jowar/Gram
18	Rice, Nachani, Masur	Wheat/Jowar/Gram
19	Rice, Bajra, Pulses	Wheat/Jowar/Gram
20	Rice, Nachani	Wheat/Jowar/Gram
21	Rice, Nachani, Bajra	Wheat/Jowar/Gram

Table 7.12 (B) Post Diversification Cropping Pattern: Mulshi Group (Kule, Bhalgudi, Belewede Villages)

Respondent No.	Kharif	Rabi	Other Diversified Crops
KULE, BHALGUDI SUBGROUP			
1	Rice	Wheat & Gram	Sugarcane, Onion, Groundnut, Mangoes, Coconut
2	Rice, Vari, Nachani, Kulith	Jowar, Gram, Onion	Groundnut, Mangoes, Vegetables
3	Rice	Wheat	Onion, groundnut, Pulses, Vegetables
4	Rice, Kulith, Matha	Wheat	Mangoes (Hapus, Payari) Onion
5	Rice, Vari, Nachani	Wheat, Gram	Mangoes (Hapus, Payari), Groundnut, Onion, Pulses
6	Rice	Jowar, Gram, Wheat	Onion, Pulses, Mangoes
7	Rice, Nachani	Jowar, Wheat	Onion, Groundnut, Mangoes
8	Rice, Bajra, Kulith, Groundnut	Wheat, Gram, Jowar	Onion, Groundnut, Pulses, Mangoes
9	Rice, Bajra, Nachani,	Wheat, Jowar	Onion, Groundnut, Vegetables, Mangoes
10	Rice, Bajri, Math, Kulith	Wheat, Gram	Groundnut, Pulse\$, Vegetables – Tomato, Brinjal, Capsicum, Mangoes
11	Rice, Bajra, Math, Kulith,	Wheat, Gram Jowar	Onions, Groundnut, Pulses, Mango
12	Rice, Vari Bajra	Jowar, Gram, Wheat	Pulses, Mangoes
13	Bajra, Rice, Math, Kulith	Jowar, Wheat	Groundnut, Vegetables – Tomatoes, Mangoes Onion, Groundnut, Pulses, Chilies, Tomatoes,
14	Rice, Vari, Nachani	Wheat, Gram	Mangoes, Jackfruit Sugarcane, Onions, Groundnut, Pulses, Vegetables – Tomato, Brinjal, Chilies, Cucumber, Green peas,
15	Rice, Nachani	Wheat, Gram	Mangoes, Cashewnut, Chikoo, Ber, Jackfruit, Almond.

BELEWADE SUBGROUP			
16	Rice, Nachani	Wheat, Jowar, Gram	Onions, Groundnuts, pulses, Mangoes
17	Rice, Nachani,	Wheat, Gram, Jowar	Onions, Groundnut, Pulses, vegetables, Mangoes
18	Rice, Nachani.	Wheat, Jowar, Gram	Onion, Groundnut, Pulses, Brinjal, Tomato, Peas, Lady Finger, Potato, Pakistan Basmati, Payari, Hapus Mangoes
19	Rice, Bajra, Masur	Wheat, Jowar, Gram	Vegetables – Brinjal, Cucumber, Tomato, Onion, Groundnut, Pulses, Mangoes
20	Rice, Nachani, Pulses	Wheat, Jowar, Gram	Onion, Groundnut, Pulses, Vegetables, Mangoes
21	Rice, Nachani, Bajra	Wheat, Jowar, Gram	Onion Pulses, Vegetables, Mangoes, Guava

5. SALIENT FEATURES OF THE JUNNAR REGION.

5.1 Introduction

This section deals with the salient features of the Junnar region. A detailed profile of the farmers in this region, the size of holdings, irrigation facilities, cropping pattern in the pre and post diversification period, their experiences with horticultural diversification etc. are provided below.

A list of beneficiaries of the CSS of the early 1980's was obtained for the Junnar Area from the Department of Horticulture, Pune District. These beneficiaries had availed of the scheme mainly in 1985-86. These beneficiaries belong to two distinct groups of the Junnar region i.e. the Parunda and Vaishnavwadi villages and Bori-Budruk village, (which is about 12 kms. on the Northeast direction from Narayangaon). The list of beneficiaries recorded in the scheme from this region consisted of 30 respondent framers from both the areas. Of these 30 farmers detailed data was collected from 11 farmers of Bori Budruk village and 13 farmers from the Parunda, Vaishnavwadi villages. The analysis is therefore based on the data provided by a total of 24 farmers from the Junnar region (inclusive of both sets of villages). Both Parunda and Vaishnavwadi villages are located in western hilly areas of the Junnar region and have remained backward in a number of respects such as agriculture, infrastructure, health, first aid centers, schools, economic opportunity etc. The Vaishnavwadi village has

neither irrigation, nor road transport facilities. Village Parunda, however is at the lower plateau near Vaishnavwadi and is better connected to the Junnar city by road transport and communications.

Bori Budruk on the other hand is a prosperous village having very good facilities of canal irrigation, electricity, roads, banking storage and marketing facilities. The Bori village is situated at about 10 kms. away from Narayangaon and only 3/4 kilometers away from Aale-phata the main transport junction on Pune-Nasik and Nagar-Bombay highway. There are a number of agriculturally developed villages in its periphery like Belhe, Bori- Khurd etc. Bori- Budruk is located in the plains and is gifted with rich, black and fertile soil. The water-table is also favourable, the villagers can get water in their wells at the depth of 20 to 40 feet. Vishnavwadi/ Parunda villages like any typical Sahyadri Maval village gets a very heavy rainfall of more than 100/150 inches during monsoons but becomes completely arid after February/ March of every calendar year. Two extreme cases of villages (in the same Taluka/region of Junnar), were deliberately selected to project polar differences in their agroclimatic conditions, ecology, water availability, experience in progressive agriculture, transport/ communication facilities etc.

Observations on Data Received from 24 Respondents of Bori Budruk, Parunda and Vaishnavwadi Villages of Junnar

Table 7.13 Classification Of Respondents On The Basis Of Age

Age Group	No. of Respondents	Percentage to Total
20-30	Nil	Nil
31-40	1	4.1
41-50	10	41.6
51-60	12	50
61 and above	1	4.1
TOTAL	24	100

Out of the 24 respondents, 12 i.e. 50 per cent are from the age group of 51-60, 10 respondents belong to the age group of 41 to 50 years. There was one respondent each from age group 31 to 40 and from age group 61 and above. The majority of the respondents thus belong to the senior age groups above 40 years.

Table 7.14 Classification of Respondents on the Basis of Educational status

Level of Education	No. Of Respondents	Percentage to Total
Primary	4	16.66
SSC level	3	12.5
Graduation	1	4.16
No Education	16	66.66
TOTAL	24	99.98

Only one respondent is a BHMS graduate (a lady doctor) who has ventured to grow Alphonso mangoes by availing the benefits of state subsidy scheme in 1985; (with the active support of her doctor husband). Out of remaining 23 respondents, 4 have completed their primary education and 3 have completed secondary education. The rest of them, i.e. 2/3rd of them have no education, majority of whom belong to the remote village of Parunda- Vaishnavwadi.

Table 7.15 Classification of Respondents on the Basis of the number of family members

Family Size(No. of members)	No. Of Respondents	Percentage to Total
1-2	4	16.6
3-5	18	75
6-8	-	-
9-11	-	-
12 and above	2	8.3
Total	24	99.9

The dominant family size group of the respondents is between 3 to 5 members, only two families are really in the large family category with more than 12 members.

Table 7.16 Classification of Respondents on the Basis of Land Holdings (land holdings in acres)

Size of Landholdings	No. Of Respondents	Percentage to total
0-5	17	70.8
6-10	1	4.1
11-15	2	8.3
16-20	2	8.3
21 and above	2	8.3
Total	24	100

17 out of 24 respondents own land holdings which are very small viz. 1 to 5 acres, these constitute 70.8 percent of the total respondent. One respondent was found to belong to the small category i.e. 6-10 acres constituting 4 percent of the total. Therefore approximately 75 per cent are marginal small holders. There are only 2 respondents whose land size is more than 21 acres. 6 out of 24 i.e. 25 per cent have land holdings larger than 11 acres. Since majority of them are small holders, they have availed of the benefits of the subsidies for horticultural development available from CSS (1981-82) and also under the EGS linked Horticultural Development programme (1991). Infact the target group of the above mentioned schemes are the small and marginal farmers apart from the SC/ST and other weaker sections of the community. Promotion of fruits has been identified as a means to increase income of this group of farmers and to provide opportunity to make better utilisation of their land.

The classifications of respondents on the basis of their land being irrigated, unirrigated, or in the waste land category is provided in Table 7.17 given below.

As can be seen from the table 7.17 given below the Bori village has a very high percentage of irrigated land i.e. amounting to 51.6 percent of the total land considered in this study. In fact in the case of 7 respondents, their entire land holding is irrigated. The Bori village therefore enjoys a very high level of irrigational facilities and only 4.2 percent of the total land holdings in this area was found to belong to the category of wasteland. The high level of irrigational facility is thus a major cause of progressive and successful agriculture in this region.

In the group of Parunda-Vaishnavwadi villages, the percentage of irrigated and unirrigated land has been calculated excluding the case of respondent No. 12, for reasons given in the note provided at the end of table 7.17. (Please see note of the table 7.17). Out of the total 73 acres holdings (i.e. subtotal of group excluding respondent no 12.) only 15 acres receive well irrigation. Rain-fed agriculture dominates with a share of 64.38 per cent, the percentage of irrigated land is only about 17.81 per cent due to the village being situated in the hilly regions and due to its remoteness from the main city. 15 per cent of the total land belongs to the category of wasteland. For both the groups of villages of Bori and Parunda and Vaishnavwadi taken together 84 acres out of 206 acres i.e. 40.7 per cent has irrigation facility, 49.5 per cent is unirrigated and 9.7 per cent falls in the wasteland category. It is thus all the more necessary to encourage adoption of horticultural crops, to provide an additional source of income to the farmers.

Table 7.17 Classification of Households on Basis Of Irrigated/ Non-irrigated Land

Respondent no.	Total Area (Acre)	IRRIGATED AREA (Acres)	NON-IRRIGATED AREA (Acres)	WASTELAND (Acres)
Bori Village				
1	13	-	13	-
2	5	5	-	-
3	25	15	10	-
4	5	5	-	-
5	5	5	-	-
6	40	10	25	5
7	5	1	4	-
8	5	5	-	-
9	5	5	-	-
10	5	5	-	-
11	5	5	-	-
TOTAL I	118	61 (51.6%)	52 (44.06%)	5 (4.2%)
VAISHNAV WADI/ PARUNDA VILLAGES				
*12	15	10	3	2
13	5	1	4	-
14	5	1	4	-
15	5	1	4	-
16	5	1	2	2
17	20	5	10	5
18	5	-	5	-
19	4	4	-	-
20	5	-	4	1
21	2.5	-	2.5	-
22	4	-	4	-
23	2.5	-	2.5	-
24	10	-	5	5
SUB TOTAL (Excluding No.12)	73	13 (17.8%)	47 (64.38%)	13 (15%)
TOTAL II	88	23	50	15
GRAND TOTAL I+II	206	84 (40.7%)	102 (49.5%)	20 (9.7%)

(Figures in brackets indicate percentage of irrigated, unirrigated and wasteland to total land)

*Note : Though respondent no. 12 belongs to Parunda region, his total land, irrigated land and other features are completely different from the common group of Parunda - Vaishnavwadi farmers. As such including him in the Parunda group gives a misleading result regarding the percentage of irrigated and unirrigated land in this region. Hence for this part of the analysis his case is kept aside. The percentage of irrigated and unirrigated area as been calculated as a percentage of the total area in Parunda excluding the area of respondents No. 12. [This respondent has been considered as an outlier in annexure 2]

Horticultural crops, mainly fruits, not only have the potential of being grown under such conditions, (i.e. some fruits can survive even under moisture-stress

conditions), but such crops are also being promoted to utilise the wasteland which otherwise has little or no utility.

Table 7.18 Classification of Respondents on Basis of Source of Irrigation

Source of Irrigation	Nos. Of Respondents	Percentage to Total
Pumpset PVC pipe	18	75
Well	24	100
Lift irrigation	-	-
Sprinkler	-	-
Drip	6	25
Earthen pots	-	-
River	-	-
Physical transportation of water	9	37.5
Any other irrigation	-	-
TOTAL	-	-

Note: Since a number of respondents have more than one source of irrigation, the total does not add up to 24.

All the respondents (i.e. 24) depend on well-irrigation, however in the Vaishnavwadi, Parunda villages the water supply in the well was not adequate. Pumpset, well-irrigation with PVC pipe-lines, was the most common form of irrigation method. 9 farmers from the Parunda, Vaishnavwadi villages have reported to have physically transported water in the initial years of the mango plantations. Only 6, i.e. 25 per cent from Bori area have introduced 'Drip Irrigation' mainly for their grape-crop, which is extremely necessary for this crop which requires continuous irrigation.

Table 7.19 Classification of Respondents On the Basis of Soil Type and Quality

Type	No. Of Respondents	Percentage to Total
Red	-	-
Black	11	50
Ashgrey with limestone	-	-
Brown	2	-
Fertile	-	9
Red Bhurkad (Inferior Quality)	9	-
TOTAL	22*	-

* 2 respondents have not reported the quality of soil

Out of the 24 respondents, 11 from Bori group own land of a very black and fertile type. 2 respondents from Parunda have brownish and rocky land, nine from Vaishnavwadi have soil which is red, brown, rocky and of a inferior quality. In fact the experts who have selected Junnar Maval (having red and rocky soil) for horticultural

development prescribe this type of a soil and the hilly region as suitable for not only mango cultivation in particular but a diversified range of horticulture crops. With adequate irrigation facility and training. The western area of Junnar has a tremendous potential for horticultural development.

The following table 7.20 gives the classification of respondents on the basis of fruit crops selected. 20 out of the 24 respondents (i.e. more than 80 per cent) have undertaken cultivation of mangoes under the State Subsidy Scheme. One respondent has opted for guavas, one, for custard apples and 3 respondents from Bori group have shown their interest in Chikoo cultivation, under the CSS (under the CSS a variety of fruit crops can be grown which includes Mangoes, Chikoos, Custard apples, Guavas, Pomegranate, Oranges, Lime etc).

Table 7.20 Classification of the Respondents on the Basis of Selected Fruit Crops

Fruit Crop	No. Of Respondents	Percentage
Mango	20	83
Cashewnut	-	-
Guava	1	4
Chikoo	3	12.5
Coconut	-	-
Custard apple	1	4
Ber	-	-
Any other	1	4
Grapes	2	8.3

Note: since some respondents have grown more than one fruit crop the total will not add up to 24.

Mangoes, was found to be the dominant fruit crop in this region. Alphonso Mango growing, according to the respondents, is not only cost-efficient, but also provides a high level of income. The market (but not the yield) is very certain and the price of mango remains consistently high. The Junnar area has been one of the main suppliers of Alphonso Mangoes next to Konkan, because of its nearness to Bombay market.

Table 7.21 Classification of the Respondents on the Basis of Cash Crops Under Cultivation In the Area

Cash Crops	No. Of Respondents	Percentage to Total
Onion	14	58.3
Groundnut	15	62.5
Pulses (dal)	15	62.5
Sugarcane	5	20.8
Flowers	11	45.8
Vegetables	11	45.8
Total	-	-

Since respondents have grown more than one cash crop the total of respondents does not add up to 24.

Groundnut, Pulses and onion are the most popular cash crops in this region undertaken by about 60 per cent of the farmers investigated followed by onion, flowers and vegetables. Only 20 per cent of the respondents have reported to have grown sugarcane, inspite of the irrigation facility in this region. In the early 1980's however the sugarcane crops was popular in this region but more recently there seems to be a preference for horticultural crops mainly on account of the lesser water requirement for these crops.

5.2 The Pre and Post Diversification Cropping Pattern in Bori-Budruk, Parunda and Vaishnavwadi Villages, Junnar

Table 7.22 A and Table 7.22 B provides a detailed break up of the pre and post diversification cropping pattern of the group of the farmers/respondents in the Junnar region.

Bori-Budruk

In Bori-Budruk villages; where land is fertile and irrigated, agriculture is practiced with modern methods for over 40 years. The pre-diversification cropping pattern prior to 1980s was as follows (See table 7.22). The main crops of the kharif season in this village was found to be bajra, groundnut, pulses and gram. Bajra is the main staple food-grain of the peasantry; groundnut and pulses was partly used for family consumption and a major part of these were for sale in the market to provide and additional source of cash- income flow. The yeild of pulses was found to be very limited. The main rabi crop in the pre diversification period in this area were reported to be jowar, wheat and gram. In the post 80s, when well-irrigation became more energy-efficient due to rural electrification and due to the subsidised supply of electricity, the peasants began to diversify their crops due to a relatively more assured supply of water throughout the year.

Table 7.22a Cropping Pattern in the Pre and Post Diversification Period in the Bori/Parunda/Vaishnavwadi villages of Junnar

A. BORI-Village

Respondent No.	Pre-Diversification Crop-Pattern (Pre 1980's)		Post Diversification Crop-Pattern (Post 1980's)		
	Kharif	Rabi	kharif	Rabi	Other diversified crops
1	Bajra, Groundnut, Pulses	Jowar, Wheat, Harabara, Gram	Bajra, Groundnut, Onion, Pulses	Vegetables, fruits,	Other fruits and Mangoes.
2	Bajra	Wheat, gram	Bajra (Sugarcane throughout the year)	Wheat, Gram.	tomato, brinjal, onion, cauli flower, walwad, guava, chikoo and mangoes.
3	Bajra – pulses	Jowar, wheat, gram	Bajra, pulses (Sugarcane throughout the year)	Onion, groundnut, pulses.	Vegetables, mangoes
4	Bajra, pulses, groundnut	Wheat, jowar	Bajra, Pulses (Sugarcane throughout the Year)	Groundnut, pulses.	Vegetables, grapes, pomegranate, flowers, walwad, (beans), mangoes.
5	Groundnut, Bajra	Jowar, wheat, gram	Bajra and pulses	Onion.	Vegetables, mangoes.
6	Groundnut, pulses, bajra	Jowar, gram, wheat	Bajra and pulses	Onion.	Vegetables, mangoes.
7	Groundnut, pulses, bajra	-	Bajra and pulses	Onion.	Vegetables, mangoes

8	Groundnut, pulses, bajra	-	Bajra and pulses.	-	Mangoes
9	Bajra, Pulses	Wheat, Jowar	Bajra and pulses	Onion, groundnut.	Vegetables, mangoes chikoos.
10	Bajra, Pulses	Wheat, Jowar	Bajra and pulses and (Sugarcane through out the year).	Onion, groundnut.	Vegetables, mangoes chikoos.
11.	Bajra, Pulses	Wheat, Jowar	Bajra and pulses and (Sugarcane through out the year).	Onion, groundnut.	Vegetables: Tomatoes, Brinjal, walwad (beans), capsicum, lady finger. Fruits: mangoes, chikoos, guava, bananas, custard apple, pomegranate. Flowers.

Table 7.22b B: Parunda/Vaishnavwadi Villages

Respondent No	Pre-Diversification Pattern (Pre 1980s)		Post-Diversification Cropping Pattern (Post 80s)		Other diversified crops
	KHARIF	RABBI	KHARIF	RABBI	
12	Bajra, rice, pulses, groundnut	Jowar, wheat, gram	Bajra, Groundnut, Pulses	Onion and pulses.	Sunflower, Fruits: chikoo, sitaphal, pomegranate, mangoes. vegetables : brinjal, capsicum, tomato
13	Bajra, pulses, groundnut	Jowar, wheat, gram	Bajra, Groundnut, Pulses	Pulses.	Vegetables, mangoes.

14	Bajra, pulses, groundnut	Jowar, wheat, gram	Bajra, Groundnut, Pulses	Pulses.	Vegetables, mangoes
15	Bajra, pulses, groundnut	Jowar, wheat, gram	Bajra, Groundnut, Pulses	Pulses.	Vegetables, mangoes.
16	Bajra, pulses, groundnut	Jowar, wheat, gram	Bajra, Groundnut, Pulses	Pulses.	Vegetables, mangoes.
17	Bajra, pulses, groundnut	Jowar, wheat, gram	Bajra	-	Vegetables – (corriander) and tomatoes. Fruits: mangoes, chikoo
18	Bajra, pulses, groundnut	Jowar, wheat, gram	Onion	-	Mangoes.
19	Bajra, pulses, groundnut	Jowar, wheat, gram	-	-	Mangoes.
20	Bajra, pulses, groundnut	Jowar & wheat	Bajra, groundnut	Jowar.	Mangoes (non-survival)
21	Bajra, pulses, groundnut	Jowar & wheat	Bajra, groundnut	Jowar.	Mangoes (non-survival)
22	Rice, bajra, pulses	Wheat, gram	Bajra, groundnut	Jowar, gram.	Mangoes (non-survival)
23	Rice, bajra, pulses	Wheat, gram	Bajra, groundnut	Jowar, gram	Mangoes (non-survival)
24	Rice, bajra, pulses	Wheat, gram	Bajra, groundnut	Jowar, gram	Mangoes (non-survival)

In the immediate post 80s, the average farmer continued to grow nearly the same crops as earlier. Therefore even during the early 80s, the kharif and rabi cropping pattern did not undergo any major changes.

Some notable changes emerged in the post 80s in this region which had an impact on the cropping pattern. These include

- a. Foundation of a co-operative sugar factory viz. Vighnagar Co-operative Sugar Society, Ozar, which stimulated the farmers from this Junnar and also the Narayangaon area, (which is close to Bori), to cultivate sugarcane in order to secure an assured income flow.
- b. Construction of number of dams viz. Manikdoh, Udgaon, Kukadi, Pimpalwadi, etc. within the region, this insured an additional source of irrigation to the farmers of this region.

As a result of these two developments, in 1980s a number of farmers diversified into production of sugarcane in the village of Bori. A change in the traditional cropping pattern which earlier was dominated by foodgrains, thus took place. In late 80's and post 1990's some of them further diversified into fruits and vegetables mainly fruits like guavas, mangoes, grapes, chikoos, and pomegranates and vegetables like tomatoes, green beans, brinjal, capsicum, export quality chilies, lady fingers. (Infact there have significant grape exports from this region in the early 1990's). This was possible obviously due to the assured water supply which was the result of the developments of irrigation facilities in this region (mentioned above).

Among the fruit crops, mangoes have been found to be very popular among the group of the respondents studied and all of them have availed of the benefits of the various Schemes to promote horticultural development undertaken by the State for example Capital Subsidy Scheme and EGS 1992 scheme and the Social forestry scheme. Mangoes provide a certain and moderately high income flow once in two years, (which is a pattern of yield of Alphonso mangoes). In most cases the marketing of mangoes is managed by the 'Dalals' who enter into the pre-harvest contract with the farmers. The Bori village also has the special advantage of being close to the Bombay market, (via Ane-Malshej ghat), which also makes it possible to maintain direct contact with the Bombay dalals for the farmers. Hence, the farmers of this region find it specially beneficial to diversify into fruits, vegetables and even flowers which have a very dependable Bombay market. However as regards flowers, it is a newly developing area and among the respondents very few have as yet taken up this venture on a large scale.

The process of agricultural diversification, as seen, in this region has thus taken place during the last two decades.

PARUNDA AND VAISHNAVWADI VILLAGES

In this group of villages located in hilly areas, the land is undulated, the soil is rocky and hard and inspite of heavy rainfall in Monsoon, there is acute scarcity of water from February onwards. Agriculture in this area is backward, traditional, and is dominated by subsistence farming. These villages also lack in serviceable roads and communication facilities. The cropping pattern of the majority of farmers (who are mostly subsistence agriculturists) prior to 1980s was dominated by the subsistence needs, (see table 7.23). During the pre-diversification period, the average farmer grew mainly bajra, rice, pulses and groundnut during the kharif season. In the rabi (winter) season, the main crops were jowar, wheat and gram. The average size of the holding is relatively smaller than that of Bori farmers. After 1980s' when some of the farmers started well-irrigation equipped with electric pumpsets and pipeline due to percolation tanks which were constructed in the lower plains; the cropping pattern of Parunda did undergo notable changes. But the cropping pattern of Vaishnavawadi shows only marginal and insignificant changes restricted to the horticultural activities promoted by capital subsidy scheme of 1985, EGS Scheme of 1991, and the social forestry scheme of 1980s.

In case of the Parunda village, the present diversified cropping pattern shows that in kharif season most of the farmers continue to grow bajra and groundnut; few have started cultivating tomatoes and onions in the kharif season. As far as the winter (Rabi) crop is concerned, there is a considerable diversification into vegetables like brinjal, capsicum, tomato, onion etc. and fruit crops like custard-apple, pomegranate and especially mangoes due to the state government subsidies. Although diversification towards horticultural crops did commence in 1980's, success in this ventures was found to be limited specially in the Vaishnavwadi village. The respondents of the Parunda village have reported some success as far as vegetables and fruit crops are concerned. However in the Vaishnavwadi village due to the extreme water scarcity, lack of technical knowledge of cultivation of the fruit crops, in adequate fertilizers and lack of tiny care and extreme poverty most of the mango plantations could not survive. In addition to these reasons a number of the farmers have reported to have lost their land which was in the catchment area of major irrigation project in the region.

Further there has been a complete lack of extension services offered by the State Government and its departments for giving proper training to the beneficiaries of the schemes in the fields of administering timely doses of insecticides, pesticides and medicines therefore ineffect, in the Vaishnavwadi, Parunda group of villages there has hardly been any effective and successful diversification and changes in the cropping pattern. This area needs a special consideration to make the horticultural diversification more fruitful, which includes developing irrigation facilities, increasing extension services and providing the technical knowledge to the farmers of this area regarding cultivation of fruit crops.

6. 1 SALIENT FEATURES OF THE DRY AREA OF SHIRUR REGION.

The taluka of Shirur including Supe lies to the North-east of Pune, it is almost wholly a dry land area with rainfall ranging between 25-50 cm. The land is of inferior quality with rocky soil. The farmers of Shirur region however have adopted horticultural crops chiefly after early 1960's and the experiments with horticultural development initiated by the earlier pioneers in this region have spread mainly during the eighties. Majority of the successful farmers have adopted horticultural crops of their own accord during the 1960's and the seventies. Those who have adopted horticultural in the 1980's can be classified into two types: Those who have adopted it on their own and those who have been induced by the Capital Subsidy Scheme and the successful experiments of farmers in their region. Without exceptions, we found that the farmers who had adopted horticultural crops on account of the capital subsidy scheme have not been successful in this region. In fact as many as 20 farmers who have been recorded as beneficiaries of capital subsidy scheme in the department of horticulture (Pune) were found, when contacted, neither to have taken the subsidy nor employed any part of their land for horticulture. Amongst those who had actually adopted horticulture, on account of inducement of capital subsidy scheme, majority were found to be unsuccessful largely due to severe water shortage in the last 5-6 years in this region. Some farmers who had adopted horticulture on their own initiative did report success. However, in the last four years even these farmers have reported very low earnings due to the peculiar drought conditions.

The primary survey in the Shirur area covered 6 villages viz. Shirur, Kasegaon, Ranjangaon, Sanaswadi, Lonikand, and Bhanbarde. A list of beneficiaries of the capital subsidy scheme who had taken up horticultural ventures during early 1980's in the Shirur taluka was obtained from the Department of Horticulture, Pune District.

The coverage of the study of this region pertains to enquiries from 22 farmers. Of these, 13 farmers reported complete failure of the horticultural plantation undertaken under the scheme due to acute water shortage. Hence details of the plantation regarding cost of production, revenue, output, etc. could be obtained in effect only from nine farmers. Of these nine farmers 2 respondents, are extremely progressive and have been kept aside to maintain uniformity. The total area of the 9 farmers taken together is 315 acres and excluding the two progressive farmers the area gets reduced to 103.5 acres (which means between these two farmers they own 211.5 acres and hence the reason for their exclusion.) Further they have a family tradition of growing foodcrops in a very progressive manner, as such they do not fall into the category of other respondents. The land quality is very poor for most of the farmers mainly, rock and dry. Orange is the dominant fruit crop in this region, alongside fruits like chikoo, ber, lime, coconut, pomegranate, guava, and to some extent mangoes are also grown. Under the EGS scheme of the Government of Maharashtra, custard apple has been specially encouraged due to its very hardy nature and its potential of being grown in rainfed dry areas like Shirur.

6.2 The Pre And Post Diversification Cropping Pattern In The Shirur Region

The traditional foodgrain crops in this area are jowar, bajra, and grams, onion and groundnuts are the major cash crops. There have been 3 phases of diversification into fruit crops in this area - Phase I began in 1970 when the well established farmers of this region began to modernise and commercialize their main fruit crop i.e. oranges. Phase II was the period between 1972-75 to 1985-86 when the farmers, either on their own initiative, or under the capital subsidy scheme took up fruit crop cultivation and phase III began in post 1990-91 period when the farmers took to fruit cultivation under the EGS Horticulture linked development scheme.

The diversified cropping pattern in this region including a few dry-area fruit crops i.e. oranges, custard apple, mosambi, chikoo, pomegranate, guava, ber, lime, coconut to some extent and very few cases of mango was also reported to be grown. The dominant fruit crop of this region however was found to be oranges, followed pomegranate, custard apple and mosambi. The Shirur region had been identified under the capital subsidy scheme of 1980's and later under the EGS scheme as a part of the policy of promoting horticultural crops in the dry and drought prone regions of the state. As such, though the scheme has reached the remotest area/villages of this region, success could not be obtained mainly due to the extreme water scarcity and prolonged

drought conditions. However there are cases of some well established farmers of this regions who have had success in fruit farming, (i.e. mainly oranges), which has been a family tradition since a number of years. With some basic minimum irrigation and water supply facility, this region does possess the potential to develop the dry –area fruit crops. The concentration of the scheme as was suggested by the respondents should be on providing some means of irrigational facilities before venturing on developing the fruit crops. In spite of the unfavourable condition, horticulture in this region seems to be the only hope to augment income of the farmers and in the ultimate analysis augment his wealth and income.

OBSERVATIONS ON THE SALIENT FEATURES OF THE STUDY REGIONS

In all the three regions studied (Mulshi, Junnar and Shirur), diversification into horticultural crops has mainly taken place over the last 2 decades, beginning in 1980's. (though there have been cases where the process diversification began as early as 1960's, however such cases belonged to farmers who have had a family tradition of growing horticultural crops). In all the study regions, the initiative of diversification has provided by the state of government through its subsidy schemes. Success in such horticultural ventures has not been of an uniform nature or degree in the regions studied. The horticultural ventures have reported greater success in areas where it has been supported by irrigational facilities, knowledge of fruit farming and knowledge of care of these crops. Hence the Bori-Buduk village of the Junnar region has reported maximum success, since it is supported by adequate infrastructural facilities. On the other hand in the case of Parunda & Vaishnavwadi villages of Junnar, which lacks in the above facility, the rate of failure of horticultural ventures was seen to be very high. These aspects become evident in the succeeding chapters 8 and 9.

CHAPTER 8

COSTS, VOLUME AND REVENUE (CVR) ANALYSIS OF SELECTED FRUIT CROPS IN THE STUDY REGIONS

1. INTRODUCTION

Since the success of the horticultural venture has to be judged in terms of the economic returns it provides, this chapter deals with the Cost, Volume and Revenue (CVR) analysis and pay back period analysis of the selected fruit crops i.e. mangoes, grapes and oranges in the three study regions.

Such an analysis is based on the data provided by the farmers (beneficiaries in the respective regions), about the initial year costs, the recurring costs, the number of trees planted, the area under the fruit crop; output per tree, price per dozen of fruits, the yield pattern of fruit trees etc. This kind of an exercise is useful not only for understanding the viability of such projects but also explains the pay back period, the profitability, and the revenue patterns in such undertakings.

Before proceeding with the revenue and cost analysis of mangoes (Alphonso); it is necessary to clarify certain aspects related to the life cycle of this fruit crop, the yield pattern, the gestation period, and some techno-agronomical details relating to this fruit crop. (This information was gathered from the respondents of the various study regions).

(i) Alphonso mangoes begin to yield returns in the fifth year after planting the tree. (Sometimes if the agroclimatic conditions are not favourable, the yield of the fruits would begin only in the 6th or 7th year).

(ii) Initially, the yield in the 5th year is low at about 50 fruits per tree, which increases to 100 fruits in the 6th year, 150 fruits in the 7th year and further to about 200 fruits in the succeeding years. This tree has generally a productive lifetime of 35 years, (on the conservative side).

(iii) Alphonso mangoes generally yield a 'good crop' every alternative year.

(iv) Alphonso mangoes requires comparatively low initial investment costs, (as compared to grapes which have very high capital investment), the recurring expenses are also relatively low but would depend on the amount and quality of fertilisers, insecticides, pesticides used. These costs would thus vary among individual farmers.

(v) For good yields it is necessary to have technical knowledge of growing this

fruit crop, in absence of which, the yield and the quality of the crop would suffer.

2. COST AND REVENUE ANALYSIS OF MANGOES IN THE MULSHI REGION.

The following section deals with a CVR analysis of mangoes (Alphonso) based on the data provided by the farmers of the Mulshi group of villages which includes Kule, Bhalgudi, and Belewade villages. The reference year is June - July 1995 - 1996.

2.1 Analysis Of Revenues From Mangoes (Kule-Bhalgudi Villages)

Enquiries pertaining to 15 respondents was undertaken from this group of Mulshi villages. This subsection provides a detailed analysis of only 14 respondent farmers since one individual farmer from the group is a beneficiary of the EGS linked horticultural development programme, and hence has been excluded from the cost- benefit analysis because of his mango plantation not having completed the gestation period. (see chapter 7, section 4.1 for his experience with agricultural diversification)

Information regarding the details of the year of mango plantation, area under mangoes, the number of trees planted, the rate of survival of the trees, the fruit bearing trees, the price of mangoes, and the resultant revenue are provided in the table 8.1 given below. (It should be noted that information reported by the respondents regarding yield per tree of mangoes is an estimate of the yield, on an average per year, since Alphonso mangoes yields a 'good crop' only in alternate years).

From table 8.1 the following observations can be noted.

1. The total number of mango trees planted by the 14 beneficiaries is 1400, on a total of 28 acres of land. Of this, 718 trees survived i.e. the rate of survival works out to be 51.28 per cent. However, only 348 trees were reported to be fruit-bearing i.e. only 24.85 per cent of the total trees planted were seen to bear fruits. The rate of fruit bearing as a percentage of the survived trees is higher at 48.46 percent. The reason given for the low rate of survival was mainly acute water shortage, especially in the initial stages of cultivation, and lack of any significant source of irrigation. The low fruit-bearing rate was explained by lack of timely care, lack of knowledge about the fruiting process and inadequate nursing of mango trees. Extreme care is therefore necessary for survival of the trees as well as at the fruiting stage.
2. The two respondents no. 2 and no. 6 have shown a 100 per cent rate of survival but even in their case the number of fruit bearing trees is very low. The

rate of survival in this region varies from as low as 23 per cent (respondent No 11) to 100 per cent (respondent No 2 & 6).

3. The average rate of fruit bearing trees as a percentage to the total trees is however extremely low at only 24.85 per cent. This leads to an over all low output, revenue and income flow from the mango plantation in this set of villages of the Mulshi region. Respondent No 9, has infact reported that inspite of having good trees he has not yet got any fruits due to the extreme water scarcity because of his mango plantations being on hilly areas.

4. The average output per tree has been quoted at 57 fruits, i.e. about four to five dozens per tree. Only respondent no. 1 and 14 have quoted an output in the range of 85 to 90 fruits per tree i.e. about 7 to 8 dozens per tree.

5. The average market price which the farmers receive has been quoted at Rs 60 per dozen, with the price ranging between Rs. 55 to Rs. 80 per dozen. Only respondent no. 14 has quoted Rs. 80 per dozen on account of the better quality of his mangoes and better market accessibility and information.

6. Most of the respondents in this have started getting the yield of mangoes only from 1993-94 except for about two to three farmers for whom the yield commenced in 1991 - 92. The characteristic features of the Mulshi region as compared to the Bori village of the Junnar region (discussed in section-of this chapter) is both late fruiting as well as lower yields per tree. Knowledge of fertilisers, insecticides and care of blossoming was found to be lacking in this region which accounts for the above problems.

7. Based on the above data provided by the respondents it was possible to estimate the revenue from mango plantation in this region. The total revenue of these 14 respondents has been calculated at Rs. 125076.7 accruing from a total of 28 acres i.e. a sum of Rs. 4467 per acre (see table 8.1).

This average revenue of Rs. 4467 per acre is quite low. The per acre revenue for the 14 respondents in this region varies between Rs. 677 (respondent no. 5) to Rs. 15000 (respondent no 14). This variation is accounted for by three factors.

a. The survival rate of trees i.e. the ratio of the number of trees surviving to the total number of trees planted.

b. The number of fruit bearing trees.

c. The variation in the yield per tree.

The explanation given for the low level of output accruing to some of the respondents was water shortage, lack of technical knowledge regarding nursing and caring of the trees and the blackening of the blossom of the mango trees.

This, in fact has been a very severe problem in this particular region as a result of which the yield of the mango trees suffers to a great extent. Respondent No. 14, however being a fairly progressive farmer has been able to solve the above problems to a large degree and therefore has been able to enjoy a higher revenue.

It is however necessary to note, that even in this region with low irrigation facilities respondent no. 14 has been able to earn an average gross revenue of Rs. 15000 per acre from the mango venture. This strengthens the need for the strategy of developing horticultural crops in this region to provide additional income to the small farmers.

Table 8.1 Revenue From Mangoes (Kule-Bhalgudi Group Of Villages, Mulshi)
Reference Period 1995-96.

Respondent No.	Nos. of trees Planted	Area under Mango (Acres)	Nos. of trees survived	Nos. of fruit bearing trees	Output per tree (No. of fruits) _E	Market Price per dozen (Rs.)	Total Gross Revenue Per respondent (Rs.) _C
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	100	2	60	25	85	70	12395.8
2	100	2	100	10	40	70	2333.3
3	100	2	80	25	75	60	9375.0
4	100	2	60	40	72	55	13200.0
5	100	2	30	10	25	65	1354.0
6	100	2	100	15	72	66	5940.0
7	100	2	35	30	60	75	11250.0
8	100	2	40	25	72	70	10500.0
9	100	2	40	0	0	0	0
10	100	2	25	20	60	60	6000.0
11	100	2	23	23	48	60	5520.0
12	100	2	25	25	60	56	7000.0
13	100	2	50	50	35	70	10208.0
14	100	2	50	50	90	80	30000.0
Total	1400	28	718 _A	348 _B	-	-	125076.1
Average	-	-	-	-	57	61.2	4467 _D

A) Survival rate as a percentage to total trees planted is 51.28 percent

B) Rate of fruit bearing as a percentage to total trees planted is 24.85 percent, and the rate of fruit bearing trees as a percentage of survived trees is 48.46 percent.

C) Column 8 shows the total revenue on an average per year from the mango plantation of the 14 respondents this is arrived at by multiplying the output per tree into a number of fruit bearing trees and arriving at the total revenue using the market price quoted by the respective respondents.

D) The average revenue per acre has been calculated by dividing the total revenue RS. 125076 by 28 acres which is the total area under mangoes in this study region.

E) The output per tree has been quoted as an average output per annum.

2.2 Analysis of the Cost of Mango Cultivation :

This section deals with a cost analysis of mangoes in the Mulshi region. The analysis is based on the detailed data provided by the 14 respondents on the break-up of costs of cultivating mangoes. The major items of expenditure given by the respondents include cost of saplings, costs of digging pits, costs of organic and

chemical fertilisers, cost of insecticides and pesticides. The cost of water, irrigation, and fencing have not been shown as major heads of expenditure as most of the farmers have physically transported water, for which no clear financial estimate could be provided. The respondent farmers were also unable to impute values to the family labour which was used in the cultivation of mangoes and hence no clear implicit value could be attached to this component of the costs of cultivation of mangoes (for exclusion of imputed value of family labour see chapter 9 section 1). As a result of these omissions, the cost figures provided by the respondents show a lower level compared to those given by the Department of Horticulture. A gross figure stating labour charges and miscellaneous cost has however been provided by the some of respondents which has been included in the costs calculation. A detailed break-up of the cost of cultivation of mangoes for the first and the second years have been given by the respondents (see table 8.2). For the third, fourth and fifth years a flat sum of Rs. 500/- per annum has been quoted by all the respondents, which is used in this cost analysis. According to the department of horticulture in the 2/3 year a sum of Rs.951 per acre is required, and in the fourth, fifth year it amounts to Rs 202 annually (see table 6.9 part I chapter 6). In this manner the total cumulative cost of cultivating mangoes per acre (for a period of 5 years) has been worked out and provided in table no. 8.2. After a period of 5 years, the cost are assumed to remain at Rs 500 per acre, (based on queries from the respondent farmers). [The cost-benefit analysis in chapter 9 has taken into consideration the cash outflows and inflows over a period of 35 years]. For this part of the analysis the total cumulative cost of 5 years is considered which includes the initial capital cost and the recurring costs. This total cost is shown in column 14 of table 8.2.

Observations on Cost Analysis of mangoes

(1) The total cumulative cost of cultivating an acre of mango plantation over a period of 5 years as given by the 14 respondents works out to a sum of Rs. 55410 (see column 14, table 8.2). (2) Thus the average per acre cost of cultivating mangoes over a period of 5 years in this region is estimated as Rs. 3957.85 as a cumulative amount (the same has been given as Rs 5161 per acre by the department see table 6.9 part I chapter 6). The total cost has been calculated for the initial five years because after this period mango start yielding fruits and the cash inflow begins. After 5 years the recurring cost would remain in the range of about Rs 500 per annum per acre. (Information by the respondents).

Table 8.2 Cost of Cultivation of Mangoes. (Kule-Bhalgudi group of villages, Mulshi) Reference Year 1995-96.

Respon-dent No.	Area Under Mango (acres)	BREAK-UP OF COST IN 1 ST YEAR FOR TOTAL MANGO PLANTATION							Total Initial year cost for entire planta-tion (Rs.) [Addition of 3 to 9] (10)	Initial Year Cost (per acre) (Rs.) (10)/(2) (11)	2nd Year Cost (per acre) (12)	Total of 3 rd / 4 th / 5 th Year cost (per acre) E (Rs.) (13)	Total Cost Per Acre (In 5 years) (Rs.) (11)+(12) +(13) (14)
		Cost of sapling (Rs.) (3)	Organic Ferti-lisers (RS.) (4)	Cost of Pits (Rs.) (5)	Chemical Ferti-lisers (Rs.) (6)	Insecti-cides Pesti-cides (Rs.) (7)	Water Charges & Fencing (Rs.) (8)	Misc + Labour Charges (Rs.) (9)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	2	1800	2000	300	100	400	150	300	5050	2525	975	1500	5000
2	2	1000	200	200	400	500	350	150	2800	1400	925	1500	3825
3	2	1000	400	400	200	300	250	100	2650	1325	875	1500	3700
4	2	1500	400	300	100	200	250	150	2900	1450	400	1500	3350
5	2	1200	400	300	400	500	250	-	3050	1525	475	1500	3500
6	2	1450	600	350	200	900	500	-	4000	2000	735	1500	4235
7	2	1200	500	300	100	300	300	200	2900	1450	900	1500	3850
8	2	1300	300	300	100	600	250	150	3000	1500	800	1500	3800
9	2	1400	700	300	200	500	200	-	3300	1650	1000	1500	4150
10	2	1300	400	350	250	500	200	150	3150	1575	1275	1500	4350
11	2	1200	400	300	200	500	200	100	2900	1450	250	1500	3200
12	2	1400	500	300	300	500	250	-	3250	1625	1250	1500	4375
13	2	1000	400	300	400	300	300	200	2900	1450	475	1500	3425
14	2	1800	500	2000	200	-	-	-	4500	2250	900	1500	4650
TOTAL	28	-	-	-	-	-	-	-	-	-	-	-	55410
AVERAGE	-	-	-	-	-	-	-	-	3310.7	1655.35	802.5	1500	3957.85
									A	B	C	D	

Notes: A) Average per acre cost in first year over 14 respondents B) Average per acre cost in second year over 14 respondents C) Average per acre cost in 3/4/5 year over 14 respondents D) Average per acre cumulative cost of 5 years. E) A flat sum of Rs. 500 per annum as recurring expenses for the 3/4/5 year and thereon was quoted by the respondents

(3) The total cumulative cost of cultivating one acre of mangoes over five years in this region varies between Rs. 3200 (respondent no. 11) to a maximum of Rs. 5000 (respondent no. 1) The variation in the cost is explained mainly by variations, (quoted by the respondents), regarding expenditure on digging of pits, on organic and chemical fertilisers, and on insecticides and pesticides. There is a relative uniformity in the cost of saplings which ranges from Rs. 1000 to about Rs. 1500. (Except for two respondents who have quoted the amount as Rs. 1800 for 100 saplings). Clear-cut estimates of expenditure on labour and miscellaneous items were also not provided.

(4). Another large discrepancy noted was that regarding expenditure on digging of pits quoted by respondent no. 14 which is stated as Rs. 1800 for 100 pits, on repeated queries, the respondent still maintained that he had incurred this expenditure, which could be explained as being inclusive of all other labour charges and miscellaneous expenses, for which, this respondent has not quoted any estimate figure.

2.3 The Cost-Revenue and the pay-back period

Based on the above detailed revenue and cost break-up one can draw certain inferences about the net revenue and the pay-back period, of the mango plantations in this set of villages in the Mulshi region. This would also indicate the period in which revenues just cover the costs incurred.

1. The average cumulative cost per acre of mangoes over a period of 5 years, in this region has been calculated at Rs 3957.85, (see table 8.2 column 14 for the average). The average gross revenue per acre, (which occurs generally from the fifth year of mango plantations), was found to be Rs 4467 (see table 8.1 column 9 for average). This indicates that in the 5th year itself a net surplus revenue of Rs 509.15 can be obtained from the mango plantation.

2. Some of the respondents of this regions however reported that the output/yield of mangoes in the 5th year was extremely low. This was mainly on account of certain agroclimatic problems, problems of adaptability of crops and acute water shortage. Therefore in this region particularly for these respondents, the pay-back period would be delayed by a year or two.

3. Yet even inspite of the fact that Alphonso mangoes are new in this region a gross return varying between of Rs. 677 (see table 8.1, respondent no 5), to Rs. 15000 per acre (see table 8.1 respondent no 14), is possible with the potential of income increasing in the later years.

However, the major complaints in this region were

a) very low yield in the initial years by some respondents, b) the mango fruit gets ready for the market only by end May / beginning June as a result even one pre monsoon shower can destroy the entire crop, c) the flower of mangoes become black and therefore leads to low rate of fruit-bearing of the trees, d) water shortage.

2.4 Revenue and Cost Analysis of Mangoes (Belewade Village of Mulshi)

This section deals with the cost and revenue analysis of mangoes in the Belewade village of Mulshi region, on the lines of the earlier analysis for the Kule-Bhalgudi villages.

The Belewade region is famous for its traditional Raiwal mangoes and in the later period also for Alphonso mangoes. This village has reached high levels of prosperity levels due to very successful mango plantation. In spite of being in the Mulshi region it is different from the earlier Mulshi group because of its irrigation facility as well as the support from the main family of the village who have had traditional mango plantations providing very high and stable incomes. This family took up commercial mango cultivation on a large scale with the pioneering effort of Shri Dhamale.

A total of 6 respondents were covered in this village, of which one respondent no. 6 is a case of an 'outlier', since he has had extreme prosperity through mango crops which has been a traditional family business from his grand father's time. (His case has been covered in the Annexure 2 on outliers).

The cost-benefit analysis in this section therefore refers to only 5 respondents, all of whom have availed of the facilities provided by the Capital Subsidy Scheme.

2.5 Analysis Of Revenue from Mangoes

The agro-climatic conditions in this area being extremely favorable for the cultivation of mangoes both of the Rawail and Alphonso variety. Alphonso mango plantations were undertaken by a number of farmers 1982-83 and 1985-86. The respondents have availed of the benefit the capital subsidy scheme.

The details of the number of trees planted, number of trees survived, fruit bearing trees, price per dozen of mangoes and gross revenue are provided in table 8.3. (This information is based on enquiries from five respondents in the Belewade village).

The following observations regarding the above aspects can be noted from table 8.3.

1. The 5 respondents have together planted 470 mango trees on 10 acres of land. Of the total 470 trees planted 350 survived. The rate of survival is 74.46 per cent, which is considerably high. Of the 470 trees planted, 62.34 percent i.e 293 trees are fruit-bearing trees, which is also considerably high level. The rate of fruit bearing trees as a percentage to trees that have survived is even higher at 83.71 percent.

2. The total revenue from the entire 10 acre plantation works out to be Rs. 272675, i.e. an average revenue of Rs 27267 per acre. (see table 8.3 column 8)

3. The gross revenue per acre in this region reported by the five respondents ranges between Rs. 4375 (respondent no 1) to Rs. 54687.5 (respondent no 2). There is a lot of variation between the incomes of the respondents on account of variation in output per tree and number of fruit bearing trees.

4. The average revenue of Rs 27267 per acre higher in this region due to the high level of output per tree which ranges from 60 to 250 fruits i.e. from 5 dozens to 16 dozens per tree owing to the black fertile soil and favourable agroclimatic conditions.

Table 8.3 Revenue Analysis Of Mango Cultivation (Belewade Region) Reference Year 1995-96.

Respondent No.	Nos. of trees Planted	Area under Mangoes (Acres)	Nos. of trees survived	Nos. of fruit bearing trees	Output per tree (No. of fruits) _E	Market Price Per Dozen (RS.)	Total Gross Revenue (Rs.) _C
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	100	2	35	25	60	70	8750
2	100	2	90	75	250	70	109375
3	100	2.5	60	55	96	70	30800
4	70	1.5	70	60	200	75	75000
5	100	2	95	78	100	75	48750
Total	470	10	350_A	293_B	-	-	272675
Average	-	-	-	-	118	72	27267_D

A) Survival rate as a percentage to total trees planted is 74.46 percent.

B) Rate of fruit bearing as a percentage to total trees planted is 62.34 percent, and as a percentage to trees which have survived it is 83.71 percent.

C) Column 8 shows the total revenue on an average per year from Alphonso mango plantation of 5 respondents. This has been arise at by multiplying the output per tree into number of fruit bearing trees and arriving at total revenue using the market price quoted by the respective respondents.

D) The average revenue per acre has been calculated by dividing the total revenue Rs. 272675 by 10 acres which is the total area under mangoes in this study region.

E) The output per tree has been quoted as an average output per annum.

2.6 Analysis of the Cost of Mangoes (Belewade village)

The details of the cost of cultivating mangoes in the Belewade region given by the five respondents is provided in the table 8.4 given below.

Table 8.4 Cost of Cultivation of Mangoes (Belewade Village, Mulshi) Reference Year 1995-96.

Respon-dent No.	Area Under Mangoes (Acres)	BREAK-UP OF COST IN 1ST YEAR FOR TOTAL MANGO PLANTATION (A)							PER ACRE COST				
		Cost of sapling (Rs.)	Organic Fertilisers (RS)	Cost of Pits (Rs.)	Chemical Fertilisers (RS)	Insecti-cides Pesti-cides (Rs)	Water charges and fencing (RS)	Misc + Labour Charges (Rs.)	Total Initial year cost for entire plantation (Rs.) [Addition of 3 to 9] (10)	Initial Year Cost (Rs.) (per acre) (11)	2nd Year Cost (Rs.) (per acre) (12)	Total of 3rd/ 4th /5th Year cost (Rs.) E (per acre) (13)	Total cumulative Cost Per Acre (In 5 years) [11+12+13] (14)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	2	1500	600	300	200	700	300	-	3600	1800	1000	1500	4300
2	2	1600	400	400	300	600	450	-	3750	1875	1237	1500	4612
3	2.5	1600	750	350	250	750	250	-	3950	1580	760	1500	3840
4	1.5	1400	400	300	200	300	-	-	2600	1733	1600	1500	4833
5	2	1400	600	350	200	500	260	-	3310	1655	1225	1500	4380
TOTAL AVERAGE	10	-	-	-	-	-	-	-	-	-	-	-	21965
	-	-	-	-	-	-	-	-	3424	1728	1164	1500	4393
										A	B	C	D

Notes: A) Average per acre cost in first year over 5 respondents B) Average per acre cost over 5 respondents C) Average per acre cost in 3/4/5 year over 5 respondents D) Average per acre cumulative cost of 5 years. E) A flat sum of Rs. 500 per annum as recurring expenses for the 3/4/5 year and thereon was quoted by the respondents

1. Column 14 of table 8.4 reports the total cumulative cost of cultivation of mangoes per acre reported by the five respondents, over a period of 5 years. The costs reported by the respondents have been worked out and adjusted to arrive at per acre cost figures. As can be seen from the table 8.4, the average cost of cultivating an acre of mango plantation in this region amounts to Rs 4393. (over a period of 5 years).

2. The cumulative cost of cultivating one acre mangoes over five years varies between Rs. 3840 (for respondent no. 3) to Rs. 4833 (given by respondent no. 4). The variation is explained on account of slight variations in expenditures mainly on various items of cultivation like organic fertilisers, insecticides and pesticides, and water charges. The range of variation here is less as compared to the Kule-Bhalgudi villages of Mulshi region because of lesser number of respondents as well as due to the fact that the Belewade is a closely set village and hence the cost estimates are more closely related.

2.7 The Cost, Revenue and Pay Back Period.

The overall average revenue (as stated) per acre has been given as Rs. 27267. (are shown in table 8.3). With the per acre cumulative cost over 5 years at Rs 4393 the net surplus in the 5th year works out to be Rs, 22874 per acre in this village. The pay-back period i.e. when the initial year expenses and the recurring costs get covered would therefore comfortably occur in the 5th year in this village of Mulshi.

Given the above per acre cost estimates and per acre revenue estimates one can arrive at certain conclusions regarding the cost revenue position of mangoes in this region.

In fact in this region, two respondents no. 4 and 2 have reported a high gross revenue i.e. ranging between Rs. 50000 to Rs. 54687 per acre (see table 8.3). This is indicative of the potential of horticultural crops as a means to augment incomes of farmers.

3. COST AND REVENUE ANALYSIS OF MANGOES AND GRAPES IN THE JUNNAR REGION

This section deals with the cost and revenue analysis in the Junnar region on the lines of the earlier study regions. The analysis in the Junnar region pertains to 2 fruit crops i.e. mangoes and grapes. In addition to those respondents who had availed of the CSS and undertaken mango plantation, a few individual farmers who had diversified into grapes in the Junnar region inclusive of Narayangaon have also been covered in the study. In what follows we begin with mangoes. The

analysis related to grapes is dealt with in section 4.-of this chapter.

3.1 Bori-Budruk

A total of 11 respondents from the Bori-Budruk village could be contacted by visiting their farms. Out of the 11 respondents one respondent had planted a total of more than 1000 trees on 22 acres of land, under the Social Forestry Scheme and Capital Subsidy Scheme (CSS). His plantation is more than 15 years old and hence the yield of mango trees is quite high fetching him a revenue of almost Rs. 7 to Rs. 10 lakhs. This respondent is a recipient of number of awards for his agricultural and horticultural ventures. As such, his data has not been considered in the sample analysis to maintain uniformity in the analysis.

Another respondent, a very progressive farmer and the leader of the group who initiated a number of respondents to take up mango cultivation, has been discussed in the section on the 'Outliers' (see Annexure 2) as an unique case of continuous diversification. He has currently diversified into a number of vegetables and grapes and no longer produces mangoes. A third respondent was found to have shifted from mangoes to chikoos and therefore is not covered in this part of the analysis. Yet another respondent has only taken up cultivation of guavas and hence also has been excluded. Thus by excluding the above four respondents the data for the cost-benefit analysis of mangoes is based on the information provided by 7 respondents who are representative of the total beneficiaries of this region. Most of them are small and medium farmers and have undertaken mango cultivation on an average plot of about 2.5 acres. The details of the findings related to the revenue and cost of mangoes for these 7 respondents of this region are discussed in the following sections.

3.2 Analysis of Revenue from Mangoes

All the seven respondents have availed of the benefits of the CSS (1981-82). Majority of them have adopted mango cultivation in 1985-86, a few of them have commenced their plantation in 1987-88. The agro-climatic conditions of the Bori village was found to be suitable for cultivation of Alphonso mangoes. The details regarding the area under mangoes, the number of mango trees planted, the survival rate, the number of fruit bearing trees, the market price and the total revenue from mangoes as given by the respondents is provided in table 8.5.

**Table 8.5 Revenue from Mangoes (Bori Budruk village, Junnar)
Reference Year 1995-96.**

Respondent No. (1)	Nos. of Trees (2)	Area under mangoes (acres) (3)	Nos. of trees survived (4)	Nos. of Fruit bearing trees (5)	Average Output per tree per year (6) ^E	Market Price Per dozen (Rs.) (7)	Total Gross Revenue (RS.) C (8)
1	155	3	103	103	50	55	23600
2	200	5	50	50	400	85	141600
3	100	2.5	78	46	90	80	27600
4	100	2.5	75	45	90	80	27000
5	100	2.5	85	85	300	80	170000
6	100	2	65	45	300	80	90000
7	100	2.5	70	70	400	70	163000
Total	855	20	526 _A	444 _B	232	75	643203
Average							321600

Notes:

- A) Survival rate as a percentage to total trees planted is 61.5 percent.
- B) Rate of fruit bearing as a percentage to total trees planted is 51.9 percent and the rate of fruit bearing trees as a percentage to survived trees is 84.4 percent.
- C) Column 8 shows the total revenue on an average per year from the Alphonso mango plantation of the 7 respondents. This has been arrived at by multiplying the output per tree into number of fruit bearing trees and arriving at the total revenue using the market price quoted by the respective respondents.
- D) The average revenue per acre has been calculated by dividing the total revenue Rs.643203 by 20 acres which is the total area under mangoes in this study region.
- E) The output per tree has been quoted as an average output per annum.

From the above table 8.5 the following observations can be noted:

1. A total of 855 mango trees were planted by the seven respondents on 20 acres of land. The average number of trees planted on one acre of land therefore works out to be 42.75. (As per the norms of mango plantations, one acre plot can accommodate 40 mango trees because each tree requires an area of about 100 sq. ft). The average area under mango plantations of the respondents in this region is about 2-2.5 acres. Respondent no. 2 has allotted five acres for mangoes.
2. Out of the total 855 trees, 526 trees survived, the survival rate of trees therefore works out to be 61.5 per cent; which is quite satisfactory. Respondent no 2 has reported very low rate of survival of trees at 25 percent only, but as will be seen later he has reported a very high yield of 400 fruits per tree.
3. Out of the total 855 trees planted, 444 were reported to be fruit bearing i.e. a 51.9 percent rate of fruit bearing (as a percentage to the total trees planted), which is reasonably high. The rate of fruit bearing trees to the total trees that have survived is much higher at 84.4 percent. It can thus be inferred that once mango plantations survive in the initial stages, generally the rate of fruit bearing is

quite high, therefore extreme care in the initial stages is vital.

4. The average output per tree has been quoted at 232 fruits in this region. There is a variation in the yield levels between 50 fruits per tree (respondent no 1) to as high as 400 fruits per tree (respondent no 2). This variation in the output levels can be explained due to differences mainly in the care, use of fertilisers, technical knowledge etc.

5. The average market price which the farmers receive for Alphonso mangoes has been quoted at Rs 75 per dozen, with the price ranging between Rs 55 to Rs 85. (Most of the marketing is done through dalals and pre-harvest contracts to vendors of the Bombay market). Most of the respondents in this region started getting the yield of mangoes from 1991-92 onwards.

6. The total gross revenue from 20 acres of mango plantations in this village is thus estimated at Rs. 643203. The average revenue in this village works out to be Rs 32160 per acre. However there is a wide variation in the average revenue from Rs. 7868 per acre (respondent no 1) to Rs. 68000 per acre (respondent no 5). The variation in revenue is attributable to differences in yield and number of fruit bearing trees and of course the use of better fertilisers as well as technical knowledge. Respondent no 2 has been able to in fact earn a gross income of Rs. 141666 from only 50 fruit trees on account of very high yield reported by him (i.e Rs. 28332 per acre).

In the Bori village of Junnar the revenue figures indicate a much higher level as compared to the Mulshi village. The average gross revenue per acre at Rs. 32160 is much higher than the Mulshi average, which was quoted at Rs. 4467 per acre. This has obviously been possible due to the better irrigational, infrastructure and other facilities, which include a better knowledge of growing this crop among farmers of this region.

3.3 Analysis of Cost of Mango Cultivation

The details of the break-up of cost of cultivating mangoes in the Bori village are provided in the table 8.6.

1. The total initial year cost of cultivating mangoes on 20 acres of land has been given as Rs. 34712 (See column 10 table 8.6) by the 7 respondents of this region; which includes digging of pits, purchase of saplings, purchase of fertilisers, preparation of soil, costs of water, fencing, labour, pesticides, etc.

2. From the total initial cost of 20 acres, the per acre initial cost of every individual respondent has been worked out, to get an uniform estimate for per acre cost of cultivation of mangoes in the Bori village.

3. The average cost of 1 acre plantation of Alphonso Mangoes in the first year has been worked out as Rs. 1706 which is much below the average expenditure given and sanctioned by the subsidy scheme of the State Government (stated as Rs. 7050 per hectare i.e. Rs. 2854 per acre, see table 6.9 part I chapter 6). The Government cost figures are estimated taking into account all costs which are shown as explicit costs. Expenditures on cowdung manure, fencing done by using steel angles, bars, barbed wire etc. have been explicitly accounted in the government's cost estimate. Factually it is found that most of the input costs are not explicitly incurred by the peasants since they use their own labour and own resources. The only costs, farmers explicitly incur are on :

- a) Purchase of saplings
- b) Purchase Phosphates, Insecticides, and Medicines

(Note: for the exclusion of labour costs, in case of mangoes see chapter 9)

4. There is however a great deal of variation between the initial year per acre costs reported by the respondents which ranges between Rs. 1313 (respondent no 1) to Rs. 2670 (respondent no 5). These differences arise mainly on account of differences in expenditure on cost of saplings and on insecticides and pesticides.

5. Costs for the second year (incurred on fertilisers, irrigation, insecticides and pesticides etc), have been given in the range of Rs. 950 - Rs. 1400. The average cost in the second year is worked out at Rs. 1143.60. (table 8.6).

6. The respondents have themselves quoted an expenditure of about Rs. 500 per acre each in the third, fourth and fifth year. According to them the expenses in these years include those on medicines, insecticides and pesticides plus some sundry expenses on care and maintenance of plantation. (The State Government under its Capital Subsidy Scheme has quoted Rs. 951 per acre in the second, third, and about Rs. 202 in the fourth and fifth years, see chapter 6 table 6.9 part I).

7. Taking all the above into consideration the average per acre cumulative costs of mango plantation over five years works out to be Rs. 4349.60 in this village (see column 14 table 8.6). This average is worked out for the information provided by the 7 respondents.

Table 8.6 Cost of Cultivation of Mangoes (Bori Budruk Village, Junnar) Reference Year 1995-96.

BREAK-UP OF COST IN 1ST YEAR FOR TOTAL MANGO PLANTATION													
Respon- dent No.	Area Under Mango (Acres)	Cost of sapling (Rs)	Organic Ferti- lisers (Rs)	Cost of Pits (Rs)	Chemical Fertili-sers (RS)	Insec- ticides Pesti- cides (Rs)	Water charges and fencing (Rs)	Misc + Labour charges (Rs)	Total Initial 1 year cost for total plantation (Rs) [Addition of 3- 9]	Initial Year Cost (per acre) (Rs)	2nd Year Cost (per acre) (Rs)	Total of 3rd/ 4th / 5th Year cost (per acre) E (Rs)	Total cumulative Cost Per Acre (over 5 years) (Rs) [11+12+13] (14)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	10)	(11)	(12)	(13)	(14)
1	3	1800	600	490	300	750	-	-	3940	1313	950	1500	3763
2	5	2400	2500	700	2000	2250	-	150	10000	2000	1000	1500	4500
3	2.5	1460	625	875	375	750	-	-	4085-	1634	1280	1500	4414
4	2.5	1400	500	300	500	812	-	-	3512	1405	1400	1500	4305
5	2.5	5000	500	300	250	625	-	-	6675	2670	1200	1500	5370
6	2	1500	500	350	350	500	-	-	3200	1600	1175	1500	4275
7	2.5	1500	500	300	250	750	-	-	3300	1320	1000	1500	3820
Total Average	20	-	-	-	-	-	-	-	34712	-	-	-	30447
	-	-	-	-	-	-	-	-	-	1706	1143.60	1500	4349.60
										A	B	C	D

Notes: A) Average per acre cost in first year over 7 respondents B) Average per acre cost over 7 respondents C) Average per acre cost in 3/4/5 year over 7

respondents D) Average per acre cumulative cost of 5 years. E) A flat sum of Rs. 500 per annum as recurring expenses for the 3/4/5 year and thereon was quoted by the respondents

The Cost-Revenue and Pay-Back Period.

Based on the above data related to revenue and costs of cultivating of mangoes, certain inferences about the net revenue and payback period of the mango plantation in this village of Junnar region can be drawn.

1. The average cumulative cost per acre of mangoes over a period of 5 years in this region has been calculated at Rs. 4349.60 per acre. (see table 8.6 column 14 for average). The average gross revenue per acre (which occurs from the 5th year of mango plantation) was estimated to be Rs. 32160. (see table 8.5 column 8 for average). This indicates that in the 5th year itself a net surplus of about Rs. 27810 can be obtained from mango plantation.
2. Since the Bori village has a reasonably well developed network of irrigation, and has conducive agro-climatic conditions for Alphonso mangoes, the cost of cultivation over a period of five years is covered by the revenue of 5th year itself (pay-back period), leaving a net surplus. In the later years the revenue would tend to go on increasing, because as stated earlier, the yield per tree goes on increasing in the later years. This revenue would take care of the recurring costs and leave surpluses for the farmers.

3.5 Revenue And Cost Analysis Of Mangoes In The Parunda And Vaishnavwadi Villages

As per the records available from the register of beneficiaries of capital subsidy scheme in the Department of Horticulture, Pune district, 20 beneficiaries of the scheme from the southwestern hilly area across the Shivneri fort of Junnar i.e. Parunda and Vaishnavwadi villages were identified. Of these 20 farmers, 13 beneficiaries were contacted and the questionnaires were filled in by the interview method. However the table gives a complete data for 10 respondents since Respondent No. 2 has given combined information for himself as well as his two brothers i.e. a total of 3 respondents, and one respondent who is extremely progressive has been discussed in the section 'outliers'. (see Annexure 2).

The farmers of this set of villages were found to belong to the very small farmer category with holdings not more than 5 acres, and their cropping pattern was found to be dominated by subsistence farming. (see chapter 7 section 5 for the salient features of this region). The department of horticulture identified this region as being suitable for cultivation of Alphonso mangoes, which was initiated under the CSS of early 1980's. The scheme got a very enthusiastic response from the farmers of this village, however the rate of failure was found to be extremely high due to lack of irrigation, technical knowledge, access to

markets etc. Based on the data obtained from the above beneficiaries the following sections deals with a detailed revenue cost analysis of mango cultivation in the Parunda - Vaishnavwadi villages.

3.6 Analysis Of Revenue From Mangoes

The data relating to the area under mangoes, the number of trees planted, the rate of survival, and fruit bearing rate, the market price per dozen of mangoes and the total revenues from the mango plantations are provided in table 8.7 given below.

Table 8.7 Revenue from Mangoes (Parunda, Vaishnavwadi villages, Junnar)
Reference Year (1995-96)

Respondent No.	Nos. of Trees planted	Area under mangoes (acres)	Nos. of trees survived	Nos. of Fruit bearing trees	Average Output per tree per year	Market Price Per dozen (Rs.)	Total Gross Revenue C (Rs.)
(1)	(2)	(3)	(4)	(5)	E (6)	(7)	(8)
1	50	1.5	20	20	60	50	5000
2	100	2.5	-	-	-	-	-
3	100	2.5	-	-	-	-	-
4	50	1.5	20	20	250	50	20833
5	100	2.5	80	-	-	-	-
6	50	1.5	15	15	40	50	2500
7	50	1.0	-	-	-	-	-
8	100	2.5	-	-	-	-	-
9	40	1.0	-	-	-	-	-
10	15	0.5	12	-	-	-	-
Total	655	17	147 _A	55 _B	-	-	28333
Average	-	-	-	-	116	50	6926 _D

Notes:

- A) Survival rate as a percentage to total trees planted is 22.44 percent.
- B) Rate of fruit bearing as a percentage to total trees planted is 8.39 percent, the rate of fruit bearing as a percentage to trees that have survived is 37.41 percent.
- C) Column 8 shows the total revenue on an average per year from the Alphonso mango plantation of the 10 respondents. This as been arrived at by multiplying the output per tree into number of fruit bearing trees and arriving at the total revenue using the market price quoted by the respective respondents.
- D) The average revenue per acre as been calculated by dividing the total revenue Rs.28333 by 17 acres which is the total area under mangoes in this study region.
- E) The output per tree has been quoted as an average output per annum.

The main highlights related to the revenue aspect can be noted as given below:

1. A total 655 Alphonso Mango trees on an area of 17 acres was planted by the group of 10 farmers in this set of villages. (Four respondents planted 100 trees each, 4 of them planted 50 trees and remaining two planted 40 and 15 trees, one very marginal farmer even planted 15 trees on his half an acre holding). The

average area under mangoes per respondent in this group is 17 acres.

2. Out of the total 655 trees planted, only 147 could survive, making the rate of survival of mango trees in this area extremely low at 22.4 per cent only. Out of the 147 trees which survived only 55 trees (belonging to respondents respondent no 1,4,6) could achieve the fruit bearing stage. So the effective productivity (fruit bearing) rate as a percentage of the total mango trees planted works out to be only 8.39 per cent implying a near total failure of the scheme in this area (the rate of fruit bearing trees to the total number of trees that have survived is higher at 37.41 percent).

3. The reasons quoted for this failure are:

- i. Acute shortage of water,
- ii. Lack of timely advice, adequate doses of insecticides and high costs of the same.
- iii. Lack of extension services or training camps required for imparting the necessary technical knowledge related to the cultivation of mangoes.
- iv. Most of the farmers reported to have lost their mango plots in the catchment areas of the newly built percolation tank in the village.
- v. Blackening of the blossom and pre monsoon cyclonic rains with humidity and strong winds at the inappropriate time were the other factors which was reported to have caused damage to the mango plantation and therefore the near total failure of this venture in this area. No timely assistance from the Department or Extension officers was available for the above problem. (timely medical and other types of assistance could have prevented this failure).

4. In the initial two years, the respondents gave water doses to all the trees by carrying water in pails on head from a long distance of 3 - 4 km., from the lower level tanks to the mango plots which were located on hillocks of their wastelands. Within the 3rd year the trees started blossoming but as the disease started from the 3rd year itself and 7 respondents out of 10 became totally frustrated and stopped their water doses. This further worsened the condition of trees and therefore the survival rate became very low. Only 3 respondents could save their trees, the overall rate of fruit bearing trees therefore is shown at only 8.39 per cent.

5. There has been very wide variations in yield per tree even among the three respondents ranging between 40 to 250 fruits per tree. Based on the data given by the three respondents of this region, the total revenue of all three combined works out to be Rs. 28333. (This total revenue is calculated by multiplying the out put per tree by the number of fruit bearing trees and valuing it at the given

market price for the respective respondents). Since the three respondents together have 4.5 acres under mangoes, the revenue per acre in this region from mangoes works out to be Rs. 6296.2 (See table 8.7 column 8). The respondents have quoted a revenue ranging between Rs. 1666 per acre (respondent no 6) to Rs. 13888 per acre (respondent no 4)

The horticultural scheme has been a complete failure in this region for reasons discussed above, yet taking into consideration the revenue figures reported by the three respondents. The point to be noted is that even in such a remote area if adequate care, water and timely doses of fertilisers, insecticides and pesticides could be administered a gross revenue of Rs. 13888 per acre is also possible. However this requires a massive support in terms of irrigational/institutional as well as technical facilities. This could be extended by the department to make the scheme successful in the remote area of Parunda and Vaishnavwadi villages.

For the region as a whole, however the horticultural venture of promoting mangoes has been an almost complete total failure.

Analysis of Cost of Cultivation of Mangoes (Parunda / Vaishnavwadi) :

Details on cost of cultivation of mangoes in the Parunda-Vaishnavwadi subregion was obtained from a total of 10 respondents. The break-up of the cost on various items like saplings, fertilizers, insecticides, pesticides, etc. are provided in table 8.8 given above. Since only three respondents reported survival of trees they have been able to provide the cost break up over a period of five years. The remaining respondents contacted reported complete failure of the mango plantation and hence has given only the costs incurred by them in the initial year. One respondent who had planted trees in 1994-95 has given cost for only two years. The following aspects related to costs analysis in this region need to be noted.

1. The total cost in the initial year of development of 17 acres of mango plantation in the Vaishnavwadi and Parunda villages as given by the 10 respondents has been worked out at Rs. 24008. However since only 3 respondents (i.e. no 1, 4, and 6) have reported success of mango plantation, the further cost-revenue analysis in this set of villages is undertaken on the basis of the data provided by these 3 respondents. Nevertheless is necessary to note that a total expenditure of Rs. 18450 incurred by the remaining respondents would have to be considered as a complete waste (see column 10 table 8.8).

Table 8.8 Cost of Cultivation of Mangoes (Parunda/Vaishnavwadi Villages, Junnar) Reference year 1995-96

Respon- dent No.	Area Under Mangoes (Acres)	BREAK-UP OF COST IN 1 ST YEAR FOR TOTAL MANGO PLANTATION							Total Initial year cost total for entire plantation (Rs) [Addition of 3- 9] (10)	Initial Year Cost (per acre) (Rs) (11)	2nd Year Cost (per acre) (Rs) (12)	Total of 3rd/ 4th / 5th Year cost (per acre) E (Rs) (13)	Total Cumulative Cost (Per Acre) (In 5 years) (Rs) [11+12+13] (14)
		Cost of sapling (Rs) (3)	Organic Ferti- lisers (Rs) (4)	Cost of Pits (RS) (5)	Chemical Fertili- sers (Rs) (6)	Insec- ticides Pesti- cides (Rs) (7)	Water charges and fencing (Rs) (8)	Misc + Labour charges (Rs) (9)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)				(13)	(14)
1	1.5	-	-	-	-	-	-	-	2500 _F	1667	1500	1500	4667
2*	2.5	1300	625	300	500	500	-	-	3225	1290	-	-	1290
3s	2.5	1400	500	300	625	400	-	-	3225	1290	-	-	1290
4	1.5	650	188	150	150	150	-	-	1288	858	1133	1500	3491
5	2.5	1400	625	300	375	500	450	-	3650	1460	1480	-	2940
6	1.5	700	195	175	150	300	250	-	1770	1180	1000	1500	3680
7	1	1500	250	350	100	100	-	-	2300	2300	-	-	2300
8	2.5	1400	500	300	375	500	-	-	3075	1230	-	-	1230
9	1	600	200	350	300	100	-	-	1550	1550	-	-	1550
10	0.5	650	250	150	150	225	-	-	1425	1425	-	-	1425
Total	17	-	-	-	-	-	-	-	24008	-	-	-	11838 _G
Average	-	-	-	-	-	-	-	-	-	1425 A	1278 B	1500 C	3946 D

Notes: A) Average per acre cost in first year over 10 respondents B) Average per acre cost over 4 respondents C) Average per acre cost in 3/4/5 year over 3 respondents D) Average per acre cumulative cost of 5 years. The average per acre cost over five years has been calculated by dividing 11838 over the 3 successful respondents. E) A flat sum of Rs. 500 per annum as recurring expenses for the 3/4/5 year and thereon was quoted by the respondents F) Respondent no 1 has directly quoted a figure of Rs.2500 for developing 1.5 acres of mango plantation. G) The total cumulative cost over five years has been calculated only for three successful respondents.

2 By considering the data of respondents 1, 4 and 6, the total cumulative cost over 5 years per acre has given by the 3 respondents works out to a sum of Rs. 11838, which implies an average per acre cost over 5 years of Rs. 3946 (i.e. Rs. 11838 averaged for 3 respondents).

The Cost-Revenue and Pay-Back Period Analysis

Based on this data of the 3 respondents following aspects relating to the net revenue and pay back period for this set of villages in the Junnar region can be noted.

- a) The gross revenue per acre in this region has been calculated as Rs.6296.2, with an average cost per acre over 5 years at Rs.3946. The net revenue per acre thus would work out to be Rs. 2350 by the end of the 5th year.
- b) By only considering the cost and revenue of the three successful respondents, the pay back period would occur by the end of the 5th year, which however is not applicable to the region as a whole.

It is however evident that even under such adverse conditions as do exist in the Parunda Vaishnavwadi villages, diversifying into mango crop can provide incremental incomes, sometimes even as high as Rs. 13888 per acre as shown by respondent No.4. The respondents inspite of the high rate of failure in this area showed keenness to adopt new mango plantations, provided they are given necessary orientation and technical training about the cultivation of this fruit crop and access to some kind of irrigation facility.

4. COST AND REVENUE ANALYSIS OF GRAPES IN JUNNAR NARAYANGAON REGION (BASED ON THE STUDY OF 6 INDIVIDUAL FARMERS IN THE JUNNAR - NARAYANGAON REGION, DISTRICT PUNE, MAHARASHTRA)

In addition to the respondents of the Junnar region who had availed of the Capital Subsidy Scheme for mango plantations, we came across a few individual farmers who had diversified into grape production, in this region. These group of 6 farmers belonged to a cluster of villages in the Junnar region which has been referred to as the Junnar-Narayangaon region for the purposes of this study. None of the Subsidy Schemes i.e. the CSS or the EGS linked Horticultural Development Scheme provides subsidies for the cultivation of grapes. (However other organisations like the NABARD, APEDA, NHB do provide incentives & subsidies in the form of subsidised credit, export subsidies, irrigation subsidies etc for the cultivation of this very important commercial crop). These farmers have therefore undertaken grape cultivation (Thompson seedless variety) primarily on their own initiative.

In what follows we present a cost & revenue analysis of grapes (Thompson seedless variety) on the lines of the earlier analysis related to mangoes. The reference year is 1995-96.

In so far as the cost - revenue analysis of grape production is concerned the special factor that needs to be noted is that - almost the entire capital cost of grape farms is incurred at the beginning of the first year on constructing the Trellis system (i.e. the Mandav) and on the cost of the plants (i.e. saplings). Thereafter, there are recurring costs of maintenance, weeding, pruning, fertilisers, insecticides, pesticides, etc. Grape cultivation involves intensive farming methods and extreme caution and attention during the initial period as well as during its growth, and during the maintenance of the grape farm and harvesting, application of fertilisers, the timely spraying of the insecticides, and the timely application of hormonal treatment to ensure the specified size of the fruit.

4.1 ANALYSIS OF COSTS OF PRODUCTION OF GRAPES

A detailed break up of the cost of cultivation of grapes was provided by the six respondents. These costs can be classified into (a) the initial year capital expenditure and (b) the recurring expenditures over the year. Before proceeding with the detailed analysis of the cost aspects it is necessary to be familiar with the product cycle of grapes given below. (This information has been obtained from the respondents as well as experts in the field of grape farming).

The information on the product life cycle of grapes given by the respondents is as follows :

In the first year itself (Thompson seedless variety of grapes) the yield is 7 tonnes per acre, in the second year it increases to 9 tonnes, and further rises to 10 tonnes in the third and fourth years. By the fifth year and sixth year it then increases to 15 tonnes and reaches a maximum of 20 tonnes; after which it yields returns till the 15th year. On an average the yield in this region has been reported to be about 10-12 tonnes per acre. After 10 years the Trellis system needs to be renovated. This average of 10-12 tonnes per year has been used for calculating the net surplus revenue in this analysis which events out the fluctuations in the yield of the grape crops. The reason for doing so is that all these farmers had adopted grape cultivation in 1980's and early 1990's and hence have achieved the average productivity as reported by them. The grape farms of these respondents had reached the full development level i.e. the fifth year as a result an average of 10-12 tonnes per acre was obtained on these farms.

The main items of expenditure involved during the initial year of grape

farming include cost on building of the trellis system, costs on purchase of saplings, organic fertilizers, preparation of beds for sowing, and other labour charges. In the initial year, the capital expenses are very high. The recurring expenditures include mainly the costs of medicines, hormonal treatment, insecticides, pesticides, labour charges, fertilizers, urea, and other miscellaneous expenses.

The details of the cost and its break up is provided in table 8.9 given below.

1. The total initial capital expenditure per acre reported by these leading grape cultivators in the Junnar-Narayangaon region is about Rs. 917100.
2. The major item of expenditure in the initial year is on the construction of the trellis system which ranges between Rs. 98000 to Rs. 105000 per acre constituting about 68 per cent of the initial year capital expenditure.
3. The other major items of expenditure include that on purchase of saplings, and purchase of organic fertilisers. The costs of sapling for one acre of grape farm ranges between Rs. 10000 to Rs. 20000 (as given by all respondents except no. 6 who has given a composite amount of Rs. 53000 as total expenses on saplings, purchase of fertilizers, preparation of beds for sowing, labour charges and miscellaneous expenses). This item constitutes about 9.8 per cent of the total initial capital expenditure.
4. The average cost per acre of grape farms as can be seen from table 8.9 in the initial year of cultivation, in this region works out to be Rs. 152850 (see column 7 table 8.9 for average) based on data provided by the six respondents. However, there is a variation in the per acre cost among the six respondents ranging between Rs. 146500 to Rs. 163000 accounted by differences in various heads of expenditures mainly on fertilisers.
5. In order to meet this heavy capital investment expenditures the respondents have taken bank loans ranging from Rs. 80,000 to Rs. 1,64000. (Respondent No.5 has categorically stated that he had taken a loan of Rs. 164000 on which during a period of 7 to 8 years he has already incurred interest on the loan amounting to Rs. 178000). On the other hand Respondent No. 3 has managed to repay his entire loan in about three to four years, showing a very keen sense of financial management.

Table 8.9 Cost of Cultivation of one acre of a Grape Farm (Junnar- Narayangoan region) Reference Year 1995-96.

Respondent No.	(1) COST OF DEVELOPMENT OF THE GRAPE FARM IN THE INITIAL YEAR (CAPITAL INVESTMENT) PER ACRE.						(2) ANNUAL RECURRING EXPENSES (PER ACRE)				
	Trellis System (Rs.)	Cost of Sapling (RS.)	Organic Fertilisers (Rs.)	Preparation of beds for sowing (Rs.)	Misc + Labour charges (RS.)	Total Capital Investment (Rs.)	Medicines Hormonal medicines Insecticides, Pesticides (Rs.)	Labour (Rs.)	Fertilisers, Urea, Phosphates (Rs.)	Electricity & Misc. (Rs.)	Total recurring cost (Rs.) (Addition of 8-11) (12)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	100000	18000	20000	7000	1500	146500	20000	20000	40000	5000	85000
2	100000	20000	20000	8000	1500	149500	30000	25000	30000	-	85000
3	105000	18000	17600	6000	1500	148100	30000	25000	30000	-	85000
4	100000	17000	20000	20000	<----	157000	----->	30000	40000	-	70000
5	98000	10000	30000	10000	15000	163000	-	-	-	-	80000 _A
6	100000	.....	.....	53000	<----	153000	20000	30000	25000	<----	75000
Total	-	-	-	-	-	917100	-	-	-	-	480000
Average	-	-	-	-	-	152850	-	-	-	-	80000

Note: a) Respondent no 5 has given a total estimate of Rs. 80000 as recurring expenses inclusive of items 8-11.

6. In addition to the initial capital investment, grape farming also requires considerably heavy recurring expenses. These include expenses on medicines, insecticides, pesticides, labour, fertilisers, electricity, etc. The total recurring expenses have been quoted as ranging between Rs. 75000 to Rs. 85000. The average recurring cost per acre of grape farms in this region can be calculated as Rs. 80000.
7. The initial year capital expenditure and the recurring expenditures have to be accounted for while calculating the net benefits and profit from the grape farms. Account will also have to be taken of the bank loan and loan repayment installment.

4.2 REVENUE ANALYSIS OF GRAPES

This section deals with an analysis of gross revenue from grape farming based on information provided by the six respondents. The details of the area under grapes, average output per acre, market price of grapes per kilo are provided in table 8.10, based on which the total and average revenue figures have been worked out.

Table 8.10 Revenue From Grapes (per acre) Junnar-Narayangaon region. Reference Year 1995-96.

Respondent No. (1)	Area under grapes (Acres) (2)	Average Output per acre per year (tonnes) (3)	Average Market Price Per Kg. (Rs) (4)	Total Revenue (In Rupees) [column 3X4] (5)
1	2	12	14	168000
2	4	12	14	168000
3	5	12	13	156000
4	3	11	13	143000
5	3	10	14	140000
6	5	10	14	140000
Total	-	-	-	915000
Average	-	-	-	152000

Observations:

1. 2 to 5 acres of land has been allotted for grapes by the respondents. The respondents have quoted an average output of 10 to 12 tonnes per acre. This level of average output has been used to calculate the gross revenue per acre of the respondents, since all the farmers have adopted grape cultivation in 1980s and early 1990s, as a result these grape farms have reached the full development level.
2. Based on the data on area under grapes, the average output per acre and the price per kilo of grapes, the gross revenue from the grape farms per acre in this region ranges between Rs. 140000 to Rs. 168000. The average gross

revenue per acre in this region is Rs. 152500 (see column 5 table 8.10).

4.3 The Revenue Cost Analysis Of Grape Cultivation

The recurring costs per acre in this region is estimated to be Rs. 80000 with the average gross revenue per acre at Rs. 152500, the net revenue works out to be Rs. 72500 per acre (i.e. the gross revenue - recurring cost). The average fixed capital cost per acre is Rs. 152850, with the contribution per acre of Rs. 72500 the crude payback period of the fixed capital cost is Rs. 152850 / 72500 i.e. 2.108 years. With interest at 15 per cent per annum (at the highest rate that farmers pay) payable at the end of payback period and without considering opportunity earning, savings on the net contribution the payback period is Rs. $152850 \times (1.15)^2 / 72500 = 2.788$ years. (It is quite clear that the discounted payback period would be less than 2.788 years but slightly greater than 2.208 years). With an average cost per acre (recurring) of Rs. 80000 and revenue equal to Rs. 162500 the surplus works out to be Rs. 72500 per acre. Of this deductions for loan repayment at least in the initial years will have to be made. (This is taken care of in the section on the NPV and IRR analysis Chapter 9).

However it should also be noted that capital investment in the initial year as well as recurring costs are very high in the case of grapes and that the crop is susceptible (like most agricultural commodities) to the usual weather and other risks. In case of grapes extreme caution at every stage including the harvesting period is required.

5. COST AND REVENUE ANALYSIS OF ORANGES IN THE SHIRUR REGION

This subsection deals with the cost and revenue analysis of oranges in the Shirur region, on the lines of the earlier analysis. A total number of 22 farmers were contacted of whom, 13 had reported completely failure of the crops and 2 being very progressive farmers have not been included in this section to maintain uniformity. Their case is considered in the discussion on 'Outliers' (See Annexure 2).

Thus, regarding the cost of production of the main crop i.e. oranges in the Shirur region, a detailed cost break up was given by seven farmers, since, as mentioned earlier 13 farmers and reported complete failure of their plantation. The other two farmers have been excluded for reasons mentioned in the earlier part of the analyse. With 13 out of 22 farmers showing a complete failure of the fruit plantation, the failure rate in this region is very high at 59.09 percent. The above mentioned seven respondents have given an estimate of the costs of

producing some fruit crops like oranges, custard apple, coconut which is the representative data of this region. Based on the data provided, a revenue-cost analysis for oranges the main fruit crop of this region has been worked out.

5.1 Revenue analysis of Oranges in Shirur Region

This section deals with details of the number of orange trees planted, the area under this crop, the average yield per tree and based on this an estimate of the gross revenue from oranges per acre in this region is worked out. Table 8.11 given below provides the above mentioned details.

Table 8.11 Revenue From Oranges In Shirur Region Reference Year 1995-96

Respondent No.	Area Under Oranges (Acres)	Nos. of Trees Planted	Output per tree (no. of fruits)	Market price per dozen A(Rs.)	Total Revenue [range of total revenue per acre](RS.) B
(1)	(2)	(3)	(4)	(5)	(6)
1.	2.5	1000	-	'A' grade fruit Rs. 20 per dozen 'B' grade fruit Rs. 12 Per dozen 'C' grade fruit Rs. 6 per dozen	Range
2.	15	5200	200		Rs. 25740
3.	5	1300	175		To
4.	1	175	-		Rs. 51480
5.	5	1450	125		To
6.	15	4500	100		Rs. 85800
7.	3	900	225		
Total	46.5	14525			
Average		312.3 C	165		

Notes:

- A) Market price has been quoted for 'A', 'B' and 'C' grade oranges.
- B) The total revenue has been calculated for all three grades of oranges i.e. A,B,C. 1) For 'C' grade fruits the total revenue would be Rs.24750 per acre (i.e. 165 fruits into 312 trees valued at Rs.6 per dozen). 2) For 'B' grade fruits the total revenue would be Rs. 51480 per acre, 3) For 'A' grade fruits the total revenue would be Rs. 85800 per acre, following the above procedure.
- C) Average trees per acre.

Information was obtained regarding the number of orange trees, area under oranges, the output per tree and the market price of oranges.

The total area covered by the seven respondents is 46.5 acres on which a total of 14525 trees have been planted. The average number of orange trees per acre would thus be about 312 trees. The average output per tree as given by the respondents is 165 oranges per tree. Oranges begin to yield returns during

the 3 - 4th year. The respondents have quoted a range of prices for 3 varieties of oranges i.e. Rs. 20 per dozen for 'A' grade fruits, Rs. 12 per dozen for 'B' grade fruits and Rs. 6 per dozen for 'C' grade fruits.

Given this information and estimate of the gross revenue per acre had been worked out, assuming all fruits to be of the 'A', 'B', or 'C', grade alternatively. If all the fruits are of the 'C' grade the gross revenue per acre can be estimated to be Rs. 25740, (i.e. the average yield per tree X no, of trees per acre X Rs. 6 for C grade fruits) If all the fruits are of 'B' grade the gross revenue can be estimated to be Rs. 51480 and if all the fruits are of 'A' grade then the gross revenue can be calculated at Rs. 85800, following the above mentioned estimation procedure. In this region therefore the gross revenue per acre from oranges ranges between Rs. 25740 to Rs. 85500. Sometimes if the crop is very good or if the market condition are favourable the revenue could even range between Rs.100000 to Rs.150000 (as quoted by the respondents no 3,4, and 6). Some inter-cropping on orange plantation like groundnut, pumpkin was also found in the case of respondent nos. 3,4 and 9.

5.2 Cost Analysis Of Oranges In The Shirur Area.

Enquiries were made regarding the cost of cultivating oranges in the Shirur area. The details of the cost of cultivation given by the seven respondents is provided in table 10.2 given below. The major item of expenditure includes cost of sapling, cost of organic fertiliser, cost of digging pits, chemical fertiliser, labour charges and miscellaneous expenses. These costs have been quoted as per acre costs of cultivation of oranges. The cost calculations have been made for a period of 4 years after which orange trees yield fruits. Respondent no.2 has not given any cost estimate and hence the calculation of averages is done on the basis of information provided by six respondents.

From the table on break up of costs it is seen that in the initial year the average cost of cultivating one acre of oranges in this region amounts to Rs.6470. For the second, third and fourth year the respondents together have provided the following information. The second year cost per acre has been quoted in the range of Rs.3500 to Rs.5000 i.e. an average of Rs.4250, for the third year and fourth year the per acre costs have been quoted as Rs.3500 and Rs.3000 respectively. The total cumulative cost for four years therefore can be calculated as Rs.17220 for one acre of orange plantation (Summation of column 8-11 in table 8.11).

Table 8.12 Cost Break up of Oranges in Shirur Region. Reference Year 1995-96

Respondent no. (1)	Area under Oranges (acres) (2)	BREAK-UP OF COST IN 1 ST YEAR FOR TOTAL ORANGES PLANTATION (per acre)					Total initial year cost (per acre) (Rs.) (8)	2 nd year cost (per acre) (RS.) (9)	3 rd year cost (per acre) (Rs.) (10)	4 th year cost (per acre) (Rs.) (11)	Total Cumulative cost per acre over four years(Rs.) (12)
		Cost of sapling (Rs.) (3)	Organic fertilisers (Rs.) (4)	Cost of Pits (Rs.) (5)	Chemical Fertilisers (Rs.) (6)	Misc. + Labour (Rs.) (7)					
1.	2.5						7000				
2.	15						-				
3.	5		7000			500	7500	-	3500	3000	
4.	1	1800	1000	500	2800	-	6100				
5.	5	3000	1000	1425	500	-	5925				
6.	15	2400	900	2000	500	1500	7300				
7.	3	1800	1000	1500	700	-	5000				
TOTAL AVERAGE	46.5	-	-	-	-	-	38825 6470 A	4250 B	3500	3000	17220 C

Notes: A) The average cost per acre in the initial year has been calculated for 6 farmers, since respondent no 2 has not quoted any costs for his plantation B) Rs.4250 has been quoted as the average cost in the second year for orange plantation by the respondents. C) This average cost per acre has been calculated by summing average of column 8-11 (i.e. 6470+4250+3500+3000).

With the per acre cost at Rs. 17220 for four years and the average per acre gross revenue in the range of Rs.25740 to Rs.85800 three estimates of net revenue can be calculated as:

The net revenue for 'C' Grade fruits would work out to be Rs.8520 (i.e. Rs.25740-Rs.17220).

The net revenue for 'B' grade fruits would work out to be Rs.34260 (i.e. Rs.51480-Rs.17220).

The net revenue for 'A' grade fruits would work out to be Rs.68580 (i.e. Rs.85800-17220).

(Some provision would have to be made for additional expenses for more fertilisers and care for the better variety of fruits, which will however be marginal).

It should be specially noted that out of the 22 respondents studied in this area 13 had taken up the scheme in Koregaon and Bhanbarde and inspite of incurring the costs have had no plantation nor survival due to extreme water shortage and severe drought conditions in the past 2-4 years. (Bhanbharde is a village in the deep interior of the Shirur taluka with no proper road and water facilities). Few farmers in this village had enthusiastically taken up oranges and even custard apple under the EGS linked horticultural development scheme but however are facing extreme water scarcity and have appealed to the Horticulture Department to make water available even at the cost of losing the monetary subsidy under EGS and Capital subsidy scheme. Their persistence of continuing with horticultural crops even in the next season with the hope of good rains was remarkable.

Inspite of unfavourable conditions, horticultural crops even in the next season with the hope to augment income of farmers and in the ultimate analysis, augment his wealth and assets. Those who have adopted horticulture in this region on their own initiative have found themselves on a path of progress though there have been failures sometimes even for them.

CONCLUDING OBSERVATIONS

From the foregoing analysis of the costs revenue and pay-back period of mangoes and grapes certain aspects regarding their gross revenue, net revenue, and pay-back period can be noted.

1) The average gross revenue for mangoes per acre in the regions studied was found to range between Rs. 4467 (Kule-Bhalgudi villages of Mulshi) to Rs.32160 (Bori village of Junnar). The range of gross revenue per acre however was

found to be as low as Rs.677 (Kule-Bhagudi village of Mulshi) to Rs.68000 per acre (Bori village of Junnar). The net surplus revenue occurring in the fifth/sixth year was found to range between Rs.509.15 (Kule-Bhagudi villages of Mulshi) to Rs.27810 (Bori village of Junnar).

2) Generally mango plantation reach their pay-back period in the 5th year, however in the Kule-Bhagudi villages and Vaishnavwadi, Parunda villages, a very low net revenue was obtained in the fifth year mainly due to unfavourable agroclimatic conditions and acute water shortage.

3) Thus the wide range both in the gross revenue and net revenue from mangoes was seen between the study regions as well as among individual farmers. It can be inferred from this that mango plantations yield is very sensitive to agro-climatic and location-specific conditions and is also subject to high risks especially at the time of survival of the tree, blossoming and ripening of the fruit. During these stages adverse weather, climatic fluctuations and lack of adequate care can have adverse effects on the yield as well as on the quality of the crop.

4) On the other hand the gross revenue per acre from grapes was found to be more uniform at Rs. 1,52500 and the net revenue at Rs.72500 for the Junnar-Narayangaon region studied.

5) Based on the limited data on oranges in the Shirur region, it was found that the gross revenue per acre ranges between Rs.25740 to Rs.85800 depending upon the quality of fruits. The net revenue was seen to range between Rs.8520 to Rs.68580 per acre.

It should be also be noted that the estimates of the revenues and pay-back period reported above pertain only to the successful farmers. The estimates are not estimates of both successful and unsuccessful ventures.

CHAPTER 9

COST-BENEFIT ANALYSIS OF THE SELECTED FRUIT CROPS IN THE STUDY REGIONS.

1. INTRODUCTION:

In the last chapter we presented the revenue and cost analysis in respect of the three main fruit crops in the selected study regions. Such an analysis is however confined to estimation of the overall average revenue and cost per acre, the lag after which the revenue makes its appearance and the break-even period. Following from that in this chapter, considering the life period of the orchards, we extend the enquiry to benefit cost-analysis based on the standard technique of discounting the future events. In what follows we present an estimation of the Internal Rate of Return (IRR), the Net Present Value (NPV) and the Benefit-Cost ratio (BCR) for the two study regions i.e. Mulshi and Junnar for the two fruit crops mangoes and grapes. The same has not been done for oranges in Shirur due to inadequate data. These estimates have been worked out region-wise as well as respondent wise.

The main data inputs for the above cost benefit analysis are as follows:

- a) Estimates of the age of the tree/farms.
- b) Estimation of product yield cycle of the tree.
- c) Estimates of the revenues i.e. output multiplied by price realised.
- d) Estimation of the initial and recurring cost over the lifetime of the tree.

Before proceeding with the estimation of IRR, NPV and BCR certain clarifications are necessary.

1) CLARIFICATION REGARDING THE ESTIMATION OF THE INITIAL AND RECURRING COSTS OVER THE LIFE TIME OF THE TREES.

Some clarifications and tacit assumptions of the last data item mentioned above namely, the estimation of the initial and recurring cost over the lifetime of the tree life cycle of costs need to be mentioned immediately. The data on the life cycle of costs pertains exclusively to the direct paid-out costs of the farmers (which is the cost A 1 in the traditional agriculture literature on cost concepts). Our sample contains the entire range from very prosperous families that employ wage labour for all operations to bare subsistence farmers who perform all the labour on their own farms and supplement their incomes by working as wage labourer on other farms. In the case of grape farming for instance some of the farmers we surveyed exclusively performed the entrepreneurial

function. They do not labour family labour. They higher all the labour that they require. In case of mango farmers however our sample is dominated by farmers who rely almost entirely on family labour for their farm operations. Of course our sample is dominated by the small to lower medium scale farms in which the bulk of farm labour is family labour. Secondly none of the farmers covered in the sample had any share cropping arrangement. These features of our sample have significant implications for the cost benefit analysis. The NPV in this study should be interpreted as the present value of net paid out costs. Whist this definition of the NPV applies equally to the grape and mango farmers the content of the NPV for the two categories is different. In case of the representative grape grower who, as we have noted employs hired labour, the NPV should be interpreted as being constituted of the rent of owned land + the remuneration for management + the interest on owned capital + the profits of entrepreneurship. In case of the representative mango farmer the NPV includes, besides all the above components the wages of own and family labour.

In the case of the peasant farmer growing mangoes it would be difficult /arbitrary to compute values for owned labour. (throughout our sample survey owned labour has ranged from individuals with age beyond 65 to children some school going, some not school going less than the age of twelve). These included family members, relatives etc. it was thus difficult or and arbitrary to impute wage costs to such heterogeneous categories of labour. At first sight the exclusion of explicit labour cost might seem to be a serious omission of the capital budgeting exercise. However, when one considers the various known methods of imputing costs to the farmers own labour, the omission might not seem so serious after all. The first and most accurate method of labour cost imputation is to estimate the opportunity cost of the labour of the farmers his family members. Our respondents (mango growers) were unable to impute any explicit value and definite estimate of what they or their family members (i.e. their wives, their children, the other members of the family) could have earned elsewhere! They were however unanimous that in their region employment opportunities on the farm or elsewhere were fairly scarce, therefore the best method of imputation was out of question. The second method could have been to estimate the going wage rates for farm labour and non-farm labour in that region and impute the labour costs. However this would have required a detailed break up of the number of hours spent on the horticultural activities by the various members of the peasant family. For, as is well

known the wage rate for these categories of labour (men, women, and children) are different. Besides, the employment opportunity in terms of number of days a year also differ. Since our respondents could not furnish a detailed break-up of the member wise number of hours worked this second method of imputation would have become equally arbitrary. A third method of imputation would have been to obtain wage-cost estimates from the horticultural department which administers the CSS scheme and therefore is required to make detailed estimates of various categories of labour. However CSS document provides no details what so ever on labour cost estimates. It implicitly assumes that the farmer will utilise his own labour (see chapter 6 table 6.9). To be sure the EGS linked horticultural development program does give labour cost estimates at the same rates as applicable under the EGS. However these rates cannot be directly used in the absence of a detailed breakup of the number of hours/days worked by men, women and children on the additional horticultural work. For all these reasons therefore the imputation of the value of family labour in the present cost-benefit analysis related to mangoes has been excluded.

Owned capital (ranged from money taken from friends, relatives, government subsidy, etc.), and land characteristics varied from fertile land to wasteland, land with road touch to remotely situated locations, with differing infrastructures. In the context the process of imputing values to owned capital and land was extremely difficult even for the respondents of the survey.

Hence it was felt that the excess reported revenues over reported costs was the best measure of the NPV. What ineffect therefore has been used is the concept of the **Farm Business Income** which is the Gross value of output (i.e. Output x Market price - Out of pocket expenses) which includes all material inputs purchased inclusive of hired labour and borrowed capital. Wherever wage cost have been reported to be paid out they have been considered as cash outflows.

Thus the NPV in the case of **mangoes** should be interpreted not as the excess of the present values over future profits but as the present value of the **Farm Business Income**. Likewise the figures for the internal rate of return (IRR) should be interpreted not as the rates of profit but as the rate of value added that farmers may expect to earn. [The NPV in the usual cost benefit analysis for example in the industrial feasibility studies is an approximation to the NPV of the profit scheme].

In the case of grapes the respondents have provided information on both initial

and recurring cost inclusive of labour cost. (see chapter 8 section 4 table 8.9). This is the income to owned labour owned capital and owned land.

The difference between the economic status of the grape grower and mango grower in our sample presents the following of the results of the Cost Benefit analysis, viz that the NPV, IRR or BCR ratios of mango cultivation cannot be directly compared to those grape cultivation.

2. CLARIFICATIONS REGARDING THE REVENUE, LIFE CYCLE OF THE TREES AND THE PRICE.

The assumptions made on the revenue side fall into two categories

- a) Assumptions regarding the realised price and
- b) Assumptions regarding the life cycle of the output of trees/ farms.

The price realised (i.e. in the reference period of the study 1995-96) will continue to be realised over the life time of the tree/farms. In other words no allowance has been made whatsoever for periodic inflation or deflation. The constant price over life assumption has been adopted as the working hypothesis chiefly on account of the diversity of the regions covered. (For e.g. if the sample survey had covered say the Ratnagiri district it would have been fairly easily to compute the growth rate of prices of Alphonso mangoes in export and domestic markets and incorporate growth rate of prices in the cost benefit analysis). Such homogeneity of the source of price data was impossible in the sample covered.

As regards the output profile, specific assumptions have been made in regard to the life cycle of mangoes and grapes, which is stated in the later part of this chapter.

- c) As regards the initial and recurring costs over the life time of the trees, these are the reported estimates of the farmers themselves. No inflation factors have been attached to the recurring costs in order to maintain similarity of treatment vis-a-vis the assumptions regarding the realised prices.

In the benefit cost analysis we have followed (a) the convention of conservatism i.e. to take low price range and low of the quantity range reported by the farmer to estimate revenues and (b) to take the low of the reported life time of the tree.

With regard to the assumptions made about the specific fruit crops of the study viz mangoes and grapes, these are discussed in sections 3 and 4 of this chapter.

2. COMPUTATION OF NPV, IRR, AND BCR.

For computation of NPV and IRR in the succeeding parts of the analysis, the following standard equations were used.

The NPV calculation

$$NPV = -C_0 + \frac{R_1 - C_1}{(1+i)} + \frac{R_2 - C_2}{(1+i)^2} + \frac{R_3 - C_3}{(1+i)^3} + \dots + \frac{R_n - C_n}{(1+i)^n}$$

where n is the life of the trees

C_0 is the initial cost incurred

R_1 to R_n are cash inflows, (which are equal to zero during the gestation period of the tree,) for years 1,2,3.....n.

C_1 to C_n are cash recurring outflows for years 1,2,3,.....n.

Note : The salvage value of the tree has been ignored. Also as a general rule the most conservative estimates of yield and price have been taken. (For example the yield of a mango tree shows a rising trend from the fifth to tenth year of its life). It is assumed that the fifth year yield remains the same up to the 9th year.

The IRR Calculation :

The IRR is calculated as the lowest positive root that makes

$NPV = 0$ i.e. it is the value of r such that

$NPV = 0$

$$NPV = -C_0 + \frac{R_1 - C_1}{(1+r)} + \frac{R_2 - C_2}{(1+r)^2} + \frac{R_3 - C_3}{(1+r)^3} + \dots + \frac{R_n - C_n}{(1+r)^n} = 0$$

The BCR : This ratio is quite simply the ratio of the discounted present value of cash inflows to the discounted present value of cash outflows. Accordingly, it shows the present value of benefit obtained per rupee of the present value of costs incurred. A benefit cost ratio greater than one implies that the project is viable. (In general there is no definite between BCR and NPV of a project in the mechanical sense higher NPV's must correspond to higher BCR's). The formula for the benefit cost ratio BCR is:

$$\frac{\frac{R_1}{(1+i)} + \frac{R_2}{(1+i)^2} + \frac{R_3}{(1+i)^3} + \dots + \frac{R_n}{(1+i)^n}}{C_0 + \frac{C_1}{(1+i)} + \frac{C_2}{(1+i)^2} + \frac{C_3}{(1+i)^3} + \dots + \frac{C_n}{(1+i)^n}}$$

3. THE IRR AND NPV AND BCR ANALYSIS OF MANGO CULTIVATION IN THE MULSHI AND JUNNAR REGION

The respondent farmers from the Mulshi and Junnar regions have provided detailed information on the cost and revenue aspects of mangoes. This has been discussed at length in the preceding chapters on the respective regions (See chapter 7 and chapter 8).

The present cost-benefit analysis is based on data obtained during the sample survey from the two regions of Mulshī and Junnar.

Some clarifications related to the *yield of the tree, life of the trees, revenue calculations, and cost calculations etc. are stated below :*

1. The general product life cycle of Mangoes (Alphonso given by the experts in the course of the sample survey is reported as follows. The life of the Mango tree has been stated to be more than 40-50 years, in the present analysis however a conservative estimate of 35 years is assumed taken as the life of the trees.

2. Alphonso trees begin to yield fruits from the fifth year onwards, in the fifth year the yield of a tree on an average is about 50 fruits, in the 6th year it yields about 70 fruits, in the seventh, eighth and ninth year it yields about 150 fruits, in the 10th year the yield is about 200 fruits per tree which continues for a considerable number of years and then again the yield reduces and stabilises till the end of the life time of mango tree. This yield pattern however differs between regions.

3. For the present purpose of IRR and NPV analysis of mangoes some specific assumptions and conservative estimates have been made regarding the yield and revenue from this fruit crop.

a. The respondents (majority of them) had undertaken mango plantation under the Capital Subsidy Scheme in the year 1985-86. These respondents belong to the Mulshi and Junnar area have provided their detailed gross revenue estimates. (see chapter 8 tables 8.1, 8.3, 8.5 and 8.7). For the purposes of the cost benefit analysis a specific method to calculate the revenue has been used. The respondents in the various regions / sub-regions have quoted the revenue per acre from mangoes during the period 1995-96 which is the 9/10th year of plantation. Going by the yield pattern of mangoes (already discussed) in the 5th year, (when mangoes reaches the fruit bearing stage), the yield is quite low per tree i.e. about 50 fruits per tree which by the 10th year increases to about 200 fruits per tree. Therefore for the purposes of maintaining uniformity and based on this yield patterns, for the fifth year revenue estimates, 40 percent of the quoted

revenue of the 10th year (which is generally the Full-Development year of the tree) is used and this is kept constant for the 6th, 7th, 8th and 9th year. In reality as the product life-cycle figures show in the fifth year the farmer gets 25 percent of the full development year output i.e. the 10th year output, which gradually increases from 0.25 to 1 by 10th year. In our analysis we have considered a 40 percent of the full development year output, from the fifth to the 9th year, from the 10th year till 35 years the revenue of the 10th year reported by the respondents has been used for conservative estimates.

b. The cash outflows used has been given by the respondent farmers in the different villages of the Mulshi region. These cash outflows have been worked out to arrive at the per acre cash outflow figures (see tables 8.2, 8.4, 8.6, 8.8). The figures for the first two years were specifically stated by the farmers, however from the third year onwards till the 35th year a uniform figure for Rs. 500 per acre on annual recurring expenses has been taken. (Based on the farmers response to the query regarding the average annual cost per acre for cultivating mangoes).

4. Three rates of interest i.e. **10.5%, 12% and 15%** have been considered to calculate the NPV. 10.25 % to 10.5% is the rate quoted for loans under the provisions of the Capital Subsidy Scheme of the Government of Maharashtra (1981-82). 12% is the average NABARD rate of interest, and 15% is to account for the market rate of interest. The reference year is 1995-96.

5. Once again it should be noted that in the case of mangoes value for own and family labour have not been imputed, since such data was not reported by the farmers.

3.1 NPV and IRR and BCR Analysis In the Mulshi region (Mangoes)

A. Kule-Bhalgudi villages.

1. Most of the farmers studied in this set of villages started mango cultivation in the year 1985-86 and though the agroclimatic zone has been found to be favourable for mango cultivation the yield is low compared to the average yield pattern quoted above. One respondent had not yet reported any yield of mangoes (respondent no. 9 see table 8.1), and hence his analysis is not considered in the Cost Benefit analysis. The cost benefit analysis therefore pertains to only 13 respondents from this set of villages.

2. The NPV, IRR calculations have been made based on data provided by individual farmers of this region on cost and revenue per acre (details of which are provided in Chapter 8 section 2). The results of the above analysis are provided in the table 9.1.

Table 9.1 The IRR, NPV and BCR (per acre) of Mangoes (Kule-Bhalgudi Villages Mulshi) Reference year 1995-96.

Respondent No./	No. of Years: Cash Inflow outflow per acre								IRR	10.5 percent		12 percent		15 percent	
	1	2	3	4	5.....	.....9	10.....	.....35		NPV	BCR	NPV	BCR	NPV	BCR
Cash outflow					5.....	.....9	10.....	.....35							
Cash inflow					...										
1															
Cash outflow	2525	975	500	500	500	500	500	500	0.3284	24151	3.85	19281	3.38	12475	2.59
Cash inflow	0	0	0	0	2478	2478	6197	6197							
2															
Cash outflow	1400	925	500	500	500	500	500	500	0.0941	-446.05	0.71	-927.3	0.6	-1565.11	0.41
Cash inflow	0	0	0	0	466.66	466.66	1166.68	1166.68							
3															
Cash outflow	1325	875	500	500	500	500	500	500	0.3408	17648.4	3.6	14100.2	3.22	9154.3	2.58
Cash inflow	0	0	0	0	1875	1875	4687	4687							
4															
Cash outflow	1450	400	500	500	500	500	500	500	0.437	27716.8	5.39	22497.2	4.86	15200	3.94
Cash inflow	0	0	0	0	2640	2640	6600	6600							
5															
Cash outflow	1525	475	500	500	500	500	500	500	0.072	-2665	0.32	-2725.9	0.24	-2774.93	0.11
Cash inflow	0	0	0	0	270	270	677	677							
6															
Cash outflow	2000	735	500	500	500	500	500	500	0.2254	8332.13	1.92	6277.96	1.68	3429.79	1.26
Cash inflow	0	0	0	0	1188	1188	2970	2970							
7															
Cash outflow	1450	900	500	500	500	500	500	500	0.3704	22286.8	4.24	17922.4	3.79	11830.32	3.03
Cash inflow	0	0	0	0	2250	2250	5625	5625							
8															

Table 9.1 Continued.....

Cash outflow	1500	800	500	500	500	500	500	500	0.3569	20413	3.96	16373.9	3.54	10738.18	2.82
Cash inflow	0	0	0	0	2100	2100	5250	5250							
9															
Cash outflow	1575	1275	500	500	500	500	500	500	0.2265	8421.59	2	6347.85	1.75	3475.56	1.34
Cash inflow	0	0	0	0	1200	1200	3000	3000							
10															
Cash outflow	1450	250	500	500	500	500	500	500	0.2568	8249	2.16	6371.81	1.93	3769.23	1.51
Cash inflow	0	0	0	0	1104	1104	2760	2760							
11															
Cash outflow	1625	1250	500	500	500	500	500	500	0.2519	10946.8	2.35	8437.26	2.37	4952.75	1.6
Cash inflow	0	0	0	0	1400	1400	3500	3500							
12															
Cash outflow	1450	475	500	500	500	500	500	500	0.3739	20195.5	4.1	16248.3	3.68	10739.6	2.96
Cash inflow	0	0	0	0	2056	2056	5140	5140							
13															
Cash outflow	2250	900	500	500	500	500	500	500	0.5502	69347	10.28	56817.9	9.15	39257.7	7.27
Cash inflow	0	0	0	0	6000	6000	15000	15000							
Average									0.3	18046	3.45	14386	3.09	9283	2.42
Std. Deviation									0.13	18016	2.52	14909	2.20	10546	1.82
Coeff. Of variation									0.43	0.9983	0.731	1.036	0.711	1.136	0.758

Observations on the Results of NPV, IRR and BCR in the Kule-Bhaldudi villages (See table 9.1)

The average IRR is found to be 0.30 i.e. 30 percent in this region, however the range of variation has been found to be between 0.072 to 0.5502, which shows itself in a rather high standard deviation of 13 percent and a Coefficient of Variation of 43 percent.¹ As earlier noted this set of villages of the Mulshi region has shown high fluctuations in the fruit-bearing rate and in the survival rate of trees because of acute shortage of water.

The average NPV of mangoes at 10.5 percent rate of discount is Rs. 18046, at 12% rate of discount it is Rs. 14386 and at 15% rate of discount it is Rs. 9283, which shows that mango cultivation is viable for most farmers. In fact the table reveals that there are only two farmers for whom the net present value is negative (see table 9.1). All other farmers have net present values greater than Rs. 6000 at 12% rate of discount (12 percent is considered because it is the regular subsidised rate offered by institution like the NABARD for agricultural activities. Considering the fact that mango orchards have been raised on the most inferior and hitherto uncultivated lands, the net present value figures in this region show an optimistic picture.

The BCR analysis shows the following results:

1. The benefit cost ratio calculated at 10.5% rate of interest (i.e. the rate under the capital subsidy scheme which is given at 10.25-10.5 percent) ranges between 0.32 (respondent no 5) to 10.28 (respondent no 13); and between 0.24 to 9.15 calculated at 12% interest rate, at 15 percent it ranges between 0.11 to 3.94 (for the same respondents).
2. The two extreme levels of the BCR given above reflect the case of the most successful and least successful farmers in this region, the extreme variation in the results is on account of the differences in the survival rate of trees, fruit bearing rate and availability of water.
3. The average BCR in this region works out to be 3.45 at 10.5% interest rate and 3.09 at 12 percent and 2.4 at 15 percent interest rates, indicating a high viability of the mango plantation project which is remarkable in a region with water shortage and other problems.

¹ The coefficient of variation is the ratio of the standard deviation of the returns to the mean return which make it possible for us to compare the riskiness of the project in relation to its expected returns.

In this region it should be noted that the above results apply to only successful farmers who have reported survival and yield of trees. The percentage of such respondents is about 59 percent in this set of villages in Mulshi region (see chapter 8 section 2.1).

B. Belewade Village

A special treatment was required for the Belewade village of the Mulshi region which has a more prosperous mango cultivation and where the agroclimatic factors are more favourable to mango cultivation.

The IRR and NPV analysis has been done on the basis of data provided by 6 farmers (see table 8.3). (Of these, one respondent's case from this village, has been analysed in the section of outlier being an extremely successful farmer to avoid discrepancies or wide fluctuations in the results, see Annexure 2). Therefore the final analysis is based on data of five farmers of this region, the results of which are provided in the table 9.2.

Observations on the Results of NPV, IRR and BCR in the Belewade village (See Table 9.2)

The average IRR for the Belewade region for mango crops is an astounding 73 percent, although the standard deviations of the IRR is 30 percent and the coefficient of variation stands at 41.3 percent it should be noted that the downside risks in this region are very low. The Belewade region is a region in which mangoes have been cultivated traditionally. As a result generations of farmers have been familiarised with the appropriate breeds of mangoes that are best suited to this region as well as agro-technical aspects of cultivation. Therefore, as compared to the Kule-Bhalgudi villages of the same Mulshi region which are new to mango cultivation the farmers of Belewade region are considerably more successful. The average net present value per acre of mangoes works out to an impressive Rs. 142364 per acre at 10.5 percent discount rate, Rs. 117151 at 12 percent discount rate and Rs. 82284 at 15 percent discount rate, which represents a considerable addition to the income of the farmers. The BCR in this region ranges between 2.99 (respondent no 1) to 38.73 (respondent no 2) at 10.5% interest and between 2.64 and 34.69 at 12 percent rate of interest and between 1.08 to 24.91 at 15 percent rate of interest for the same respondents. The average BCR is 21.06 at 10.5 percent, 18.88 at 12 percent and 15.82 at 15 percent. The high BCR in most respondent cases is due to the extreme suitability of the agro climatic zone for Alphonso mango plantation.

Table 9.2 The IRR, NPV and BCR (per acre) of Mangoes (Belewade Village Mulshi) Reference year 1995-96.

Respondent No./	No. of Years: Cash Inflow outflow per acre								IRR	10.5 percent		12 percent		15 percent	
	1	2	3	4	5.....	.....9	10....	.....3 5		NPV	BCR	NPV	BCR	NPV	BCR
Cash outflow															
Cash inflow															
1															
Cash outflow	1800	1700	500	500	500	500	500	500	0.2937	15464.96	2.99	12190.4	2.64	7629.7	1.08
Cash inflow	0	0	0	0	1750	1750	4375	4375							
2															
Cash outflow	1875	975	500	500	500	500	500	500	1.018	272025.4	38.73	224936	34.69	158835.8	29.09
Cash inflow	0	0	0	0	21875	21875	54687	54687							
3															
Cash outflow	1580	925	500	500	500	500	500	500	0.5658	56462.12	9.53	46265.3	8.57	31980.19	6.75
Cash inflow	0	0	0	0	4928	4928	12320	12320							
4															
Cash outflow	1733	875	500	500	500	500	500	500	0.9739	249708.8	34.51	204906	30.86	144548.4	27.73
Cash inflow	0	0	0	0	20000	20000	50000	50000							
5															
Cash outflow	1655	500	500	500	500	500	500	500	0.7961	118164.3	19.57	97465.6	17.68	68427.9	14.45
Cash inflow	0	0	0	0	9750	9750	24375	24375							
Average									0.73	142364	21.06	117152	18.88	82284	15.82
Std. Deviation									0.30	114458	15.45	94535	13.82	67143	12.44
Coeff. Of variation									0.413	0.804	0.73	0.807	0.732	0.816	0.786

3.2 The IRR, NPV and BCR Analysis In Junnar Region (Mangoes)

For the Junnar region the NPV, IRR analysis has been carried out for two fruit crops i.e. mangoes and grapes. This region covers two sets of villages i.e. Bori (Budruk) and Parunda/Vaishnavwadi. As stated earlier these regions are very different and possess distinct characteristics. (see chapter 7-section __ for the salient features of these set of villages). The cost-benefit analysis for mangoes has been carried out separately for these two sets of villages. In addition to a study of the beneficiaries of the CSS scheme who had adopted mango plantation, 6 individual farmers from the Junnar region (referred to as the Junnar-Narayangaon region) producing grapes were also covered in the study. (see section 3.3 of this chapter).

We begin with the cost-benefit analysis of mangoes in this region of Junnar.

A. The Bori village.

1. Majority of the respondents studied in this village started mango plantation in about 1985-86.
2. This village shows a more progressive and successful mango cultivation as compared to the Kule-Bhulgudi villages of Mulshi region on account of better quality of soil, climate conditions and better water availability.
3. The assumptions about the life cycle, fruit bearing age of trees and the yield pattern have been maintained to be the same as for the earlier region i.e. the Mulshi region.

The results of the IRR, NPV and BCR for this village is provided in table 9.3.

Observations on the Results of NPV, IRR and BCR in the Bori village (See Table 9.3)

In the Bori village of Junnar, the average IRR stands at 77.84%. Although the standard deviation and coefficient of variation at 30.44 percent and 39.11 percent in this subregion seem rather large, the table will clearly show that the downside risks are very low. There is no farmer among the seven respondents having an IRR less than 45%. Likewise the average NPV at 10.5 percent is Rs. 201219 and at 12% rate of discount it is Rs. 136529 and at 15% discount is Rs. 96040. As has been stated earlier much of the success of Bori (Budruk) village in mango cultivation can be traced to the availability of sufficient water due to the network of dams in the Junnar regions and the favourable agro-climatic conditions.

Table 9.3 The IRR, NPV and BCR (per acre) of Mangoes (Bori Village Junnar) Reference year 1995-96.

Respondent No./	No. of Years: Cash Inflow outflow per acre								10.5 percent			12 percent		• 15 percent	
	1	2	3	4	5.....	.....9	10.....	.....35	IRR	NPV	BCR	NPV	BCR	NPV	BCR
Cash outflow															
Cash inflow															
1															
Cash outflow	1313	950	500	500	500	500	500	500	0.4587	33828.7	6.13	27511.5	5.15	18676.9	4.46
Cash inflow	0	0	0	0	3147	3147	7868	7868							
2															
Cash outflow	2000	1000	500	500	500	500	500	500	0.7642	137572	20.18	113433	18.05	79565	14.51
Cash inflow	0	0	0	0	11333	11333	28333	28333							
3															
Cash outflow	1634	1280	500	500	500	500	500	500	0.4983	300246	16	40327.3	7.03	27620	5.62
Cash inflow	0	0	0	0	4416	4416	11040	11040							
4															
Cash outflow	1405	1400	500	500	500	500	500	500	0.5053	48298.2	7.86	39432.9	7.04	27022.1	5.66
Cash inflow	0	0	0	0	4320	4320	10800	10800							
5															
Cash outflow	2670	1200	500	500	500	500	500	500	1.004	339226	43.49	280542	38.63	198156	30.68
Cash inflow	0	0	0	0	27200	27200	68000	68000							
6															
Cash outflow	1600	1175	500	500	500	500	500	500	0.9854	222901	33.41	184248	30	129996	24.36
Cash inflow	0	0	0	0	18000	18000	45000	45000							
7															
Cash outflow	1320	1000	500	500	500	500	500	500	1.2334	326462	51.88	270215	46.93	191249	38.51
Cash inflow	0	0	0	0	26080	26080	65200	65200							
Average									0.7784	201219	25.56	136530	21.83	96040.8	17.69
Std. Deviation									0.3044	129398	17.73	109536	16.88	77831.8	13.68
Coeff. of variation									0.391	0.643	0.694	0.8022	0.7732	0.8104	0.7733

The average BCR in this region ranges between 25.56 (at 10.5 percent interest rate) to 21.83 (at 12 percent interest rate) to 17.69 (at 15 percent interest rate). The BCR among the 7 respondents at 10.5 percent ranges between 6.13 to 51.88, at 12 percent it ranges between 5.15 to 46.93 and at 15 percent the range is 4.46 to 38.5.

B. The Parunda-Vaishnavwadi villages:

In this set of villages of Junnar, the NPV, IRR and BCR estimates have been made only for the 3 farmers who have reported survival and success of the mango plantations. The rest of the 7 farmers studied have obviously not been considered because none of their trees has survived. The main reasons for non survival of trees were acute shortage of water, and remoteness of village, and due to some farmers their land in the catchment area of an irrigation project. The other technicalities related to the cost-benefit analysis is on the same lines as has been done for the earlier region of Mulshi.

The results of the estimates of NPV, IRR and BCR in this set of villages is provided in table 9.4.

Observations on the Results of NPV, IRR and BCR in the Parunda, Vaishnavwadi villages (See Table 9.4)

When we come to consider the Parunda and Vaishnavwadi villages in the same Junnar area, the IRRs reported are significantly lower than the Bori subregion. The average IRR in this set of villages is only 43 percent and the average net present value at 10.5 percent is Rs 33401, it is Rs. 27085 at 12% discount rate and Rs. 18255 at 15% discount rate. It has already been stated that of the 10 beneficiaries of the capital subsidy scheme in Parunda, 7 have failed completely, mainly due to acute water shortage and lack of technical knowledge of growing fruits. The figures reported pertain to *only the three who have been successful in mango cultivation in this village*. The average BCR ranges between 4.37 (at 15 percent) to 6 (at 10.5 percent).

Of those respondents whose plantation have survived the common feature is that their cultivated lands were at comparatively lower altitudes given the topography of that region the height of the water table is more favourable at lower altitudes than on mountain tops, and hence the reasonably high returns are indicated. *It should however be noted that the percentage of success is very low in this region hence these figures cannot really be representative of the entire area.* (In this set of villages the percentage of successful farmers is only 25 percent, for details see chapter 8 section 3.5).

Table 9.4 The IRR, NPV and BCR (per acre) of Mangoes (Parunda-Vaishanavwadi Villages Junnar) Reference year 1995-96.

Respondent No./	No. of Years: Cash Inflow outflow per acre								10.5 percent			12 percent		15 percent	
	1	2	3	4	5.....	.....	10... ....	.....3 5	IRR	NPV	BCR	NPV	BCR	NPV	BCR
Cash outflow															
Cash inflow															
1															
Cash outflow	2500	1500	500	500	500	500	500	500	0.292	20336.5	3.22	16040.3	2.81	10047.81	2.13
Cash inflow	0	0	0	0	2222	2222	5555	5555							
2															
Cash outflow	858	1133	500	500	500	500	500	500	0.67	64850.8	11.58	53293	10.51	37098.53	8.68
Cash inflow	0	0	0	0	5555	5555	13888	13888							
3															
Cash outflow	1180	1000	500	500	500	500	500	500	0.319	15016.9	3.21	11924.4	2.88	7619.54	2.31
Cash inflow	0	0	0	0	1666	1666	4166	4166							
Average									0.43	33401.4	6	27085.9	5.4	18255.29	4.37
Std. Deviation									0.21	27365.6	4.83	22789.1	4.43	16363.83	3.73
Coeff. of variation									0.488	0.8192	0.805	0.8413	0.8203	0.8963	0.8535

4. THE IRR, NPV AND BCR ANALYSIS OF GRAPES IN THE JUNNAR NARAYANGAON REGION

This section deals with the cost benefit analysis of grapes, in the Junnar-Narayangaon region. The analysis data is based on data obtained from six individual farmers producing grapes in this region (details of the cost of production, revenue, and other data related to grape production of these group of farmers is provided in chapter 8 section 4 and tables 8.9 and 8.10).

The technical details and assumptions used for the IRR, NPV and BCR analysis are given below:

- a) The respondent farmers produce Thompson-seedless variety of grapes.
- b) The life cycle of grapes is given to be 15 years.
- c) The Thompson-seedless variety of grapes start yielding fruits in the first year itself. The average yield in the first year has been reported at about 7 tonnes per acre which increases to about 9 tonnes per acre in the 2nd year, 10 tonnes in the 4th/5th year, reaches a maximum of 15-20 tonnes in the 6th/7th year which continues almost till its tenth year after which it gradually declines to 12 tonnes in the 11th year and thereafter stagnates at 10 tonnes till the end of its life cycle.
- d) In this region the average yield of grapes per acre has been reported at 10-12 tonnes and since most of the farmers had adopted grape cultivation in 1980's and early 1990's, their grape farm had already attained the Full Development Year, this average of 10-12 tonnes per acre was considered to be the basis of the present cost-benefit analysis. For the first year no yield has been considered (for the sake of conservatism). For the second year the yield have been assumed to be 7 tonnes per acre, followed by 9 tonnes in the 4th year and from the 4th to the 15 year, and an average yield of 10 tonnes per acre has been considered, to follow the principle of conservatism. The basis of assuming 10 tonnes per acre is the information provided by the farmers regarding the average yield to be 10-12 tonnes per acre in this region.
- e) For the purpose of the present analysis therefore the life cycle has been taken as 15 years and a definite yield pattern has been assumed.
- f) Grape cultivation requires a very heavy capital investment in the initial year and also very high annual recurring expenditure in the successive years. By the 10th year again some capital expense is required for renovation of the infrastructure.
- g) As mentioned earlier, in the case of the grape cultivation, the data on cost of production provided by the farmers was inclusive of labour cost and other detailed costs.

(see table 8.9).

h) In the case of grapes two interest rates have been used i.e. 12 percent and 15 percent since grapes is not included in the fruits under the capital subsidy scheme.

The results of the IRR, NPV and BCR related to grapes is presented in table 9.5.

Observations on the Results of NPV, IRR and BCR in the Junnar-Narayangaon region: Grapes. (See Table 9.5)

For the Junnar-Narayangaon region as shown in table 9.5, the average IRR works out to be 31.66 percent. In fact the lowest IRR reported is 28.38 percent. The average NPV figures at 12 percent rate of discount is Rs. 245329 and at 15 percent rate of discount it is Rs. 179894 per acre. It may be reasonably concluded that where conditions of plantations are appropriate, farm incomes can rise substantially if grape cultivation is adopted. The standard deviation of IRR works out to be 2.4 percent only, which shows that the level of riskiness in relation to the rate of return obtainable is very low. The coefficient of variation (Standard deviation divided by mean of the sample) for is 7.58 percent. The average BCR ranges between 1.04 at 15 percent interest rate to 1.13 at 12 percent interest rate, which shows the viability of the grape project.

It should be noted that cash outflow figures in case of grapes are inclusive of wage costs that are actually paid out by farmers. This means that the IRR and NPV figures are indicative of the profits earned by the farmer. One is tempted to remark that the risk return relationship in grape farming would warrant that agricultural banks should engage in commercial lending to prospective farmers of grapes.

The IRR computed in this study compares favourably to that of the earlier studies which shows a 27 percent IRR for grapes (Gadam 1992) and 21 percent (NABARD 1993).

Table 9.5 The IRR, NPV and BCR (per acre) of Grapes (Junnar-Narayangaon Region) Reference year 1995-96.

Respondent No./	No. of Years: Cash Inflow outflow per acre							12 percent			15 percent	
	1	2	3	4	5	6.....	.....15	IRR	NPV	BCR	NPV	BCR
Cash outflow												
Cash inflow												
1												
Cash outflow	146500	85000	85000	85000	85000	85000	85000	0.3375	285095.26	1.19	211784.57	1.1
Cash inflow	0	98000	126000	140000	140000	168000	168000					
2												
Cash outflow	149500	85000	85000	85000	85000	85000	85000	0.3322	282095.26	1.18	208784.57	1.09
Cash inflow	0	98000	126000	140000	140000	168000	168000					
3												
Cash outflow	148100	85000	85000	85000	85000	85000	85000	0.2838	211315.35	1.09	149090.92	1
Cash inflow	0	91000	117000	130000	130000	156000	156000					
4												
Cash outflow	157000	70000	70000	70000	70000	70000	70000	0.3258	255522.61	1.15	189000.39	1.06
Cash inflow	0	91000	117000	130000	130000	143000	143000					
5												
Cash outflow	163000	80000	80000	80000	80000	80000	80000	0.2874	196991.15	1.05	140734.45	0.96
Cash inflow	0	98000	126000	140000	140000	140000	140000					
6												
Cash outflow	153000	75000	75000	75000	75000	75000	75000	0.3333	241045.47	1.13	179971.31	1.04
Cash inflow	0	98000	126000	140000	140000	140000	140000					
Average								0.3166	245329.24	1.13	179894.37	1.04
Std. Deviation								0.024	36172.37	0.0538	27921.72	0.0538
Coeff. of variation								0.0758	0.1474	0.0476	0.1652	0.0516

Concluding Observations :

Some interesting aspects of the IRR, NPV and BCR between the mangoes and grapes which need to be noted are that the results are seen to be very much higher for mangoes as compared to grapes this could be explained as mentioned earlier due to the fact that in case of grapes explicit costs of labour and other expenditure have been given by the farmers in the case of mangoes the explicit costs included mainly those on planting material digging of pits, fertilisers, insecticides and pesticides. However the deviation in the benefit cost ratios in mangoes is very high which implies either extreme success or complete failure. For grapes on the other hand the BCR is more or less uniform for all respondents implying a more steady and assured return in this venture. Moreover the high recurring expenses in grape cultivation, also to some extent explains the lower BCR of grapes found in the primary data analysis. Mangoes also show a high degree of variation in return between regions. As can be observed from the above cost-benefit analysis the IRR/NPV for mangoes shows a very large variation as between regions and as between individual farmers within the same region as compared to grapes whose IRR/NPV is characterised a striking uniformity. The variability of the IRR/NPV of mangoes is readily explained by the fact that the yield of mangoes is very sensitive to characteristics like rainfall, humidity, wind, temperature etc. In contrast the process of grape production is much better streamlined and controlled. As a result the farmer is better able to regulate the flow of output that he can obtain from his grape farm. (due to various treatments, like Gibberlic acid, various fertilisers, various medicines etc.)

It would be appropriate while concluding this chapter to draw attention to the chief reservations that should be applied when interpreting the results of the cost-benefit analysis.

Firstly, the IRR's and the NPV's pertain to the **Farm Business Income** and not to the rate of profit earned by entrepreneur farmer, in the case of mango cultivators.

Secondly, the results pertain exclusively to those farmer who had been successful in their horticultural ventures. They **do not** include a substantial number of those who had ventured but failed.

Be that as it may, the substantial success in horticultural diversification is evident from the high NPV figures in a number of cases (see tables 9.1 to 9.5) which do indicate that if the initial conditions are appropriate enough to ensure healthy survival of trees, the yield and income obtained in future would be fairly stable.

CHAPTER 10

ORGANISED EFFORTS IN GRAPE FARMING (A CASE STUDY OF TWO GRAPE GROWERS' CO-OPERATIVE SOCIETIES)

I. INTRODUCTION

In addition to the study of individual farmers producing mangoes and grapes, a detailed analysis of two grape growers' co-operative societies has been covered in the primary data investigation. They are:

- (1) The Abhinav Grape Growers' Co-operative Society, Aagar, Taluka Junnar, District Pune and
- (2) Vignahar Grape Grower's Society, Narayangaon, District Pune.

This chapter provides the details of-

- a) The general profile and horticultural spread of the member farmers of the societies with special reference to their main horticultural crops i.e. grapes.
- b) The profile of grape exports of these societies, which includes a study of the total exports, the storing and processing facilities, the problems and prospects related to export of grapes and
- c) A cost-benefit analysis of grape cultivation based on data provided by the Vignahar society representing 70 member farmers.

The two co-operatives have been chosen for the study on account of the following reasons: (these reasons have already been discussed at length in chapter 7, section 3.)

- a) The co-operative societies have played the role of nodal agencies in the process of diffusion of horticultural knowledge and practice amongst the member farmers.
- b) Being in the nature of corporate bodies, they have collected and maintained detailed information on their members, the areas that they have devoted to horticultural crops, mainly grapes, the costs of cultivation, the returns, the problems related to cultivation of grapes, the prices reserved by them in both local & foreign markets etc.
- c) Such organised data available from them therefore could be used to make a cost-benefit analysis of grapes, which can serve as a benchmark for the somewhat haphazard figures reported by the individual farmers.

d) Besides the above mentioned reasons, there is also an intrinsic value in studying co-operative and 'organised' efforts due to the following considerations:

(i) any diversification effort would tend to be more successful if undertaken collectively on account of economics of scale in the purchase of inputs, in sharing of knowledge and experience and in the marketing of the produce at the best possible prices.

(ii) Co-operatives can bring in its wake a variety of 'external economics' like bank credit, subsidies, crop insurance arrangements, centralised market information etc.

(iii) Finally, for individual farmers especially of the size that we have studied they find it extremely difficult to make export arrangement for their crops. When a co-operative effort is undertaken, the size of the output, grading, selection, storing, centralised collection of the output, its packaging and transport, enable the realisation of much better export revenues.

(iv) Such organisations are also able to obtain the support of government agencies. Besides, the State of Maharashtra has had a strong tradition in such co-operative efforts.

Thus a study of co-operative or 'organised efforts' is useful in understanding the contribution of such organisations in storing, processing, transporting, marketing and exports of horticultural crops, (in this case specifically related to grapes.)

In a way therefore, the organisation of fruit growers into co-operatives represents the final step in the efforts to promote horticultural diversification. This is for two reasons

(a) When farmers organise themselves into co-operatives or corporate organisations, they are in a better position to dictate their commercial terms (in absence of which, they can be taken undue advantage by the intermediaries) and

(b) Fruits being highly perishable in nature need proper storing, packaging, transporting, facilities which also includes cooling chains, collection of fruits at the right time etc. These aspects are all the more important in export of fruits, in processing of fruits (for e.g. The preparation of wines, squashes, pickles, jams etc). Such activities are capital intensive in nature and also involve huge expenses which may be unlikely for the individual farmer to bear.

For this purpose an 'organised effort' gains significance. Any study of agricultural diversification therefore would be incomplete if such efforts are not considered. Along with production of fruit crops what is equally important are the

2. AN ACCOUNT OF THE TWO GRAPE GROWERS' COOPERATIVE SOCIETIES

In the course of our sample survey we came across two pioneering voluntary efforts in the Junnar/Narayangaon region aimed at co-operativisation of grape growing, selection, collection, grading, processing and marketing in an organised manner. These Co-operatives are engaged in export of grapes to Dubai and Europe. These efforts began as voluntary efforts and resulted in a substantial spread of grape growing both a account of the historical background of the success of grape growing in this region and the leadership qualities of the individuals pioneering these efforts. The subsidisation of the co-operatives by the government agencies helped to stabilise and institutionalise the co-operatives.

We are referring here, to (1) **The Abhinav Grape Growers Co-operative Society**, Agar, Junnar Taluka, headed by Shri Jayaram Seth Landge and **Vighnagar Grape Growers Co-operative Society** headed by Anil Seth Meher.

2.1 Back Ground Of Co-Operative Grape Producing And Marketing Efforts In Maharashtra.

Before proceeding with the details of the two societies we begin with a brief summary of the historical background of co-operative grape producing and marketing efforts in Maharashtra.

As early as in 1967 – 68 horticultural crops were recognised as a commercially viable alternative with a very strong market potential, in fact by 1940's Baramati, Nasik had already emerged as established centres for grapes. In 1974 – 75, there was a change from seeded to 'seedless grapes' which were priced higher and also had a strong export potential. In the Junnar and Narayangaon region the major pioneer grape growers were Mr. Bhalu, Mr. Bankar and Mr. Vijay Meher. Cultivation of grapes spread in this region through the information and guidance provided by the Grape Grower's Association. The leaders of this association were Vasant Rao Arve (Sangli), Datta Prasad Dabholkar, Aba Munetra (Tasgaon), Mani Bhai Desai, etc along with agricultural scientists like Dr. A.N. Nagpal, Dr. Bhujbal and Dr. Khilare. By mid seventies; there were 17000 members of grape growers association from various regions of Maharashtra like Sangli, Junnar, Narayangaon, Pimpalgaon Baswant of Nasik district, Kolhapur and Sholapur district of Western Maharashtra. (These seedless grapes have its origin in Afghanistan. India had been importing the Sandhukhani and Sultana Variety of grapes which had very thin skin, high sugar content and were market-friendly). With the introduction of 'Thompson seedless grapes', the grape market

expanded to far off states in India and also to the Gulf countries. These grapes were priced at Rs. 25 to Rs. 30 per kg in early seventies and in 1974 – 75 the price increased to Rs. 50 to Rs. 60 for a kg.

In 1989 the London market demand was studied, and priority was to be given to develop the pre-cooling units with cold storage and marketing facilities in order to reach the European markets. Mobile units which collected grapes from the farms were introduced to facilitate transportation and marketing of grapes. In 1990, the Mahagrapes co-operative organisation was established. Shri. Sopan Kanchan was its Executive Director. The co-directors were Anil Meher, Balasaheb Jagtap, etc. This was to be an agency for marketing of grapes in the domestic as well as in the foreign market. 17 societies belonging to various parts of Maharashtra joined this organisation. The production of grapes was however to be managed by the private co-operatives and grape cultivators/growers, the Mahagrapes would only concern itself with the marketing of the grapes. In 1991, the first consignment of grapes was sent to G.O. Simps & Company by Mahagrapes. In October 1991, Mahagrapes sent a delegation to Europe to study the pre-cooling chains. Since Mahagrapes was to deal only in marketing of grapes it became very difficult to maintain quality control on grape production, because of the diverse agroclimatic conditions in the state and because the grape cultivation operated over a vast area. The quality of grapes varied a lot and it was also difficult to have an assured supply of grapes. The proposal by the private co-operative organisation was that Mahagrapes should be only a market intelligence agency and provide information on market potential and market specifications both in the domestic and international market, especially that relating to the international market and guidelines for grape production. A Consultancy Commission of 1 to 1.5 percent would be given to Mahagrapes by the members. There are about 33-40 grape growers societies in the Western belt of Maharashtra.

The two cooperative organisations, considered in this study i.e. Abhinav Grape Growers Cooperation Society, Aagar, Taluka Junnar and Vighnagar Grape Growers Cooperative Society, Narayangaon were established in early 1990's. A brief profile of their achievements in promoting grape cultivation, and export of grapes is provided below, which could serve the purpose of a representative case study of all the independent grape growers societies of the state. Data was collected by the questionnaire cum interview method. (The questionnaire used for the grape growing society is shown as Annexure 7).

2.2. The General Profile And Horticultural Spread Of The Member Farmers Of The Societies (With Special Reference To The Main Horticultural Crop I.E. Grapes).

THE ABHINAV SOCIETY

The society was established in 1990-91 with a membership of 142 farmers covering 36 villages. The total cultivated area of the members of the society is 1064 acres out of which 341 acres are allotted to grapes, 114 acres to other fruits like Chikoo, Mango, Banana, Ber, Pomegranate, and 118 acres are under vegetables and the rest is allotted to the regular food grains and some cash crops. The average size of the total land holding of each member is about 7.5 acres. The average area allotted to grapes is about 2.5 to 3 acres per member. On an average approximately 30 percent of the land holdings of each member are under grapes in this region. In addition to grapes, about 10 percent of the land holding is under other fruits and 10 percent is used for vegetable crops. Thus on an average approximately 50 percent of the land holding of the member farmers in this region is used for horticultural activities. This has been facilitated mainly due to the dense network of 5 major irrigation projects in this region. These include (Manidoh, Kukadi, Yedgaon, Pimpalgaon and Dimbe). Around 50 percent of this region has canal irrigation. This irrigation facility has proved to be especially beneficial to the grape crop and has resulted in quality production of grapes in this region. The following table 10.1 provides information on the production of fruits and vegetables of the member farmers of this society. -

Table 10.1 Data On Production Of Fruits And Vegetables Other Than Grapes (Reference Year : 1993 - 94

Production of Fruits (Total 114 acres)		Production of Vegetables (Total 118 acres)	
Item	Production (tonnes)	Item	Production (tonnes)
Chikoo	45	Karela (Bitter gourd)	175
Mango	65	Lady Finger	700
Banana	1200	Green beans (Walwad)	800
Ber	70	Chilies	1600
Pomegranate	60	Sweet gourd	100
Guava	120		
Total	1560	Total	3375

The above data brings out the following aspects of horticultural activity in this region.

- a. The total production of fruits is 1560 tonnes from 114 acre i.e. about 13.68 tonnes per acre. The major fruits cultivated by the member farmers include bananas, guava, mangoes and grapes. Other details regarding production & export of grapes is discussed in section of this chapter.
- b. Taking the average price of all fruits to be Rs. 3000 per tonne (not accounting for the fact that the price of mangoes is higher), the gross revenue from all fruits other than grapes from this region can be estimated at Rs. 46,80,000/- (i.e. 1560 tonnes x Rs 3000/ tonne). This amounts to Rs 41052 per acre.
- c. The total production of vegetables is 3385 tonnes from a total of 118 acre which works out to be 28.68 tonnes per acre on an average. Assuming for the sake of conservation a minimum market price of vegetables at Rs. 3000 per tonne (which has in fact prevailed over the last 5 years), the gross revenue from vegetables can be estimated at Rs. 10155000 (3375 tonnes x Rs 3000/tonne). The average gross revenue per acre would be about Rs. 86059 per acre.
- d. Thus as can be seen as a result of the spread of horticultural activity including fruits and vegetable production a gross income of Rs. 63943 per acre can be generated if a proper diversified cropping pattern is followed.

GRAPES: This is most important fruit crop of the member farmers. The total output of grapes of the member farmers have been reported at 3410 tonnes for the period 1995-96. Of this total output about 1500 tonnes is exported to Dubai and 304 tonnes are exported to Europe and the rest i.e. about 1600 tonnes is sold locally. (The details of the export profile of grape exports are provided in section 3 of this chapter). The average productivity of grapes per acre has been reported as 10 to 12 tonnes per acre.

THE VIGHNAHAR SOCIETY.

The society was established in 1991-92 with a membership of 70 farmers. These members belong to the neighbouring villages of Junnar and Narayangaon, Warulwadi, Derewadi, Wargewadi, Belhi, Kothewadi etc. The chairman of the society is Mr. Anil Ghamaji Meher who is also the president of Draksha Bagiyatdar Sangh, Maharashtra state and member Board of horticultural development, 9th plan, Government of India.

The major horticultural crop of the member farmers is grapes, the total area of all the members under grapes was reported to the 140 acres. The average productivity of grapes has been quoted as 10-12 tonnes per acre similar to

Abhinav society. The average area under grapes per member thus works out to be about 2 acres. The area under grapes for the members varies between .75 to 4.2 acres. The dominant group being about 2 acres reported by 20 members. About 16 members have very small area under grapes ranging between .75 to 1 acre. Only about 3 members have grape farms of 3 acres. The age of the Vineyards range from 4 to 12 years and the grapes produced are of a very superior quality (these grapes are produced mostly for the export market, details of which are discussed in the later sections). The member farmers produce a variety of grapes which includes Thompson seedless, Tas-a-ganesh, sonaka, kishmish chorni and Sharad-seedless. (Information regarding the other horticultural crops i.e. fruits and vegetables was not available from this society as was in the case of the Abhinav society).

The Abhinav and Vighnahar societies have substantially augmented spread of grape farming in the Junnar and Narayangaon regions, prior to the formation of these societies the total area under grape cultivation was in the region of 25 to 40 acres- which primarily consisted of the area devoted to grapes by the early pioneers of grape farming the region. Descendants of these early pioneers have donated a plot of land for the cooling plant construction and organised other farmers to join in the efforts of augmenting grape production. The result has been a total spread of grape farming to 341 acres for abhinav members and 140 for Vighnahar members. With an average output of 10 tonnes (at the minimum) of grapes per acre per year the output works out to 3410 tonnes (Abhinav) plus 1400 tonnes (Vighnahar) i.e. a total of 4810 tonnes. The revenue estimates of grapes along with their break ups are reported in the section. [The societies are engaged basically in the exports of grapes to Dubai and Europe and hence a revenue estimate would necessarily involve both the revenue obtained by selling grapes in the domestic and the international markets].

3) GRAPE EXPORTS OF ABHINAV AND VGHNAHAR SOCIETIES.

Grape exports have been identified as a significant non-traditional export item in the recent years in India, and holds the potential to emerge as a major foreign exchange earner in the future (see chapter 4 section 3.1).

The liberalisation policy of the early nineties had encouraged a number of private societies to take initiative and interest in grape production and exports. The Abhinav and Vighnahar societies are representative of such developments and have sought to undertake export of grapes through formation of 'cooperatives' in

the Junnar- Narayangaon region of western Maharashtra. Both these societies as mentioned earlier were established in early 1990's. On account of the substantial economies of scale achieved by the organised efforts of the Abhinav & Vighnagar societies (with Abhinav reporting 3410 tonnes of annual grape production and Vighnagar 1400 tonnes in the year 1995-96). These societies were in a position to specialise in export of grapes.

In what follows we present a brief profile of the 'organised efforts' of these societies towards promoting export of grapes. The two co-operatives have been instrumental in promoting exports of grapes in the Junnar region and have provided the infrastructure, financial and technical support for the same. These societies have installed chilling plants, provided for collection, storing, processing and transportation of grapes. They have also given continuous guidance to the member farmers to ensure production of high quality grapes and have extended both financial and technical assistance and also the required extension services.

FORMATION OF GRAPE GROWERS SOCIETY AND CONSTRUCTION OF CHILLING PLANTS

The idea of formation of grape growers' co-operative societies and construction of chilling plants to facilitate export of grapes was conceived and brought into reality by the chairman of these 2 societies. The first chilling plant was constructed by the Abhinav society followed by the Vighnagar society.

The initial land required for the construction of these chilling plants was provided by the chairmen, in the premises of their farm estates. The construction of these plants required a total finance of Rs. 1.5 crores each. Initially the chilling plant was constructed by the societies own finance and bank loans, (mainly provided by Bank of India) at 14 percent annual rate of interest. The interest burden of the of the bank loans proved to be very heavy amounting to more than Rs. 14 to 18 lakhs). However recently, due to the efforts of the chairman of Vighnagar, the APEDA, National Horticultural Board (NHB) and the Ministry for Food Processing (MFP) have provided loans on subsidised term to the societies in the following manner; Rs. 5 lakhs by APEDA, Rs 40 lakhs by NHB and Rs. 60 lakhs by MFP. These soft loans have relieved the burden of interest payment to a large extent. Accordingly it is expected that the societies would be able to fully pay their loans with interest by the end of the century i.e. within about 8-9 years of their inception. The chilling plants would then be able to operate profitably. Presently the chilling plants are in the red partly because of the heavy burden of

the loan and interest payment and partly due to the fact that only about 30 percent or so of the capacity of these plants are utilised. Both the plants are used only for a period of about 4 months for grape processing from January to April. These societies have a future to diversify into other fruits, vegetables, and flowers provided that adequate quantity of such items are supplied by the member farmers. These chilling plants are highly mechanised, computerised and automated. Besides they maintains high levels of hygienic standards that are required for intentional acceptance of food and fruit crops.

GRAPE EXPORTS:

The total output of grapes of the member farmers of the Abhinav society has been given as 3410 tonnes for the year 1995-96. This output is sold locally as well as exported to Dubai and Europe. The society initially started with exports to Dubai which in 1991 was reported at 100 tonnes, this increased to 1200 tonnes in 1992 and further to 1500 tonnes in 1995-96, which means about 40 percent of the output is exported to Dubai. Exports to Europe started only recently, and this society had exported about 304 tonnes to Europe in the year 1995-96.

The total production of grapes of the Vighnahr society as been reported at 1400 tonnes in 1995-96. The exports of Vighnar to Europe was reported at about 336 tonnes for the year 1995-96 about 560 tonnes was exported to Dubai in the same year. These societies are infact rapidly increasing their exports to Europe and have been able to satisfy the international specifications prescribed by the World Wide Fruit, (WWF) organisation. Details of the specification are provided in the later part of this analysis.

A total of 640 tonnes were reported to have been exported to Europe in the year 1995-96. These societies produce a variety of grapes which include Thompson seedless, Thompson selection – I, Tas-a-ganesh, Sonaka, Kishmish-chorni and Sharad seedless. The most popular variety in demand in the European market is the Thompson seedless grapes. The details regarding planting, pruning, application of fertilisers, hormone-treatment, harvesting, packaging etc are prepared and circulated to the member farmers by the society to ensure quality production of grapes. Regular visits by technical officers are made and other extension services are provided to them. These societies also arrange seminars, water management field visits etc for the purpose of ensuring a high standard and imparting knowledge to the member farmers.

As a result the members have been able to produce quality grapes, ensure good

yields, high keeping quality and have been acknowledged as top grape growers, satisfying the international specifications required for export of grapes, specially for export to the European market.

In what follows is presented the international specifications for grape exports to the European market prescribed by the World Wide Fruit Organisation (WWF) and the agencies which deal in the exports of these societies.

a) Specifications regarding the berry size and bunch size

The Thompson seedless grapes to be acceptable in the European market must be of the minimum berry size of 16mm, the preferred size is 18mm. (Sometimes very high quality grapes of 20 mm are also made available.) The minimum bunch size is 350gm, the preferred size is 500 gm upto a maximum of 800 gm.

b) Specifications regarding weight of carton and labelling : The net weight of the carton of grapes must be Rs. 5 kg at arrival. The label of the carton should contain the commodity description, the country of origin, class I grapes, Variety, name and address of packer and packaging date.

c) Specifications regarding harvesting and packaging. The grapes must be harvested when fully mature and sweet. Bunches should refrigerated within 6 hours of picking. The packaging material should be clean & suitable for food export – the carton should be lined with tissue paper or polythene bag clearly labeled as seedless grapes. It should also contain a presentation i.e. a sulphur dioxide pad not in direct contact with the fruit and its details should be communicated to the WWF technical department.

d) Specification regarding use of Pesticides and chemicals: All Pesticides and chemicals applied to the fruit must be recorded and communicated to the WWF.

e) Specifications regarding taste & texture: The fruit should be sweet, juicy free from Taints, or colours and the minimum sugar level is specified at 16% (infact Indian grapes are preferred due to its high sugar content.) The fruits should also be clean and free from insect, bird damages etc.

The grapes are sent to the European market in march-end April, and India enjoys the advantage of entering the European market in summer when South Africa, Chile, main competitors are unable to supply their grapes because of their climatic constraints. India also has a cost-advantage in the production of grapes.

Marketing Agencies for export of grapes: The major agencies dealing in export of grape from these societies include, Mark Spencer a well known super market having chains shops and over the US, Canada, and Europe. The other agencies

include Mack Multiple discussion, Beans trading, G.S. Series Safeway (England).

PRICES IN THE EXPORT MARKET: The prices received in the local market is in the range of Rs. 14. These include Bombay, Delhi, Ludhiana etc. The prices received in the Dubai market as been reported as Rs. 60 per kg. of grapes, and in the European market it is quoted at Rs. 90 to 100 per kg. (reference year 1995-96). However the net price received by the member farmers from exports to Dubai are in the range of Rs. 20 to 24 and that received from exports to Europe has been given at about Rs. 27 to Rs 30 per kg. This is after deducting the packaging, transport, storing & processing expenses and the society charges. The details of the break-up of the receipts and expenditure for 1 kg. of grapes exported to the European market are provided below in table 10.2. This break-up includes the transport charges, export duty, commission of agents, packaging processing charges etc. Once these charges are deducted the member farmer receives the net price of the amount shown n the table 10.2. If the price in the European market is Rs. 100 per kg. various expenses of charges have to be deducted to arrive at the net priced by the farmer. This is given in the table 10.2 given below.

If the price in the is Rs 100 per kg.then a total of Rs 66 is required for transport freight charges, transportation from chilling plant to Bombay, export duty advalerlum (at 18% of value received of 100 Rs. per kg.), commission of agencies, packaging, forwarding & processing, bunching & cooling charges. After deducting this Rs 66 from Rs 100 Rs 34 remains, out of which Rs 7 per kg. is deducted at source as a contribution to the capital overhead fund and thus a net of Rs 27 is paid to the member farmers. (When the price in the European market falls to Rs 90 then the society retains a lesser amount for the contributory fund).

Once the loans of the chilling plant are fully repaid, the members would obviously get higher prices per kg. after a couple of years. At present the chilling plant societies have to bear heavy costs of overheads because of 70 percent non-utilisation of the plant capacity, as mentioned earlier.

The European market offers the advantage of a higher price as compared to Dubai where the price is only Rs 20 –24 per kg. and the local market where the price is Rs 14 per kg. However it should not be forgotten that the specifications for exports to European market are much more difficult to achieve.

Table 10.2 Break up of revenue and expenditure of one kg. of grapes exported to the European market (Thompson seedless)

RECEIPTS	EXPENSES
Rs. 100 per kg. (income of exported grapes in EEC.)	Rs. 15 per kg. Transport freight of the container. (shipping)
	Rs. 2 per kg. for transportation from chilling plant to Bombay
	Rs. 18 export duty ad valorem at 18% of the value received of 100 Rs per kg.
	Rs. 8.00 Commission of Agencies.
	Rs. 13.00 Packaging, forwarding etc.
	Rs. 10.00 Processing, bunching, cooling etc.
Rs. 100	-----
- 66	Rs. 66.00

34	
less 7 per kg. deducted at the source from due payments of grape farmers adjusted towards capital overhead fund	

Rs. 27 per kg. to the grape grower member. (Net price paid to the member farmer)	

Source: Unpublished data from Vighnagar society, Narayangaon, Junnar.

In the last 4-5 years the two societies have however established their reputation in European market and have thoroughly satisfied the requirements of the quality and standards of that market. They have also developed trade relations with their agents, who have a larger net work of their trade throughout the world. Thus there is a sure potential that through their 'satisfied' agents, the societies will be able to expand their market elsewhere, other than EEC market.

The most notable contribution of the societies and chilling plants is to provide export market for their member growers and assured price for their produce. They have been able to penetrate into the Europe market. Together these societies have been able to raise an export revenue of about Rs 17280000

(640 tonnes x Rs 27/tonne) i.e. an approximate revenue of Rs 86400 per member.

Some of the problems that these societies face,

- a) Under utilisation of the capacity of the chilling plant.
- b) Huge interest burden and high recurring costs in the range of 32 lakhs per season.
- c) A very exorbitant advalorem duty of 18% for export of grapes to Europe. (The Chile exporters have to pay only 5-8 percent & South African grape exporters have zero duty).

4. REVENUE AND COST ANALYSIS OF ONE ACRE OF GRAPE FARM

(Based on Consolidated data of 70 Members of Vignahar Grape Growers Cooperative Society, Junnar-Narayangaon, District Pune, Reference Year 1995-96.)

This part of the study analyses the revenue and cost of grape farms based on data provided by the Vignahar Society. This data was obtained from the chairman of the society and is representative of the 70 member farmers of the society who have adopted grape farming. The dominant size of the grape farm of this group is between 2 to 2.5 acres (i.e. about 50percent of the member farmers fall into this category). 13 members i.e. 18.57 percent have allocated between 3 to 4.5 acres of land for grape farming.

4.1 Cost Analysis Of Grape Farming:

The following section reports the details of the cost of cultivation of grapes, (of Thompson seedless variety in the Junnar Naraygaon region). Details of the various aspects of the cost of cultivation of grapes, the capital investment of the initial year, the recurring expenses, the bank loan component and the gross revenue from the grape farms have been compiled. These details have been provided in Tables 10.3, 10.4, 10.5 respectively.

ANALYSIS OF THE INITIAL YEAR CAPITAL EXPENDITURE ON GRAPE FARMS

The capital expenditure in grape farming are incurred in two phases i.e. phase I & phase II. Table 10.3 reports the various items of expenditure incurred in the initial year in both the phases.

Table 10.3 Cost Of Development Of One Acre Of Grape Farm: Variety: Thompson Seedless. Spacing: 10'x6'; No. Of Vines: 726 (Also Applicable For Other Spacing Like 8'x6', 12'x6' Etc) Reference year 1995-96

ITEMS	Cost Phase I (Rs.)	Cost Phase II Rs	Total I + II Rs.	Percentage Share in total cost of development
1. Preparation of land	1000	-	1000	0.47
2. Digging of Pits/trenches & refilling	13920	-	13920	6.62
a. Excavation work : 174 brass X Rs. 40 per brass				
b. Refilling Work : 174 brass X Rs.40 per brass				
Cost of Plant Material : 726 plants @ Rs. 2.50 per plant	1815	-	1815	0.86
4. Cost of Supporting System :	7390	-	7390	3.51
a. Bamboo 800 Nos. X Rs. 8 each	6400			
b. Tarfelt 50 Kg. X Rs. 6 per Kg	300			
c. Twine 30 Kg. X Rs. 18 per Kg	540			
d. 3 pairs of hammer & pliers @Rs. 50 each	150			
	7390			

Table 10.3 Continued...

Cost of Trellis System :	58460	-	58460	27.81
a. Steel angles 2.2 tons X Rs. 13000 per ton	28600			
b. Welding charges, 2.2 tons X Rs. 2000 per ton	4400			
c. Steel Wire 0.7 ton X Rs. 20000 per ton	14000			
d. Cement 20 bags X Rs. 120 per bag	2400			
e. Sand and stone 2 brass X Rs. 200 per brass	400			
f. End angle supports, 200 Kg. Round brass	2400			
g. Mason work - 21 days X Rs. 60 per day	1260			
h. Trellis erection - 5 labour X 20 days	5000			
@ Rs. 50 per day				
	58460			
6. Irrigation : 25 rounds in each phase @ Rs. 35 per round	875	875	1750	0.83
7. Fencing the vine yard	7500	7500	15000	7.13
8. Spray solution	500	-	500	0.23
9. Fertilisers				
<u>Pits Dose (Phase 1)</u>	21715	17980	39695	18.88
a. F.Y.M. 10 lorries X Rs. 1200 per lorry	12000			
b. Bonemeal 500 Kg X Rs. 222.50 per 50 Kg	2225			
c. Super Phosphate 1 ton X Rs. 122.50 per 50 Kg	2450			
d. Trace element 75 Kg X Rs. 15 per Kg.	1125			
e. Boron 3 Kg X Rs. 20 per Kg.	60			
<u>Vine Growth Dose</u>				
f. Bonemeal 500 Kg. X Rs. 122.50 per 50 Kg.	1225			
g. Super Phosphate 1 ton X Rs. 122.50 per 50 Kg	2450			
h. Sulphate of Potash 200 Kg. X Rs. 900 per ton	180			
	21715			
Total for Phase I				

Table 10.3 Continued...

<p>10. Phase II - Fertilisers</p> <p>a. F.Y.M. 10 lorries X Rs. 1200 per lorry 12000</p> <p>b. Bonemeal 500 Kg. X Rs. 222.50 per 50 Kg 2225</p> <p>c. Super Phosphate 1 ton X Rs. 122.50 per 50 Kg 2450</p> <p>d. Sulphate of Potash 200 Kg. X Rs. 900 per ton 180</p> <p>e. Trace element 75 Kg X Rs. 15 per Kg. 1125</p> <p style="text-align: right;">Total for Phase II <u>17980</u></p>				
<p>11. Labour :</p> <p>Phase I</p> <p>a. For planting : 20 labour @ Rs. 50 per day 1000</p> <p>Phase II</p> <p>a. Routine farm work like pruning, G.A. treatment girdling, thinning, fertiliser application, etc. One labour for 360 days @ Rs. 50 per day 18000</p> <p>c. Driver to operate tractor mounted spraying system for 20 acres crop salary Rs. 1200 p.m. 720</p> <p style="text-align: right;">Total for Phase II <u>18720</u></p> <p>12. Farm Mechanisation (Tractor mounted spray)</p> <p>13. Plant Protection</p> <p>Phase I :</p> <p>a. Copper fungicide 2.5 Kg. X Rs. 250 per bag 625</p> <p>b. Wettable sulphur 2 Kg. X Rs. 55 110</p> <p>c. Nuvan / Nuvacron 1 lt. X Rs. 500 per l tr. 500</p>	1000	18720	19720	9.38.
	-	11250	11250	5.35
	1910	8939	10849	5.16

Table 10.3 Continued...

d. Bordo 1 percent CuSO ₄ 15 Kg. X Rs. 45 per kg	675				
Total for phase I	1910				3.84
Phase II :					
a. Copper fungicide 2.25 Kg. X Rs. 250 per bag	562.50				
b. Dithane M 45 2.25 Kg. X Rs. 230 per Kg.	517.50				
c. Wettable sulphur/ Karathane 0.9lt X Rs. 960	864.00				
d. Nuvan 5 lt / Nuvacron 3 lt. (5 X Rs. 500 + 3 X 440 per ltr.)	3820.00				
e. Sulphur dust 50 Kg. X Rs. 12 per Kg.	600.00				
f. Belaton 1 Kg. X Rs. 1900 per Kg	1900.00				
g. Bordo 1 percent CuSO ₄ 15 Kg. X Rs. 45	675.00				
Total for phase II	8939				
14. Gibberellic Acid Treatment @ Rs. 40 per gram x 20gms		800	-	800	0.38
15. Misc. Expenses :		400	6000	6400	3.04
<u>Phase I Fuel Consumption</u>					
a. 20 sprays X Rs. 100	200				
b. Tractor Maintenance	200				
Total for Phase I	400				
<u>Phase II Fuel Consumption</u>					
a. 20 sprays X Rs. 100	200				
b. Tractor Maintenance	200				

Table 10.3 Continued...

c. Bird control for 60 days	3000				
d. Night Watchman for 75 days X 25	1875				
e. Stationary & Travelling etc.	500				
f. Agricultural Cess and Other fees	225				
	6000				
16. Drip Irrigation System : Per Acre Installation etc.		20000	-	20000	9.51
17. Accommodation for Driver and Manager : (per acre)		1600	-	1600	0.76
	32000				
Total Cost of Development (Capital Investment)		138885 (66.09)	71264 (33.91)	210149	

Figures in bracket refers to the percentage of cost in phase I and phase II to the total cost of development. Source data obtained published document of Vighnagar Grape Groweres Society, Narayangaon. (adjusted for errors) period - 1995-96.

OBSERVATIONS:

The following major observations regarding the cost of development of one acre of grape farm can be noted from table 10.3 given above.

1. The standard spacing, which is followed by most of the growers, is 10 feet by 6 feet, and number of vines per acre are 726. The cost of 726 plants at the rate of Rs. 2.50 per plant works out to be Rs. 1815, which is a very small and negligible portion of the total cost (see table 10.3 item nos. 3).
2. Preparation of the land requires Rs. 1000/-. The digging of pits, trenches and refilling of 174 brass requires a total expenditure of Rs. 13920/- which is about 6.62 percent of the total development cost in the initial year. The cost of the supporting system done with bamboo's, twine, etc. is Rs. 7390 i.e. about 3.5 percent of the total development cost (see items 1, 2, and 4 in table 10.3 respectively).
3. The most heavy cost under this category of development cost or capital investment is the cost required for erection of Trellis system (i.e. Mandav's). [For the detailed break up of steel angle / steel wire sand, cement etc. required for the Trellis system see item nos. 5 in table 10.3]. The total cost of the Trellis system is reported as Rs. 58460/- i.e. 27.81 percent or nearly more than 1/3 of the total development cost. For the development of a grape farm, the investment required for this item i.e. the erection of trellis system is the single most dominant expense, this cost is non recurring and would tend to get evened out in course of time. The Trellis system requires renovation after a period of 10-15 years.
4. Another very cost heavy item is the cost required for fertilizers in the first and second phase. The detailed break-up of phase-wise requirements of bonemeal, superphosphate, borax, potash, etc. are provided in the table 10.3 (Items 9 and 10). In the first phase a total of Rs. 21715 is required, the breakup of this is provided in item 9 under Pits Dose and Vine growth Dose. In the second phase a total of Rs. 17980 is incurred on various items of fertilizers, the break up of which is provided in item 10. The total expenditure on fertilizer therefore amounts to Rs. 39695 in both phases which is 18.88 percent of the total development cost.
5. The other important item of the development cost is the drip irrigation system (item 16) which requires Rs. 20000 i.e. 9.51 percent of the total cost. (For which subsidy and bank loan are available).
6. Labour also is an important item in the development cost in the first phase labour cost is Rs. 1000, in the second phase it is higher at Rs. 18720 (item 11). In the second phase the labour intensive activities like pruning, G.A. treatment, Girdling, thinning and tractor mounted spraying, account for the higher level of

cost. The total labour cost per acre for both phases taken together amounts to Rs. 19720 i.e. 9.38 percent of the total cost.

7. Plant protection in Phase I and Phase II taken together amounts to Rs. 10849 i.e. 5.16 percent of the total development cost (see item 13). This includes expenditures on doses of copper fungicide, dithane, M 45, Nuvan 5, Nuvacron, Sulphur dust, Belatone, etc. Gibberlic acid treatment requires Rs. 800 only in the first phase.

8. Miscellaneous expenses such as fuel, bird control, night watchmen, electricity and tractor maintenance require Rs. 6400 i.e. 3.04 percent of total development cost.

9. The other items in the table include tractor mounted spray, (item 12), which amounts to Rs. 11250 i.e. 5.35 percent of the total cost, and other minor expenditures dwelling for driver and manager. (see item 16).

The total development cost or capital investment for one acre of a grape farm, (for Thompson seedless grapes), thus amounts to Rs. 210149. (see item 17 in table 10.3). Of this Rs. 138885 has to be incurred in phase I and Rs. 71264 is incurred in the second phase. This implies that almost 66.09 percent of the capital investment is required in the initial phase I, and 33.91 percent is required in phase II. Cultivation of grapes therefore as can be seen involves very heavy initial capital investment.

4.2 RECURRING AND MAINTENANCE COST IN GRAPE CULTIVATION

This sub-section provides the details of the maintenance costs or recurring costs for grape cultivation. Table 10.4 gives the break-up of the recurring costs in Phase I and Phase II. The total recurring cost in both phases together amounts to Rs. 70686/- (see item 24 in table 10.4). The first phase refers to the period from April pruning to September and the second phase is from October pruning to the time of harvest.

OBSERVATIONS:

The total recurring cost in the first phase is Rs. 14694 (see item 9) and the detailed break-up and analysis of these costs are provided below. (see total of items 1 to 8 in phase I in table 10.4 given below)

1. In the first phase the major items of expenditure includes on inter-cultivation of bullocks, irrigation labour, urea, & fertilizers like copper fungicide, wettable sulphur, nuvan, nuvacron, Bordo, is given as Rs. 14694.

Table 10.4 Cost Of Maintenance Of One Acre Grape Farm (Annual Recurring Expenses) 1995-96

PHASE I: FROM APRIL PRUNING TO SEPTEMBER			
Description of work	Units	Rate (Rs.)	Amount (Rs.)
Inter cultivation of Bullocks @ Rs 200 per pair	6 pairs	200	1200
Irrigation	25 rounds	35	875
Labour (one male 180 days)	180 days	50	9000
Urea	500 Kg	1709	1709
Copper fungicide	2.5 Kg	250	625
Wettable Sulphur	2 Kg	55	110
Nuvan/Nuvacron	1 litre	500	500
Bordo 1 percent	15 Kg	45	675
Total of Phase I			14694
PHASE II: FROM OCTOBER PRUNING TO HARVEST			
F. Y.M application	10 Trucks	1200	12000
Chemical fertiliser	1 Tonne	9000	9000
Trace elements Zn, Fe, Mg each	15 Kg	15	225
Inter cultivation by bullocks/Tractors	6 pairs	200	1200
Irrigation	25 rounds	35	875
Labour (one male 180 days)	180days	50	9000
Blue Copper	2.25 Kg	174	391
Methene M 45	2.25 Kg	230	517
Wettable sulphur	0.9 litres	1000	900
Nuvan/Nuvacron	8 litres	500	4000
Sulphur Dust	50 Kg	12	600
Belayton (Byer)	1 Kg	1900	1900
Ridomil	2.25 Kg	1366	3073
Bordo 1 percent (CuSo4)	15 Kg	45	675
Growth retardant	500 ml	670	335
Gibberellic acid	20 gm	40	800
Tractor fuel	lumpsum	-	4000
Bird control	lumpsum	-	3000
Night watchman	-	-	1800
Stationary, travelling etc	-	-	1000
Tractor maintenance	-	-	200
Agricultural Cess and other fees	-	-	500
Total for phase II	-	-	55992
TOTAL RECURRING EXPENSES OF PHASE I & PHASE II	-	-	70686

Source: Data obtained from the published documents of the Vignahar Grape Growers co-operative society Narayangoan, (Adjusted for errors) period 1995-96.

- Of these expenditures which are incurred in the first phase the single most dominant expenses is incurred on labour cost which amounts to Rs. 9000 i.e. 61.2 percent of the cost of phase I.
- The cost on fertilizers which includes copper fungicide, wettable sulphur, nuvan, nuvacron, Bordo, and other fertilizers together amounts to Rs. 3619. (total of items 4-8 in phase I reported in table 10.4), i.e. 24.62 percent of the total recurring expenditure in phase I.
- Rs. 1200 is incurred on inter-cultivation by bullocks and Rs. 875 is incurred

on irrigation for one acre of the grape farm.

In the second phase the total recurring cost amounts to Rs.55992.5 (see item 23 in table 10.4). The second phase of grape cultivation requires extreme care and caution and alertness and even a slight negligence can lead to the crop being completely destroyed.

1. The major items of expenditure in this phase are on FYM applications, fertilisers, labour, and tractors. This is the phase when appropriate and adequate application of fertilisers insecticides, hormones, pesticides is essential. Expenditure on FYM application amounts to Rs. 12000 accounting for 21.43 percent of the total cost of second phase, followed by labour cost that is Rs. 9000 accounting for 16 percent of the total cost of phase II. The expense on chemical fertilisers also is about 16 percent of the total cost in the first phase. Expenses on Nuvan, Nuvacron, Ridomil (items 10 and 13) together amount to Rs. 7073.5 i.e. 12.6 percent of the total cost of phase I, amounting to Rs. 9000. Another dominant cost in the second phase is on bird control given at Rs. 3000/- amounting to 5.3 percent of the phase II cost.

2. The total recurring cost for one acre of grape farm per annum inclusive of phase I and phase II as seen from the table 10.4 amounts to Rs. 70686.5, (see item 24 in table 10.4)

Grape farming therefore involves not only heavy capital investment expenses but also considerably high recurring expenses, however grapes also have the potential to fetch high revenues, which account for the popularity of this fruit crop. The following section makes a revenue and cost analysis of grape farming.

4.3 The Revenue And Cost Analysis Of Grape Farming

The following tables 10.5 and 10.6 indicates the net revenue of one acre of grape farming taking into consideration the annual outgo inclusive of the various costs as well as the interest payment on bank loans required for the capital investment as well as maintenance cost.

Table 10.5 Total Annual cost per acre of grape farms (Thompson seedless) Capital and recurring expenses of one acre of grape farm:

Item	Cost (Rs.)
1. Capital Investment	210149
a. Grower's margin at 25 percent	52537
b. Bank loan at 75 percent	157612
2. Maintenance Cost	70686
3. Total Cost (1+2)	280835

Table 10.6 Total annual outgo per acre (cash outflow and inflow)

Item	Cost (Rs.)
1. Maintenance Cost	70686
2. Instalment on Bank loan on 75% of Capital Investment*	31838
3. Interest on Bank Loan for maintenance cost	14133
Total Annual out go per acre (1+2+3)	116657
4. Gross revenue per acre	168000
5. Net revenue per acre (4-3)	51343

Source: Data obtained from Vighnahar Co-operative society , Narayangaon

*- Instalment and bank loan is calculated as equated annual instalment at the rate of 18 percent per annum repayable in 7 years. The factor that converts the loan amount to the equated annual instalment is 0.202. Thus Rs. 157612 (loan) x 0.202 (factor) = Rs.31838 per annum.

II - Interest rate for working capital loan is assumed to be at 20 percent per annum. Both the rate of interest for the long and short term funds are assumed to be on the higher side chiefly on the grounds of conservatism.

OBSERVATIONS

- 1) As can be seen from table 10.5 the total annual cost per acre of grape farm works out to be Rs. 280835, which includes capital investment of Rs. 210149 and maintenance cost of Rs. 706865. Of the total capital investment 75 percent is financed by bank loans and 25 percent is the growers contribution.
- 2) Table 10.6 shows the total annual cash outflow which includes a) maintenance cost, b) instalment on bank loan of 75 percent of the capital investment (see item 2 of table 10.6) and
- 3) Interest on loan taken for covering maintenance cost, (item 2 in table 10.6). The assumption here being that the entire maintenance cost is also financed by a loan.
- 4) The total annual cash outflow per acre of grape farm thus amounts to Rs. 116657 (item 3 in table 10.6).
- 5) With the per acre average production of grapes in this region at 10-12 tones and the price of grapes at Rs. 14 per kg.(for good quality grapes) quoted for

the reference year 1995-96; the gross per acre revenue can be estimated to be Rs. 168000. (with production at 12 tonnes per acre and price at Rs 14 per kg.). From this gross revenue the total annual out go of Rs. 116657 will have to be deducted to arrive at the net revenue which works out to be Rs 51343 (see item 6 in table 10.6)

[If the production is assumed to be at 10 tonnes per acre, the total revenue at Rs 14 per kg. of grapes would work out to be Rs 140000 leaving a net surplus of Rs 23342 per acre. Therefore even with a lower level of production, grapes still prove to be a remunerative crop.]

The earlier figure of Rs 51343 is the explicit net revenue per acre (with 12 tonnes and price at Rs 14 per kg.). To obtain the surplus over and above opportunity cost we must make an assumption about what the farmer could have earned on his own capital contribution of Rs 52537 per acre, (table 10.5 item 1a). If we assume a 15 percent rate of return the opportunity cost element would be Rs. 7880.55 and the net surplus would be Rs 43462.45. Assuming a 20 percent opportunity rate of return the figures would be Rs 10507.40 and Rs 42029.60 respectively. Even at higher rates of 25 or 30 percent a net revenue in the range of about Rs 36000 to Rs 39000 still occurs.

In spite of the huge capital investment and bank loan, the return per acre is quite high for grapes. Grape farming seems to be the most remunerative fruit crop in this region. With prices of rising in future, (as it has prevailed in the current year of 1997-98, the return and profitability would also show higher levels.) Grape farming thus is a continuous activity throughout the year like a farm, both in the slack as well as busy seasons. The slack season is from April to September and the busy season lasts from October pruning to harvest time. Utmost vigilance and crop care are essential in Grape farm and absentee land lordism does not pay.

CHAPTER 11

SUMMARY AND CONCLUSIONS

The principal objective of this study is to examine the benefits of and costs of agricultural diversification through an 'agricultural- friendly' technology namely horticulture, to enhance the economic status of the poor peasant farmer. A peasant farmer possesses meagre resources but he also possesses several latent and unutilised, underutilised resources. The size of his farm is small, the quality of the land he owns, the water that is available to him, and the capital resources he can command are all meager. On the other hand he usually possesses, on account of his family size and labour to which he has access, some unutilised labour power and also possesses some unutilised wasteland with soil of poor quality and meagre water availability. Given the peasant farmers' constraints and endowments are there methods that he can adopt to earn a larger income and /or a more regular and stable income? What promise does the strategy of agricultural diversification in general and horticultural technology in particular hold for the farmer to meet these ends? This is the principal enquiry of this study.

Several underdeveloped countries are characterised by unequal distribution of land, capital and other resources in the agricultural sector. They are also characterised by the existence of numerous peasant farmers. Therefore the problem of augmenting and stabilising farm incomes is common to several underdeveloped countries.

Having stated the objective of this study it is necessary to have a brief word about the methodology. This study has adopted a two fold methodology, a) it has drawn extensively upon the existing literature on the subject of agricultural diversification and b) a sample survey from a cross section of farmers in western Maharashtra, was conducted with the objective of examining the potential of diversification and validating the results from the survey of literature, to establish what potential horticultural crops hold in terms of the income, employment and foreign exchange that it can provide.

The enquiry at the field level has concentrated on the cost-benefit analysis of individual farmers who had availed of the benefits of the Capital Subsidy Scheme initiated by the Govt. of Maharashtra to promote adoption of horticultural crops in early 1980's. The regions from Western Maharashtra covered are representative of diverse agroclimatic conditions, which includes the a) the Mulshi

region, (mainly rain-fed) b) the Junnar region (covers both irrigated villages and remote villages,). c) the dry-area of Shirur (drought prone area) [for the description of the regions see chapter 1 section 4 & chapter 7 section 2]. The main fruit crops covered in the study are mangoes, grapes and oranges, keeping in view the suitability of these crops for the different regions mentioned. In addition to the individual farmers, 2 grape growers societies belonging to the Junnar region were also covered in the study, to bring out the nodal role that these societies in the nature of 'organised efforts' can play in enhancing the spread of horticultural activities (amongst its members) and also in export of such crops.

We shall now draw out the conclusions of this study under the following heads.

- (1) Conclusions from the survey of existing literature.
- (2) The main observations based on the analysis of data collected through field survey.
- (3) Results of the cost-benefit analysis of farm diversification.
- (4) Role of cooperatives in the process of agricultural diversification.
- (5) Observations on the reach and effectiveness of the Capital Subsidy Scheme (CSS) of the Government of Maharashtra.
- (6) Principal findings of the study.

1. CONCLUSIONS FROM THE SURVEY OF EXISTING LITERATURE

1.1 A Review Agricultural Development Strategies.

A review of the evolution of agricultural development strategies over the past 50 years reveals some significant paradigm shifts. From the 1920's to the 1940's the agricultural sector, was regarded quite simply as the "handmaiden" of the industrial sector. Economic progress was thought to be synonymous with progress of the industrial sector. The purpose of agricultural sector was to make that progress possible by furnishing cheap labour, cheap raw materials, cheap food stuffs, besides supplying cheap savings, earning foreign exchange and providing easy markets for industrial products.

It was realised, primarily in the late 1960's that this strategy was unable to take care of the problems of the development of the agricultural sector which was showing itself in the marked imbalances, inequalities and poverty in the sector. Thus the focus shifted towards strategies that would enlarge the agricultural surpluses (via HYV seeds, subsidised fertilisers, large scale irrigation, subsidised

credit, large scale irrigation, subsidised power, administered prices etc).

It was only in late 1970's and 80's that the realisation dawned that both the above strategies benefit only the urban/industrial sector and the well endowed rural sector. They do not make a significant dent into rural poverty i.e. the poverty of small/marginal and the landless labourer. Such was the impact of the urban –bias literature, that, from the 1970's onwards the task of economic development has begun to be seen as the task of reaching development to the poor rural farmer.

The agricultural diversification movement, which was initiated in India as well as in several other countries mainly in 1980's is a movement in the direction of reaching development to the 'peasant farmer.'

1.2 Survey of Analytical Literature on Agricultural Diversification

The case of India typifies the changes and paradigm shifts in the thinking and policy of economic development/agricultural development as reviewed above. Beginning with the immediate post independence era when the chief concern of the policy makers was with 'food self- sufficiency', the second to the seventh plan continued to emphasise on increasing productivity and production of food grains, cash crops in order to avert any 'food crisis', along with bettering the conditions of the farmer. Such a programme of building up food stocks and raising productivity was heralded mainly with the radical break through in mid 1960's with the introduction of the Green revolution, and use of HYV seeds and modernised technology in agriculture. The above development programme was supported by a number of other policy instruments like the price policy, subsidies, credit on easy terms huge public investments, massive expenditures on irrigation etc.

Towards the end of the seventh plan a special focus on small and medium farmers, development of rain-fed dry land areas became more pronounced. The plan introduced a number of programmes in this direction (see chapter 2 section 3.6). By the beginning the 8th plan it was realised that though the extremely crucial objective of 'food security' was attained to a considerable extent, certain essential aspects of the rural agricultural sector continued to cause concern. (see chapter 2 section 3.7). Among the various persistent problems of this sector, the dominance of the small and marginal farms and stagnation of their incomes was one of the major drawbacks of the agricultural development proceeds. It was realised that these farmers could not be absorbed in large numbers into either in the capital intensive industrial sector or in agricultural sector itself. Therefore

different approaches came to be sought which could activate whichever endowments these farmers possessed. The strategies to achieve this aim include agro-forestry, animal husbandary, pisciculture, sericulture, poultry horticulture etc. One of the alternative policies which has gained special significance in the 8th and currently the 9th plan is that of agricultural diversification in general and horticulture in particular. The 8th plan has laid special emphasis on agricultural diversification and has earmarked horticulture as a major potential area on grounds of income, employment generation, for use of unutilised land as well as for the purposes of generating foreign exchange. The trends towards agricultural diversification have, in most developing countries including India, found their expression chiefly in terms of horticulture, especially fruits and vegetables. Horticultural technology has the unique feature of being diverse. It is adaptable to a variety of soil, water, and other climatic conditions. At the same time it is adaptable to a variety of economic and social conditions including capital availability, land distribution, land inheritance pattern, family sizes etc. The versatility and flexibility of horticultural technologies make them amenable to easy adoption in diverse conditions. The diverse agroclimatic, soil and other conditions in India are favorable to the production of various horticultural crops for which reason these crops are being encouraged in the country (see chapter 3 for major states production of fruits and vegetables).

The trends towards agricultural diversification are evidenced (a) from the plan outlays of the central government for horticultural crops which increased from 7.61 crores in the 5th plan, marginally to 9.13 crores in the 6th plan, but thereafter increased to 24.19 crores in the 7th plan and then shot up to 1000 crores in the 8th plan and (b) from the changes in the cropping pattern at the macro level showing that the index of diversification (the reciprocal of Herfindhal index of concentration) increased from 1.76 in 1980-81 to 1.87 in 1989-90 to 2.03 in 1994-95. A closer look at the index of diversification (see table 2.4) would reveal an increase in the percentage of area devoted to fruits, vegetables and oilseeds and a decline in the percentage of area devoted to traditional crops including food grains, especially the inferior foodgrains. The area under fruits and vegetables which was just 1.7 percent of the total area in 1960-61 increased to about 4.8 percent of the same in 1994-95. Fruits and vegetables accounted for about 8.7 million hectares of the total cropped area in the country in the same year. The area under all horticultural crops (including other horticultural crops) was 13.6 million hectares occupying about 7 percent of the total area and accounting for 18

percent of the total agricultural output.

The production of these crops are also on the rise, the production of fruits and vegetables which was 69 million tonnes in 1984-85 was estimated to increase to 120 million tonnes by 1996-97. Between 1984-85 to 1993-94, fruits production increased at a compound rate of 4.39 percent per annum and vegetables at 4.06 percent compound rate per annum for the same period. These rates have to be stepped up further if the projected demand in the year 2000 AD of fruits and vegetables have to be met. Studies have raised doubts about the rate of production of fruits to keep pace with the demand. Hence various schemes to encourage production of such crops are underway both at the central and state govt. levels. (see chapter 2 and 6).

It is well known that it is not sufficient to produce and supply. Demand should match supply for the activity to be viable to both producers and consumers. Accordingly the demand characteristics of fruit crops and vegetables in terms of income expenditure elasticities of demand have been reviewed.

Almost all the studies on the estimates of income elasticity and expenditure elasticity of demand have found that as incomes would rise in future the demand for high value crops like fruits and vegetables milk eggs, fish, meat etc would have a tendency to rise rapidly. The income elasticity of demand for fruits and vegetables was found to range between 0.25 (in North America) to 0.85 (in Asian centrally planned economics). With most of the countries having elasticity ranging close to the 0.61 & 0.74 range. The expenditure elasticity for fruits and nuts found to be 1.36, and 0.82 for vegetables, for the urban areas it was found to be 1.54 and 0.94 respectively. The projections of demand and consumption pattern for future indicate that expenditure on fruits and nuts which was only 1.4 percent in 1990's would rise to about 2 percent of the total expenditure by the year 2000 AD (see chapter 3 section 3.1).

Some inferences which can be drawn from the above estimates are that as income increases commodities like fruits, nuts, vegetables, milk, meat and fish are going to occupy increasing shares in total expenditures both in the rural and urban areas, for which purpose increases production of such commodities have been emphasised in the recent agricultural development strategies. Another significant trend that can be inferred from the expenditure elasticities of demand indicate that farmers would withdraw their marginal lands from the cultivation of food grains like maize, millet etc whose expenditure elasticities are quite low and even negative ranging between 0.03 & 0.07 in rural areas & -0.76 and -0.59 in urban

areas and devote them to (a) food grains with higher rural & urban elasticities of demand and (b) vegetables, fruits sugarcane if they are feasible.

Such an increasing demand for the high value crops could be explained by increasing awareness of nutritional standards, increasing urbanisation (i.e. structural changes which involves a movement of population from the rural to the urban areas), changes in the consumption pattern etc.

The increasing importance of these crops in the agricultural setup today is also evident from the fact that these crops have been identified in the category of non-traditional exports, as having significant export earning potential. The share of agricultural and allied commodities in the recent years in value terms increased from 17.61 percent in 1992-93 to 19.8 percent in 1995-96. Of this fruits and vegetables which consisted 0.68 percent of the total agricultural and allied products exports in 1992-93 increased to 3.7 percent in 1995-96. The major reforms of the recent past i.e. the latest GATT Uruguay round 1993 and the economic liberalisation reforms (1991) have contributed significantly to this phenomenon. Within a short span 1991 to 1995-96 in value terms the exports of fruits and vegetables and pulses increased from 216 to 802 crores. Among the category of fruits, exports of grapes increased from 3842 tonnes in 1989-90 to 22287 tones in 1995-96, in value terms grape exports in its fresh form was Rs 4048.98 lakhs (1994-95). Fresh mango exports increased from 3000 tonnes 1975-76 to 35000 tonnes in 1994-95 valued at 60 crores (not accounting for the exports in the processed forms of these fruit crops).

The international market holds promise for horticultural crops. The world demand for fruits is expected to grow at 3.1 percent per annum & vegetables at 3.9 percentage during 1984-2000. For developing nations the demand for such crops is expected to grow at 4.5 per annum & for developed countries at 2.8 percent per annum (fruits) and 3.85 (Vegetables) (see chapter 4 section). It is also projected that the world demand for fruits and vegetables would be 95.48 million tonnes against projected export supply of 85.76 million tonnes.

For India alone it is projected that by end 2000 AD the total horticultural exports are expected to increase to 1930 thousand tonnes with an estimated value of Rs. 4813 crores. However, due to the severe constraints that India faces related to exports of these commodities in the nature of quality control, lack of adequate post harvest technology, storing processing, cold storage, special treatments etc. the share of Indian's horticultural exports in total world exports continue to remain negligible at about 1.7 percent. Extensive efforts have been undertaken and more

is required if such crops have to make a significant contribution to the foreign exchange carryings of the country.

In the wake of the encouragement given to agricultural diversification via horticulture after the 8th plan at the national and state levels a number of feasibility studies were conducted at several levels ranging from apex level agricultural refinancing agencies like NABARD to agricultural universities, agricultural extensions centers, academic institutions, to studies by horticultural departments, NGO's and individual level studies.

The studies on the feasibility of horticultural crops and agricultural diversification fall into 3 categories. *Group one* which simply relies on pay back period analysis; the *second approach* which uses the usual capital, budgeting approach to arrive at the NPV, IRR of horticultural crops and *Group three* which concentrates mainly on possibility of augmenting and stabilising incomes through diversification.

The studies in the first category have, without doubt, established that horticultural crops, especially fruits and vegetables, can provide a net income ranging between Rs 915 per acre (figs) to Rs 2739 (bananas). For mangoes a range of income of Rs 1210 (in the first harvest itself) to Rs 4629 per hectare to 11,600 per hectare (during the peak period of 16-20 years) was found, for acid lime a return as high as Rs. 32,584 per hectare (in the 11-15th year period) was estimated. For apples a return as high as Rs 11,326 per hectare was established. For grapes a revenue of Rs 67016 per hectare was found. (the reference year however differs in these studies, see chapter 5 section 2).

The NPV range was found to be Rs 38441 per hectare (mangoes) to Rs 74739 (oranges) and to Rs 94053 (apples). The IRR for mangoes was found to be 36, for guavas 55 and for acid lime 51. For grapes IRR was found to be between 26 to 27 percent.

Many studies established that return from fruit crops are as high as 10-11 times field crops, indicating the possibility of augmenting income from such crops wherever it is conducive to cultivate such crops. Even though such a direct comparison between returns from fruit and field crops is not right because of differences in gestation period, initial and recurring expenses, yet the point remains that fruit crops can become a viable subsidiary activity for increasing incomes as well as optimally using the land. In the case of such fruit crops the initial year investment in some cases is high, but the recurring expenses being reasonable and sometimes quite low would lead to cost being spread over in the

later years, generating increasing incomes in future. A decision to adopt horticultural crops in particular fruit crops, therefore is a capital investment decision.

The studies in group 3 focuses mainly on impulses of diversification and impact of agricultural diversification on enhancing and stabilising farm incomes and also have highlighted the main constraints to such a diversification process based on farm level investigations.

Many studies have established the potential of generating higher returns with high value crops and one study has established a positive relationship between agricultural diversification and increases in income strengthening the case for diversification. Crop diversification was found to impart greater stability to incomes in drought prone-dry land areas, where such diversification could become a means of self-insurance for the farmers. However inspite of the obvious advantages from producing horticultural crops some studies have found that farmers (both small and large) devote very small proportions of the gross cropped area to fruits, vegetables and other high value crops. A study found that only 3 percent of the gross cropped area in the region studied was under horticultural crops.

Large areas were still found to be under cereals/ foodgrains to ensure food security, though some studies highlighted that wherever economic incentives are available farmers allocate land based on relative profitability, irrespective of foodgrains requirements of family. In recent times however there has been much concern about whether the movement towards agricultural diversification, in view of its high returns might not jeopardise the original aim of India's agricultural policy viz, food security. Some remarks on the validity of this important issue as well as a brief survey of the arguments on the issue have been highlighted in Appendix to chapter 5.

The main factors on which diversification into high value crops depend are food, fodder requirements, favourable institutional arrangements, irrigation facilities and marketing facilities, processing facilities etc. Agroclimatic factors, resource endowments and socioeconomic conditions of specific regions were also found to have a significant influence on crop diversification.

What is of importance is the general conclusion of almost all studies regarding the positive contribution that crop diversification can make to the income, land utilisation and employment generation. Studies have also emphasised on the importance of co-operatives in encouraging crop

diversification, and adoption of horticultural crops.

1.3 Agricultural Diversification: Some Selected Developing Countries

The realisation of the benefits of agricultural diversification and the trends of agricultural diversification towards fruits, vegetables and other allied agricultural activities are not confined to India. As Annexure 1 (Annexure to chapter 2) shows, these trends are observed in many developing countries of the world. For instance, in the republic of China the trends in the percentage share of new crops in the value of agricultural output show fruits to be increasing from 4.17 percent in 1960 to about 27 percent in 1988 and that of vegetables from 5.04 percent to 23 percent during the same period. Whereas for rice the chief staple, the share falls from 57 percent to 27 percent for the period under study. Similar trends are observed in Thailand, Chile, Israel, Indonesia, Kenya, Korea, Sri Lanka and MENA countries like Egypt, Jordan etc. Depending upon the countries agro-climatic conditions, the agricultural sectors have diversified into horticultural crops or into livestock, piggery, fishery etc. In many of these country's the strategy of agricultural diversification has not only supported farm incomes but has also significantly enhanced the country's foreign exchange earnings due to the exports of these products and their derivative products. For example in the case of a dry low rainfall country like Egypt by 1992 the export of fruits vegetables and dry fruits amounted to US \$ 214 million, in Chile it was US\$ 981 million.

1.4 Diversification Experience In The State Of Maharashtra

Apart from the general initiatives of the central government, several states of India undertook their own incremental initiatives to encourage horticultural diversification. Notable amongst these was the state government of Maharashtra which introduced 2 major schemes, namely the Capital Subsidy Scheme (1981-82) and the EGS linked Horticultural Development scheme (1990-91) to promote horticultural expansion in the state. Maharashtra capitalised on its advantages (a) of having a well developed and fairly successful employment guarantee scheme (b) a fairly well developed agricultural diversification programme and (c) the close relationships of the state government and agricultural co-operatives which could serve as nodal agencies for the propagation of horticulture.

The need for horticultural diversification in the state arose on account of the following (a) low water availability (only 15 percent of the land receives irrigation compared to the national average at 33 percent) In spite of all irrigation potential which could be utilised 60-70 percent of the net sown area would remain dependent on rain. (b) the state has huge areas of wasteland not suitable for

cultivation of the regular/conventional crops. The wasteland is estimated at 29 lakh hectares (see chapter 6 table 6.3). (c) a dominance of small/marginal farmer accounting for 63 percent of the land holdings and 27 percent of the total cultivated area in the state.

It was therefore crucial to find alternative means of enhancing incomes especially of this category of farmers. Horticultural crops, mainly fruits not only can enhance incomes, but also employment and use of land, in addition a number of fruit crops can be grown under water stress conditions. Maharashtra's soil, topography, climate favour cultivation of a variety of horticultural crops (see chapter 6).

From 1980-81 to 1993-94 on account of the impulses of the state of government the area under fruits and vegetables increased from 160 thousand hectares in 1960-61 to 278 thousand hectares in 1980-81 to 497 thousand hectares in 1993-94, i.e. fruits and vegetables which occupied only 0.86 percent of the gross cropped area in 1960-61 increased to 1.41 percent in 1980-81 and further to 2.3 percent in 1993-94. (This however has not been at the cost of adverse implications on area under foodgrains, see table 6.4, 6.5 chapter 6). The production of horticultural crops has been targeted to increase to 12,785 thousand tonnes and the area to 15,75000 hectares by the end of the 8th plan.

The 8th 5 year plan of the Maharashtra government (1992-97) has laid special emphasis on horticultural development mainly (a) as a means to enhance incomes of specially the small and medium farmers, (b) as an anti-poverty programme, (c) on grounds of encouraging employment.

The estimated generation of mandays only through various types of fruits by the 8th plan is expected to be 1765.55 lakh mandays (see table 6.9, chapter 6). The potential of income per hectare from fruit crops range between Rs. 0.75 to Rs 0.9 lakh for oranges, to Rs 1.83 lakh for mangoes, to Rs 3 lakhs for grapes. Fruits crops can make high value additions in agriculture and become a supportive activity.

As mentioned earlier the government of Maharashtra had introduced 2 major schemes to develop horticulture in the state i.e. the Capital Subsidy Scheme (1981-82) and the EGS linked horticultural development programme (1990-91). (see for details of the scheme chapter 6 section 4).

The Capital Subsidy Scheme (1981-82)

Very briefly the under the CSS various fruit crops were identified as being suitable to the states agro-climatic conditions. The major objective of the scheme

was to provide a complementary avenue to raise the economic status of small marginal farmers and weaker section of the rural community and also for the purposes of better land utilisation. Under the scheme 50 percent of the total cost is given to the beneficiary against 50 percent loan upto 1 hectare of irrigated land and 2 hectares of unirrigated land for mangoes. For the other crops like chickoo, custard apple, lime, oranges etc 33 1/3 of the cost is released as a subsidy. The success of the scheme is evident from the fact that upto end 1991-92, 47961 hectares of land was brought under fruit crops benefiting about 31883 cultivators.

The EGS linked Horticultural Development Programme (1990-91)

In 1990-91 the employment guarantee scheme of Maharashtra was linked to the Horticultural development programme of the state. The objective was to improve condition of the small, marginal farmers, the SC, ST, in specially the drought prone areas. This programme would provide an alternative supporting income to farmers dependent on rain-fed agriculture (estimated at 70 percent in the state) employment in rural area, earn foreign exchange and yet would be able to conserve soil and water resources. The scheme was extended to over 22 fruit crops (for details of the scheme see chapter 6 section 4).

Under this scheme a 100 percent subsidy grant for both labour & material cost would be provided to small, medium farmers, schedule casts schedule tribes. For the large farmer category the subsidy grant would be 100 percent of labour cost and 75 percent of material cost. It was proposed to bring 10 lakh hectares under horticultural crops and generate 4 crores additional mandays under this programme, by the end of 8th plan.

Because of these incentives of the state government there has been a definite increase in a) consciousness of farmer that horticulture represents a promising avenue for augmenting incomes, (b) an increase in area under these crops.

2. Main Observations Based on the Analysis of Data Collected Through Field Study

Chapter 7 through chapter 10 of this study has been devoted to reporting the findings of our sample survey. The sample survey was conducted in western Maharashtra for two reasons: (1) The State of Maharashtra presents two distinct types of initiatives in horticultural development. Firstly, some of the most progressive farmer families of Maharashtra have made pioneering efforts in agricultural diversification through horticulture as far back as 1920's/1930's.

Indeed so prominent were the early stages of agricultural diversification that it lead scholars like Cheema (1928) to undertake extensive experimental and secondary studies to propagate horticultural programs. Secondly, the state government of Maharashtra has formulated and implemented well designed schemes viz the Capital Subsidy Scheme and EGS linked horticultural development programme and followed the same through a vigorous program of agricultural extension and education.

(ii) The Western regions of Maharashtra (barring Konkan, which has been a traditional horticultural belt and results of which have been extensively documented) provided areas with considerable agro-climatic diversity.

Therefore, in order to make an assessment of the cost and benefits, the problems, the success and failure, the attitude of farmers towards crop diversification the reach/effectiveness of the policy initiative; we conducted a sample survey of a cross section of farmers who attempted to diversify their cropping pattern by adopting horticultural crops.

In order to represent diverse agro-climatic zones, three regions from Pune district in western Maharashtra were chosen for the field investigational survey. These include (1) The Mulshi Taluka (which is basically rainfed); (2) The Junnar Taluka (from where two categories of villages were chosen, one which was well irrigated and one set of villages which faced acute water shortage); (3) The dry region of Shirur to represent the drought prone areas. The villages covered in the regions, the number of beneficiaries and the fruit crops covered in the study are reported below:

- 1) 21 farmers from the Mulshi region which included the villages of Kule-Bhalgudi and Belewade for Mangoes.
- 2) 24 farmers from the Junnar region which includes the villages of Bori, Vaeshnawadi and Parunda for mangoes. Six individual farmers for grapes from Junnar region were also covered.
- 3) 22 farmers for oranges from the shirur region.

(For the detailed salient features of the three study regions see section 4,5 and 6 of chapter 7)

In all therefore 73 farmers for the three main fruit crops of the study i.e. mangoes, grapes and oranges were covered in the study.

In addition to the above individual farmers, a detailed analysis of two grape growers' co-operative societies has also been undertaken; these include the Abhinav grape growers co-operative society and the Vighnagar grape growers co-

operative society in Junnar taluka, District Pune. These co-operatives have played the role of diffusion of horticultural knowledge and practice among member farmers. Such collective organised efforts brings in its wake a number of economies of scale in purchase of inputs, sharing of knowledge experience and marketing of the produce. These societies have specialised in and promoted exports of grapes. When such co-operative efforts are undertaken the size of the output, the grading of the output, its selection the centralised collection of output its packaging, transportation enable the realisation of much better export revenues.

In all the three regions studied the diversification into horticultural crops was found to be a recent phenomenon which has taken place over the last two decades, beginning mainly in 1980's.(though there have been cases where the process of diversification began in 1960's.) In all the study regions initiative for diversification has been provided by the state government through its subsidy schemes. The success in the diversification in to horticultural crops, mainly fruits, has not been of an uniform nature in the regions studied. It has been more successful where the process has been supported by institutional/irrigational arrangement and a better technical knowledge of fruit growing (for e.g. in Bori village of Junnar) whereas it has been a near complete failure in remote regions (Vaishnavwadi-Parunda villages of Junnar.)

In the Shirur region also the scheme has not been able to attain success mainly due to acute water shortage, and also because the mango plantations were confined to the catchment area of irrigation project. In the dry region of Shirur, very little success was observed specially in case of farmers who had adopted orange plantations under the Capital Subsidy Scheme, accountable mainly due to water scarcity and also due to lack of technical knowledge.

Since the success of the horticultural venture has to be judged in terms the economic returns it provides, a cost volume and revenue analysis of the main fruit crops of the study i.e. mangoes, grapes and oranges was carried out for the three study regions. Such analysis is based on the data provided by the respondents on the initial year costs, recurring costs, the number of trees planted, the area under fruit crops, the output, the price etc. (for details see chapter 8).

Such an analysis of the costs, revenue and pay-back period of mangoes and grapes, certain aspects regarding their gross revenue, net revenue, and pay-back period can be noted in the following.

1) The average gross revenue for mangoes per acre in the regions studied was found to range between Rs. 4467 (Kule-Bhalgudi villages of Mulshi) to Rs. 32160

(Bori village of Junnar). The range of revenue per acre however was found to be as low as Rs.677 (Kule-Bhagudi village of Mulshi) to Rs.68000 per acre (Bori village of Junnar). The net surplus of revenue occurring in the fifth year was found to range between Rs.509.15 (Kule-Bhagudi villages of Mulshi) to Rs.27810 (Bori village of Junnar).

2) Thus, a wide variation both in the gross revenue and net revenue from mangoes is observed between the study regions as well as among individual farmers. It can be inferred from this that the yield of mango plantations is very sensitive to agroclimatic and location-specific conditions.

3) On the other hand the gross revenue per acre from grapes was found to be more uniform at Rs. 1,52500 and the net revenue at Rs. 72500 for the Junnar-Narayangaon region studied. (see chapter 8).

4) Based on the limited data on oranges in the Shirur region, it was found that the gross revenue per acre ranges between Rs. 25740 to Rs. 85800 depending upon the quality of fruits. The net revenue was seen to range between Rs. 8520 to Rs. 68580 per acre.

It should be also be noted that the estimates of the revenues and pay-back period reported above pertain only to the successful farmers. The estimates are not estimates of both successful and unsuccessful ventures.

The major problems encountered by the respondents specially the Kuli-Bhagudi villages of the Mulshi region and the Vaishnavwadi, Parunda villages of Junnar were a) acute water shortage, b) low yield due to unfavourable agroclimatic conditions c) late fruiting i.e. the fruit gets ready only by end of May, beginning of June making the output vulnerable to even one pre-monsoon shower, d) blackening of the blossom which has an adverse effect on the yield of the crop, e) the mango plantation being lost in Parunda, Vaishnavwadi villages in the catchment area because of construction of irrigation project, f) and lack of technical knowledge g) lack of extension services and implementation.

Most of the respondents were emphatic about the fact that more than the monetary subsidy what is of greater importance is the provision of basic irrigation facility. A number of them were hesitant to adopt horticultural crops in future mainly due to acute water scarcity.

3. RESULTS OF THE COST BENEFIT ANALYSIS OF FARM DIVERSIFICATION

A cost benefit analysis in respect of 2 main fruit crops, i.e., mangoes and grapes in the study regions of Mulshi and Junnar was undertaken. (The same was

not done in the case of oranges because of inadequate data, (for details of the assumptions of the analysis, the yield pattern of fruit crops, and the other clarifications regarding the cost benefit analysis see chapter 9). For the cost benefit analysis a very crucial point to be noted is that in case of the mango growers the costs include only the paid out costs and not the imputed value of labour, land and capital (the reasons for exclusion of these costs are provided in chapter 9 section 1). Thus in the specific case of mangoes the NPV should be interpreted as returns to the farm business income.

A wide variation in the IRR, NPV and BCR was found in the case of mangoes in the 2 study regions.

For the Kule-Bhalgudi group of villages of Mulshi, the average IRR was found to be 30 percent. The standard deviation was found to be at 13 percent with a coefficient of variation at 43 percent. The average NPV in this set of villages was found to range between Rs 18074 at 10.5% to Rs 14430 at 12% to Rs 9341 at 15% rate of interest.

The BCR was found to be range between 0.32 to 19.28 (at 10.5%) 0.24 to 9.15 (at 12%) and 0.11 to 3.94 (at 15%) rate of interest. The average BCR in this region was 3.45 at 10.5%; 3.09 at 12% and 2.42 at 15%.

In the Belewade region which has a tradition in mango cultivation, where the soil is fertile and the agro-climatic factors are favourable the IRR was found to be 74 percent with a standard deviation at 30 percent and coefficient of variation at 40.5 percent.

The average NPV was found to be Rs 161843 per annum at 10.5%, 132791 per annum at 12 percent and Rs 92664 per acre at 15 percent. The BCR ranged between 24.17 to 21.61 to 17.91 at 10.5, 12 and 15 percent respectively. The range of BCR among the farmers was found to be between 2.99 to 38.73 at 10.5 rate of interest.

In the Bori village of Junnar which again is facilitated by well developed irrigation facilities, agroclimatic conditions, better technical knowledge of fruit growing the IRR, NPV and BCR figures show high levels. The IRR worked out to be 77.84 percent with a standard deviation at 30.44 percent and co-efficient of variation at 39.11 percent. All the respondents indicated an IRR above 45 percent. The average NPV ranged between Rs. 96040 at 15 percent with average BCR at 25.56 (10.5%), 21.83 (at 12%) and 17.69 (15%).

In the remote villages of Vaishnavwadi and Parunda with acute water shortage and unfavourable conditions regarding irrigation, technical knowledge,

market access, out of the 22 respondents covered in the survey 13 had a complete failure (on account of a acute water scarcity). Of the remaining 10 only 3 respondents finally reported success in the mango plantations i.e. only about 30 percent rate of success. For these respondents the IRR worked out to be 43%. (This is accounted due to the fact that the mango plot of these respondents was on a slightly lower plain (closer to Parunda) and hence they could derive some benefits of the percolate tank in the village). The BCR was found to range between 4.37 (at 15%) and 6 (at 10.5%). Among the 3 respondents also very high variation in BCR was found, for example at 10.5 percent the BCR ranged between 3.22 to 11.58. A very important point to be noted here is that the percentage of success is very low in the region and hence these figures cannot really be representative of the entire area.

Therefore, it can be observed that mangoes show a very large variation between regions as well as individual farmers within the same region. The variability of IRR, NPV and BCR is readily explained by the fact that the yield of mangoes is very sensitive to characteristics like rainfall, humidity wind, temperature etc.

For grapes, the other main fruit crop of the study, a greater degree of uniformity among the farmers was found regarding all indicators of IRR, NPV, and BCR. The average IRR was found to be 31.66 with lowest IRR at 28 percent. The average NPV was found to be Rs. 179894 at 15 percent with a standard deviation in IRR at only 2.4 percent and a co-efficient of variation at 7.58 percent. The average BCR ranged between 1.04 at 18 percent to 1.13 at 12 percent.

The process of grape production is much better streamlined and controlled and farmers are better able to regulate the flow of output that they can obtain from the grape farm. (due to various treatments, fertilisers and medicines).

Certain reservations about the cost-benefit analysis should be noted that the IRR & NPV's pertain to the farm business income and not to the rate of profit earned by the entrepreneur farmer in case of mangoes, and hence the figures have to be scaled down to allow for value of owned labour, capital, land etc. The IRR, NPV and BCR's figures however do indicate the viability of mango cultivation and in many cases show high return from this venture. In addition to the income effects on direct field observation wealth effects were noticeably found in terms of 'pucca' houses, 2 wheelers, increasing education of the children, greater value of land with standing crop, PVC lines and pump sets etc.

4. ROLE OF COOPERATIVES IN THE PROCESS OF AGRICULTURAL DIVERSIFICATION

In the course of our sample survey we got the benefit of visiting two grape growers cooperative societies namely the Abhinav and the Vignahar society, Junnar (Maharashtra). This benefited the study in two respects 1) we had access to centralised data regarding 200 members of the societies which increased the coverage of our study and 2) we got to observe first hand, the difference which collective efforts make to expansion of horticultural activity as well as to the exports of horticultural crops. The organisation of fruits and vegetables growers into cooperatives thus represents in a way the final step in the efforts to promote horticultural diversification. This is because when farmers organise themselves into such bodies they are in a better position to dictate their commercial terms, and also because fruits being very highly perishable require proper storing, packaging, transport facilities. It is here that such organised efforts can become significant.

It was found that an income of almost about Rs 63943 per acre per annum could be generated by a diversified cropping pattern into fruits and vegetables (Abhinav society). A total of 4810 tonnes of grapes were produced by these societies in 1995-96 of which 640 tonnes was exported to Europe in the same year, generating an export revenue of about Rs 86,400 per acre per annum for each member of the society (see chapter 10 section 4).

The major problems that these societies faced was a) under utilisation of capacity of the chilling plants, b) heavy interest burden and an annual recurring cost of Rs 32 lakhs.

Based on the detail information provided by the Vignahar society it was found that grape farming involves huge initial year capital investment of Rs. 280835 per acre with recurring annual expenses of Rs 706865 and with the average gross revenue at Rs 168000, the net revenue per acre was estimated at Rs 51343. (for details see chapter 10).

Even if allowances are made for the opportunity cost of owned capital i.e. the growers margin a net surplus of Rs 43462 per acre (at 15 percent) and Rs 42029 per acre at 20 percent is obtained. Grape farming therefore is a highly remunerative activity.

5. OBSERVATIONS ON THE REACH AND EFFECTIVENESS OF THE CAPITAL SUBSIDY SCHEME OF THE GOVERNMENT OF MAHARASHTRA.

The State Government of Maharashtra has been a pioneer in increasing and spreading agricultural diversification amongst the medium and small farmers. The initiative of the State Govt. has taken various forms, as follows:

- a) Through micro watershed development programmes.
- b) Through agricultural extension services.
- c) Through the Capital Subsidy Scheme and the Employment guarantee Scheme linked horticultural development programme.
- d) Through agricultural marketing. (mainly co-operative marketing).
- e) Other state govt. bodies.

The CSS has been formulated with the explicit intention of spreading horticulture. It would therefore be appropriate to summarise our observations and findings on the reach and effectiveness of this scheme in the areas in which we conducted the sample survey.

1) Without exception we found that the capital subsidy scheme (and also the EGS schemes) have reached the remotest and the poorest regions for e.g. Parunda and Vaishnavadi in the Junnar Taluka, Bhalgudi Kule, Satesai, Nangaon in the Mulshi taluka, Koregaon, in the Shirur taluka. Many of these are unconnected by road but officers have reached and induced the farmers to adopt horticultural crops. Surprisingly in some prosperous regions (like the Bori village) some farmers were not aware of the scheme.

Though the CSS has been able to reach the poorest and the marginal farmers having poor quality of land and limited means of income, the scheme could not be successfully implemented due to the following factors.

- a) Difficulty of follow-up
- b) Lack of frequent extension visits
- c) Inadequate technical consultancy and advice.
- d) Difficulty in marketing of the product due to inaccessibility of villages.

It was also found that the income generation as reflected in the NPV per acre, the IRR, or the BCR in these villages have not been as high in the relatively accessible regions. Yet it should be pointed out that for some of marginal farmers covered by the CSS, the horticultural extension programme has not been non-viable.

2) We also found that several beneficiaries claimed by the horticulture department and shown in list of beneficiaries as having availed the subsidy and started

plantation, had in fact neither taken subsidy nor started plantation, specially in the Shirur region (see chapter 7 section 6).

3) Most beneficiaries of the CSS were satisfied with quantum of subsidy. However we met several farmers who although were enthused by the subsidy, did not actually become beneficiaries on account of acute water scarcity. We also came across several farmers who were aware of the subsidy but chose not to take it because they feared that taking subsidy would mean increasing government interference in their own decisions.

4) A few region - specific problems related to the reach of the scheme are enlisted:

- a) The subsidy scheme in the Mulshi region have not brought satisfactory results. The common complaint of the respondents is that due to humidity in the region the Alphonso mango tree blossom is burnt (blackened) due to a common disease.
- b) The Alphonso mango variety of this region has the problem of late fruiting by end of May beginning June and there is high susceptibility of the fruit crop due to onset of monsoon, this completely destroys the crop and leads to distress sale of the crop.
- c) This region also faces problem of acute water scarcity and water management programmes for water retention are extremely crucial to guarantee success of the subsidy.
- d) In short, this agroclimatic region found to be suitable by the experts of the Dept. of Horticulture suffers from some very serious limitations, which accounts for the low level of yields and revenue. Further, there has been a complete lack in of providing extension facilities like training and supply of appropriate medicines to avert the common disease of 'black mohor' (blackening of the blossom) for the last 10 years. A total indifference of follow up by the Dept. was found.

5. a) In the Bori (Budruk) village of the Junnar taluka , the alphonso mango cultivation promoted by CSS was found to be rewarding, the most favourable factors being ecological, climatic and recent irrigation facilities and possesses favourable climatic condition for the cultivation of mangoes (see chapter 7 section 4). The survival rate of trees was found to be highest at 61.5% and average revenue was found to range from Rs. 30000 to 1 lakh per acre.

b) In the Vaishnavadi village (which is on a very high altitude and undulated terrain) and which has acute water scarcity, low yields and spoiling of blossom were witnessed leading to a very low survival rate of the mango crop.

The beneficiaries of the scheme have 2 genuine complaints - i) The Department failed to give them proper guidance training and extension services, where farmers had no experience in mango cultivation, and ii) the insecticides and life saving medicines of mango trees are too expensive and are not affordable due to the extremely low levels of incomes of these farmers.

c) In the Parunda region, which is at a slightly lower terrain, marginal success with Alphonso mango plantation was seen.

In the course of our sample survey we collected data on cost of production of various food grains, fruits and vegetables in the study regions with a view to cross validate these estimates and tally them with secondary data sources. These have been documented in Annexure 4. Likewise we have also attempted to make a rough estimate of incomes obtainable with a diversified cropping pattern (inclusive of fruits and vegetables). This is done for the Mulshi and Junnar region. These results are reported in Annexure 3.

In the course of our survey we got the opportunity to meet several prosperous farmers who were pioneers in fruit farming in their regions. Since these farmers were atypical in terms of their impulses for agricultural diversification and in term of their spectacular success, they have been considered separately. Brief case studies of their experience have been documented in Annexure 2.

6. PRINCIPAL FINDINGS OF THE STUDY

The objective of the study, as mentioned at the outset, was to examine whether, and to what extent, does horticulture hold promise of augmenting land, labour and entrepreneurial farmers' unutilised resources, viz. Land, labour and entrepreneurial abilities; and thereby enable them to augment their income and wealth. India, being a major producer and exporter of primary products, it was only natural to extend the inquiry to the potential of horticultural products, especially fruits, to earn foreign exchange for the country. In concluding this study we summarise, very briefly, our findings on these counts.

1. Utilisation of hitherto unutilised land and wasteland.

As regards the utilisation of hitherto unutilised land/wasteland or low lying dry area, the 8th five year plan itself set a target of bringing about 3 million hectares of wasteland and 13 million hectares of low lying dry areas under cultivation chiefly

through horticultural adoption. This represents a major initiative. A parallel initiative was made by the state of Maharashtra. The area under horticultural crops which was on average about 5 lakh hectares during 1985-90, has increased to about 8 lakh hectares by 1991 and about 15 lakh hectares by 1992-93. Maharashtra has targeted to bring 29 lakh hectares of wasteland under horticultural crops during the 8th plan. As a direct consequence of these initiatives fruit and vegetable production at the all-India level and at the state-level have shown unprecedented growth during the 90's (see table 2.4 & 6.7).

A glimpse of these developments has been captured in our own field survey. In our aggregate sample of farmers who undertook plantation of mangoes, of the 94 acres of wasteland that they owned, they devoted 53 acres to mango plantation (see tables 7.5 & 7.17). The maximum utilisation of wasteland was observed in the most backward (poor soil, no water) villages of Vaishnavwadi and Parunda where the farmers we met had devoted their entire wasteland to mango cultivation. Likewise in the drought-prone Shirur region, even if we consider only the successful farmers, the wasteland devoted to oranges was 46.5 acres out of the total 103 acres covered in the sample study of this region (see chapter 7 section 6.1).

All of the above data bring out one important point viz that horticultural crops have been adopted chiefly on poor, uncultivable, unirrigated wastelands. It may therefore be inferred that the substantial proportion of income generated from horticultural diversification represents a net addition to farm income due to incremental resource utilisation. Only a small proportion may be due to a substitution of horticulture for regular crops. (see Appendix to chapter 5 for the implications of this for the food security question).

In addition to the use of unutilised land and wasteland an additional effect of the diversification process was seen in terms of the better and more intensive land use, which was possible due to the changes in the cropping pattern witnessed in all the regions studied in the sample survey.

The cropping pattern which was restricted to only 3 to 4 crops of the kharif and rabi seasons in the pre diversification period was found to include a variety of both fruit and vegetable crops in the post diversification period (mainly in the post 1980's). Details of the diversified cropping pattern have already been documented in chapter 7, table 7.12A, 7.12B, 7.22 A & 7.22 B.

As a result of this the cropping pattern was found to be more continuous throughout the year, reducing the uncertainty and risks associated with

dependence on the few seasonal crops.

2. *Income and Wealth Augmentation Potential of horticultural crops.*

As regards the Income and wealth augmentation potential of the horticultural crops evidence both from the existing literature as well as the field survey has already been documented in support of such a proposition (see chapter 5). Studies at the state and region level have shown that the returns from fruit crops could range between Rs 11,600 per hectare for mangoes to RS 11,362 for apples and about Rs 67016 per hectare for grapes. Further, studies also have established the IRR to be 36% for mangoes, 55% for guavas, 51% for acid lime and 27% for grapes. Many studies have established that returns from fruit crops do possess significant potential to augment income wherever conditions are conducive to the production of such crops. At the Maharashtra state level, the Economic Survey document establishes the potential of income per hectare from fruit crops to be between Rs 0.75 lakhs for oranges to Rs 1.83 lakhs for mangoes and to about Rs 3 lakhs for grapes (see chapter 6). Fruit crops therefore can make high value additions in agriculture and become a subsidiary and supportive activity.

The analysis based on the field data brings out the income potential of the selected fruit crops of the study, under diverse agroclimatic conditions.

For the mango crop the average revenue was found to range from as low as Rs 4467 per acre (Kule-Bhalgudi villages of Mulshi region) to Rs 32160 per acre (Bori village of Junnar region). The net revenue obtainable in the 5th year of the plantation itself showed a range of Rs 509 to Rs 27810 per acre for the same villages mentioned above.

The NPV of mangoes at 10.5 percent rate of interest was found to range between Rs 18046 (Kule-Bhalgudi villages) to Rs 201219 (Bori Village). The 10.5% rate of interest is the subsidised rate charged on the loans extended to the farmers for cultivation of mangoes under the CSS of the government of Maharashtra. By considering a higher rate of 15 percent the NPV was found to range between Rs 9283 to Rs 96040 for the same set of villages.

The IRR for mangoes varied between 30 percent to 77.84 percent applicable to the same villages of Mulsi and Junnar region. The standard deviation in the IRR was found to range between 13 percent in Kule-Bhalgudi villages to about 31 percent in the Bori village of Junnar.

The BCR was seen to range between 3.45 (Kule-Bhalgudi villages) at 10.5 percent to 25.56 in the Bori Village. At 15 percent the BCR was found to vary

between 2.4 to 17.69 again in the two above mentioned villages.

As can be observed in case of mangoes a greater degree of variability was found between regions as well as farmers. Mangoes were thus found to be extremely sensitive to agroclimatic conditions as well as to the care and nursing of the trees particularly in the initial stages.

A point to be noted however is that a) a part of the high returns shown for mangoes have to be scaled down to include value of owned/family labour and (b) these results pertain to only these farmers who had been successful in their horticultural ventures and do not include a substantial number of those who had ventured, but failed.

Be that as it may, it is quite evident that if the initial conditions are appropriate enough to ensure healthy survival of trees, the yield and income obtained in future would be fairly stable and high from this crop.

In the Shirur region, which is a drought prone dry area, for the main horticultural crop of this region viz oranges, a gross revenue ranging between Rs. 25740 to as high as Rs 85500 per acre was found, depending on the 'quality' of the fruit (see section 5 chapter 8). The net revenue was found to range between Rs 8520 to 68580 per acre. (However here again it should be noted that a number of respondents in this region were unable to achieve success).

For the grape crop in the Junnar-Narayangaon region on the other hand the gross revenue was found to be Rs 152500 per acre with the net revenue at Rs 72500. The average NPV was found to be Rs 245329 at 12% & Rs 179894 at 15 percent. The average IRR works out to be 31.66 percent with a standard deviation of only 2.4 percent indicating that the level of riskiness in relation to the rate of return obtainable is very low. The coefficient of variation is 7.58 percent. The average BCR ranges between 1.04 at 15% to 1.13 at 12 percent which shows the viability of the grape project. A greater degree of uniformity was noted in the revenue, NPV and IRR figures in case of grapes between farmers mainly due to the fact that there are greater possibilities of regulating the output, quality of grapes through use of fertilisers, insecticides, pesticides, preventive medicines etc. The respondents in this region were found to be using modernised practices of cultivation.

In addition to the above figures which show the income potential of the fruit crops, direct wealth augmenting effects in terms of an increase in the value of the land (with standing crop), development of PVC pipe lines, wells, installation of PVC Pipe lines, in some cases drip and sprinklers, construction of 'pucca'

houses, purchase of two wheelers were also observed on direct field observation. An increase in the standard of living, better education to the children was also evident (mainly after adoption of a diversified cropping patterns). In some regions (Bori) the diversification process was seen to have infact speeded up development of irrigation facilities.

3. Utilisation of Labour

With regard to the utilisation of family labour, on this count, the existing literature has shown considerable employment potential of the horticultural crops.

The potential of horticultural crops to generate employment is evident from the data at the Maharashtra state level which has targeted an employment generation of 17655 lakh mandays between the period 1992 to 1997 from various horticultural crops, some of the fruit crops, for example grapes, have a very high labour intensity generating close to 185 days of additional employment per acre per annum (Gadam 1992).

However our field investigational data sources are weak and have not allowed as to quantify the employment that could be generated by the adoption of the various fruit crops. This was mainly on account of 2 reasons (a) what one is dealing with here is the phenomenon, of reduction in 'disguised employment' (which itself is a difficult concept to quantify and (b) there were difficulties in quantifying hours of 'family labour' engaged exclusively in the horticultural activities, into 'mandays' or 'labour hours'.

The difficulty of quantification of labour generated in our sample survey was specially related to crops like mangoes, oranges in whose case almost all the additional labour was performed by family members. However it would be possible to work out such an estimate in the case of grapes.

The annual wage cost per acre in case of grapes is about 25000 to 30000 (see table 8.9). The per acre and average daily wage rate ranges between Rs 70-100 per day for semi skilled labour (based on queries from respondents). Taking the figures of the annual wage cost to be Rs 25000 on the lower side and Rs 85 to be the mean daily wage rate, the number of mandays required per acre of grapes could be placed at about 290 mandays in a year. However, all the farmers we surveyed were unanimous in their opinion that adoption of horticultural activity has increased the utilisation of labour by 2 to 3 times (in their language).

4. The Export Potential Of Horticultural Crops.

Finally, as regards the export potential of horticultural crops, these have

been already documented at length in chapter 4. To highlight only the broad figures. The export earnings due to fruits and vegetables and pulses which was only Rs 6 crores in 1960-61 grew to Rs 80 crores in 1981, a compound annual growth rate of 13.8 percent. By 1995-96 the exports grew to Rs 802 crores at a compound growth rate of 16.6 percent per annum. In the post liberalisation period during which time the rupee was devalued, exports grew from Rs 216 crores to Rs 802 crores a compound growth rate of 30 percent per annum. In terms of share of horticultural exports to agricultural exports too there was growth from 0.68 percent in 1992 to 3.7 percent in 1995-96.

Further, even in our sample survey we found tremendous export potential of grapes even in the relatively new region of Junnar which had undertaken export of grapes only in early 1990's due to the 'organised efforts' of the cooperative societies in this region. (see chapter 7).

The representative member of the Abhinav and Vighnagar grape growers societies earned Rs 86,400 on account of exports of grapes only to Europe (not including the export revenue to Dubai, where a substantial part of the grapes of these members are also exported). In 1995-96 these societies reported to have exported 640 tonnes to Europe. This was clearly on account of the intensive extension efforts of the society, intensive care of the crops of member farmers, rigorous grading and selection of fruit and the economics of scale in the precooling, packaging, transporting and marketing of grapes. All these activities would be impossible for individual farmers.

Thus neither exports, nor even export awareness, was found in the case of mangoes, oranges and other fruit crops in our sample survey. Because all these initiatives were those of individual farmers in search of opportunities to augment their incomes. It is inconceivable that they would contribute anything to exports unless co-operativisation /corporatisation efforts are made.

It should be noted that even though diversification via horticulture has unquestionable ability to augment resource utilisation and farm incomes and generate employment and foreign exchange; there are a number of constraints which prevent the realisation of the full benefits of such a process of diversification.

These constraints (as have been discussed at length in the course of the study) are in the nature of:

1) Financial Constraints: Some horticultural crops require very heavy initial capital expenditure as well as high recurring costs (for eg grapes require an

average about Rs 1 to 1-5 lakhs capital investment and about Rs 70-80000 recurring expenses per annum) which prevents the small farmer from venturing into the production of such crops. However, institutions like NABARD, the horticultural department etc, do extend certain facilities for this purpose in the forms of loans at subsidised rates or subsidies

2) Technical Constraints: The chief reason for the failure of the fruit crops in case of a number of respondents was the extreme scarcity of water, which is very crucial specially in the initial stages of plantation. Infact the problem of non-availability of water has been repeatedly emphasised by the respondents. In many instances a lack of knowledge on the part of the growers regarding nursing, care of the fruit crop, especially in the initial stages, the timing of spraying insecticides pesticides, use of preventive medicines, use of hormonal treatment for acquiring the specified size of a fruit, prevention of common diseases (like blackening of blossom of mangoes), ensuring right timing & method of harvesting etc. It is in this area that maximum extension services by the department of horticulture or agricultural universities is required. (This in fact was found to be a major area of dissatisfaction among the beneficiaries of the capital subsidy scheme, majority of whom were new to the cultivate of Alphonso mangoes).

3) Post Harvest Management Constraints: This is an extremely crucial area and involves all aspects of marketing, storing, transportation. All these aspects become all the more significant in case of export of the fruit crops. In fact it is due to these reasons that the share of Indian's fruits and vegetables in world exports has been lagging at 1.7 percent in 1994. Almost 30-40 percent of the losses of horticultural crops in the country arise due to these constraints, causing a loss of almost Rs 6000 crores on this account.

In addition to the above constraints adopting horticulture crops is a capital investment decision and also blocks the land for long periods which might not be suitable for farmers who prefer to have flexibility in land use.

It is also important to note that even though diversification via horticulture has unquestionable ability to augment resource utilisation and farm incomes, the adoption of horticulture is fraught with risk of varying degrees depending upon the crops chosen, the capital investment required and the gestation period of the crop, apart from the usual weather, climatic and other fluctuations which apply to all agricultural commodities. An idea of the magnitude of risk is obtained from the standard deviations of the IRR (see table 9.1,9.2,9.3 and 9.4) for the mango crop. In the two areas of the Junnar region they are 30 percent and 21 percent

respectively. The coefficients of variations (showing the degree of risk per 100 percent return) are 43 percent and 40 percent for the 2 areas of the Mulshi region and 39 percent and 49 percent in the 2 areas of the Junnar region. Even these are underestimates considering the fact that their computation excludes those farmers who have completely failed. This shows that the high returns come at the price of risk- there's no free lunch. Other risk intensifying factors include the lack of adequate extension services, storing and marketing facilities. It is these latter factors that can be moderated by appropriate government intervention. Nevertheless there is a considerable residual risk which remains- it can neither be insured nor be diversified away. This risk in the ultimate analysis has to be borne by the entrepreneur farmer.

In spite all this, our interviews with farmers revealed, that irrespective of whether the farmer had a successful or disastrous horticultural venture, all of them were unanimous on one point, viz that the promise of horticultural venture in terms of expected returns was more than sufficient to compensate for the risk. The idea of horticultural diversification seems to have activated the farmers minds towards a positive attitude of 'Nothing Ventured Nothing Gained'.

The movement towards agricultural diversification in India was initiated in the 1980's. Yet rapid progress, mainly, in terms of the dissemination of the idea has been achieved so far. In the coming decades we should expect that the idea would be translated more rapidly into concrete achievements. One of the principal findings of the study has been that the government schemes and incentives will work best if they are administered through organised institutions like cooperatives, and or voluntary agencies. It is only then that the economies of scale (production, collection, selection, processing and marketing) would be fully realised. For the success of agricultural diversification, in the times to come, it is imperative that the government creates more or less permanent institutional structures and enables farmers to sustain in their diversification efforts.

ANNEXURE 1

(ANNEXURE TO CHAPTER 2)

EXPERIENCES WITH AGRICULTURAL DIVERSIFICATION

(Evidence from some developing countries)

Several countries in 1980's have diversified their agricultural activities through changes in the cropping pattern or by expanding the allied sectors. This has been done to reach economic development to the level of the farmers to increase their income levels and in many cases to expand and diversify the agricultural export base to enhance foreign exchange earnings.

This process of agricultural diversification in a number of countries has been initiated due to a variety of factors like near self-sufficiency in staple foodgrains (for eg. in Thailand, Indonesia, etc.) decline in export market for traditional agricultural commodities, increasing domestic as well as international demand for high value crops like fruits/vegetables. Availability of advanced irrigation and increasing access to new technology have worked as supportive infrastructural developments in implementation of diversification programmes.

The following analysis deals with experiences of some selected developing countries of the world belonging to both western and eastern hemispheres.

The common features of the countries chosen comparable to India are:

- a) All these countries are developing countries,
- b) Agricultural sector is a dominant sector in these economies (contributing in most cases 15 to 30 percent of its GDP and supporting about 30 to 70 percent of its population)
- c) All these countries started agricultural diversification in the post 1970's and 1980's, (a relatively recent phenomenon).

However, a distinguishing feature of these countries as compared to India is that most of these countries depend on export earnings as one of the major sources of national income. It should also be noted that in some countries agricultural diversification has taken the form of changes in cropping pattern while in others it has also been diversification into allied activities like fisheries, livestock, meat production and piggery etc. Diversification in these countries has been mainly due to four factors,

- a) Decrease returns from cereal based farming.
- b) Availability of advanced technology
- c) Development and adoption of improved high value crops.
- d) Increased domestic, regional, and international demand for fruits,

vegetables, and live stock.

REPUBLIC OF CHINA (TAIWAN): Rice has been the major staple crop of this country, the other commonly grown crops being cassava, sweet potato, soyabeans, peanut and cotton. Till about 1960's, rice occupied 57 percent of the share in total value of production. However, by 1980's the country showed a widely diversified pattern of agricultural production which became essential due to changing consumption patterns, income patterns, increasing awareness of higher nutritional standards of fruits and vegetables and due to the changing international market demand conditions. The diversified structure and relative changing cropping patterns is evident from the table given below:

Table A 1.1 Share of new crops in total production value

CROP	(percent)	
	1960	1988
Fruits	4.17	27.73
Vegetables	5.64	23.13
Sugarcane	6.88	6.26
Rice	57.0	27.0

Source: APO (1990), Page 148.

The production of some major fruit crops and vegetables by 1993 was estimated at about 4032 thousand tonnes which included a wide range of fruit crops like bananas, pineapples, citrus fruits, vegetables, asparagus etc. The share of fruits and vegetables in the production has increased from a mere 10% in 1960's to about 50 percent in 1988. Horticultural products like fruits and vegetables both in fresh and processed form have also contributed significantly to the export earnings of the country. In 1955 the export value of fresh fruits which was about US\$4.8 million increased to US\$ 33.9 million in 1988 and the export value of vegetables during the same period increased from US\$ 8 million to US\$49.8 million. The preserved food category exports were estimated at US\$ 117.9 million in 1980's. In 1990's the country has further diversified into meat, both in its fresh and frozen form. The process of agricultural diversification was facilitated by growth of credit co-operatives, processing units, price guarantees; infrastructural development support by government.

THAILAND: Thailand's cropping pattern was dominated by rice and rubber. In spite of the country accounting for 1/3 of the rice exports of the world, it diversified into 10 new crops, which brought in a revenue of more than 1 Billion Baht (US\$ 1 = 26 Baht) in export trade. The impulse for diversification

was the almost near stagnation of rice and other traditional crops. Since 1981 fruits and processed products have shown a steady rise. The diversified crops include banana, mangoes, jackfruit, lime, guava, sweet orange, and other allied activities like fisheries and livestock. Infact fisheiries and livestock is the sixth largest export commodity of this country. Presently Thailand is the second largest producer of pineapples (with production at 2674 thousand tonnes in 1993), and accounts for almost 38 percent of the World exports of this fruit. Between 1985-1992 the export value from fresh and processed horticultural products nearly doubled from US\$ 1 Billion to US\$ 1.9 Billion. The foreign markets, which were restricted to Singapore, Malaysia & Hongkong have now expanded to include distant markets of Europe.

CHILE : The unusual geographic span and micro-climatic conditions of this country favour a continuous supply of fruits. The total production of some of its major fruits and vegetables amounted to 4209 thousand tonnes in 1993. The major fruits and vegetables include grapes, apples, watermelon, peas, potatoes, tomatoes, etc. Chile has become Latin America's leading fresh fruit exporter, with the United States as its dominant market. The total horticultural exports in 1992 amounted to US\$981 million. By 1992 fruits and vegetables accounted for 11.2 percent of the total exports. The principal export product of this country is grapes. Between 1962 to 1992 grape exports increased from 5800 tons to 400,000 tonnes and area under grapes increased by four times from 1 lakh acres in 1965 to 4 lakh acres in 1992. U.S., Europe, Middle East are its major export destinations. Export of grapes is handled by six multinational companies, which have contributed to a large extent to the success of grape exports, (in fact about 50 percent of the grape exports of this country is handled by them). The other supportive factors for this success has been the subsidies provided by the government, irrigation facilities, agricultural inputs, transportation, (the country has a network of 10,000 refrigerated trucks), financial services, tariff protection, free price determination according to market, and quality control. Further motivation is given to small farmers/medium size growers.

ISRAEL : A largely food self sufficient country where diversification into horticultural crops was practised. Its production of fruits and vegetables in 1993 amounted to 1408 thousand tonnes and vegetables amounted to 858 thousand tonnes in 1993. The country has diversified into a number of new fruit crops like

mangoes, grapes, apples, grapefruits, dates and other citrus fruits. It is one of the four largest countries producing and supplying horticultural crops to Europe. Fresh fruits, flowers and vegetables constitute its largest export sector. Its leading export fruits are Avocadoes and citrus fruits. The country has witnessed a phenomenal growth in fruit exports since 1988. Its fruits and vegetable exports in 1992 was estimated at US\$'000 573600. Its major fruits exports are mangoes, grapes, dates, and melons. In 1988-93 Israel's exports of mangoes were 2 percent of all non-EU country exports to Europe, in the later years it increased to 7 percent.

The success factors in building up a diversified and successful export oriented agriculture concentrating on horticulture can be listed as :

- a) Technological innovations - specially irrigation technology (area under irrigation in this water scarce country increased from 74 thousand acres in 1948 to 630 thousand acres in the recent years).
- b) Development in marketing network.
- c) Industry co-ordination with the government.
- d) Increase in the irrigated area.
- e) Special incentives through increased water quota for export-oriented horticulture.
- f) Encouragement to shift from high water requirement crops like cotton and others to high value, off season, green house horticultural plants.
- g) Free trade agreements with European Union (1975), United States (1985), European Free Trade Area (EFTA) (1993).
- h) Member of GATT.

INDONESIA : Indonesia an agriculturally dominant country had as its main crop rice, where self sufficiency was reached in 1984 however the country had to again import rice in 1991 but the situations stabilised in 1992. Production of rice was concentrated at Java. Diversification into a variety of crops like vegetable crops, fruit crops and annual crops was undertaken to create a more balanced development and better utilisation of land. The country diversified into a number of crops like clove, coffee beans, cocoa, fruit crops like banana, citrus fruits, mangoes, papaya, pineapple etc. the total production of fruits and vegetables was estimated at 12253 thousand tonnes in 1993. The country further, in the recent years has diversified into marine products which fetches a revenue of US\$ 2467.5 million.

KENYA : Kenya's case is one of the very few sub-African countries which has emerged as a major exporter of horticultural product. This country was earlier dependent on exports of coffee and tea, which constituted its major exports. The country diversified its export trade pattern in 1980's and by 1988 horticultural products amounted to 110,000 million tonnes bringing in a revenue of US\$107.5 million. The average annual increases in trade volume being 11.6 percent. In the recent years-canned pineapple, pineapple juice and cut flowers accounted for over 75 percent of Kenya's horticultural exports. In the recent years therefore Kenya is among the top leading countries in horticultural exports. Success in Kenya's trade can be accounted primarily to large-scale foreign investments.

The Kenyan experience indicates that there are potentially high pay-off in demand driven, export oriented horticultural development. Increasing horticultural exports have also helped Kenya to maintain balance of payments situation. It has provided employment and rise in income to the farmers. Increasing support services for small-scale horticultural producers would further enhance the situation.

Summing up - Kenya has earned a niche in the European market, accounting for 12 percent share in the exports of vegetables in the year 1993. UK has 90 percent share of Kenya's vegetable exports and other buyers are France, Holland and Germany. Fresh vegetables comprise 42 percent (26,000 tonnes of Kenya's fresh and export volume in 1993. Out of which french beans alone account for 54 percent of all vegetable exports followed by chillies, Karela (bitter melon) and okara.

The country has made special efforts for promotion of horticultural products through post harvest training, improve packaging (imported packaging material), cold storage units and transportation facilities which are available to even small vegetable producers who have become members of the Exporters Association of Kenya.

KOREA : An agriculturally dominant country with 40 percent of GNP being contributed by agriculture in 1960 its share fell to 17 percent in 1988 with agricultural sector showing a sluggish growth rate. This declining performance of agriculture set off the need for various programmes of agricultural diversification - In 1983 a diversified farming project was introduced to diversify from the paddy dominated cropping pattern. In 1984 the Integrated Regional Agricultural

Development project was also introduced and in 1988 the diversification programme received a boost from the co-operative movement. These diversification programmes led to a remarkable increase in area under fruits and vegetables. Fruit production increased at 7.1 percent per annum between 1965 to 1988 and vegetables and livestock increased at 5.4 percent and 2.4 percent per annum, respectively during the same period.

Korea's diversification programme has made remarkable contribution to the farm incomes. There was also an increase in gross production of fruits (from 22 thousand tons to 510 thousand tonnes) and of vegetables (from 66 thousand tonnes to 1095 thousand tonnes) between 1960's to 1980's indicating the success of diversification. The agricultural development and diversification programme has been supported by a number of schemes of the government. In the later period i.e. early 1990's the country has further diversified into livestock and export revenue from food and livestock in 1994 amount it to US\$ 2294.6 million.

SRI LANKA : In Sri Lanka, agriculture is a dominant sector accounting for 24 percent of the GDP, 42 percent of total export earnings and about 50 percent of total employment. Paddy, tea, coconut are the predominant crops in the wet zone - however in view of developing agricultural sector - Sri Lanka adopted a policy of emphasis on production of rice for self sufficiency and initiated a programme of agricultural diversification. The diversified crops include bananas, mangoes, pineapple, root crops and vegetables.

The efforts of diversification indicate positive trends considering the fact that the share of fruits and nuts in the total agricultural production value increased from 8.74 percent in 1960 to 16.80 percent in 1980, and the share of banana's increased from 0.79 percent to 5.3 percent and that of mangoes from 0.45 percent to 3.05 percent during the same period. The share of other commercial crops like coconut and sugarcane showed a significant decline during this period.

Fresh horticultural products like fruits and vegetables have been identified as the new export commodities and also as a measure to stabilise the violent fluctuations in agricultural exports. By 1992 the total vegetable and fruits exports were valued at US\$ 82.8 million.

PHILIPPINES : This country is a model case study of radical transformation in the economy due to agricultural diversification. Initially in 1960's rice dominated the cropping pattern contributing about 25-30 percent of total crops and about 42

percent of the total harvest area; by 1985 the area under rice declined to 25 percent. Sugarcane, one of its major crops faced a problem due to the slump in world market prices in 1980's. In 1987, as a result of this 5000 hectares of land under sugarcane was diversified into vegetables, legumes and cotton. In 1975 an official crop diversification program was initiated as a result of which a variety of fruit crops and vegetables were introduced. Between 1960 to 1988, the share of three fruits mangoes, pineapple and banana which was a negligible at 2.8 percent of total crop production value in 1960, increased to 12 percent in 1988.

There was an increase in both production and yield of these crops in early 80's. The yield of bananas increased by 15.7 percent, mangoes by 44 percent and pineapples by 35 percent per hectare. This was accompanied by a growth in production of these diversified crops with Pineapples registering a rise of about 20 times i.e. from 133.90 thousand tonnes in 1960 to 2350 thousand tonnes in 1988. As regards overall value of agricultural exports to total exports. It declined from 66 percent of total exports in 1960's to 13 percent in 1980's. As a result of which the country is diversifying further into non-traditional exports, agricultural business, flowers, poultry, fruits and vegetables to name a few. Its principle exports are coconut, banana, sugarcane, and pineapple. Livestock and fish exports are also becoming increasingly significant. The vegetable and fruit exports in 1994 were estimated at US\$571 million with exports of bananas at US\$215.3 million. Food and livestock exports amounted to US\$ 1332.7 million during the same year. Special government official crop diversification programmes have supported the diversification and multi-cropping programme in this country.

DOMINICA : The case of Dominica is a study of a very small economy dependent on a single crop i.e. banana for a long time. Banana production in 1993 amounted to 55 thousand tonnes fetching an export earning of EC \$72.3 million. This crop is vulnerable to weather risks and hurricanes. To avoid this, the country embarked on a programme of diversification in agriculture - into Bay oil (bayleaf oil), grapefruit, coconuts, floriculture, root crop, and other vegetables. The other objectives of diversification are increasing the income, employment and foreign exchange earnings through promotion of these crops.

As compared to the traditional crop banana, coconut yields a higher net return per acre valued at US\$ 62 and banana fetch US\$ 41 per acre. However it was found that the traditional crops had more advantages in foreign exchange and employment potential. Of the new crops, grapefruit recorded a distinct advantage

in export, its export value increased by 154 percent within a short period between 1960-69. The exports value of bay oil which were at US\$ 1/2 lakh in 1960 increased to nearly US\$2 lakh by 1985, in addition it also stimulates cosmetic industry and is a sure earner of foreign exchange because of the country's monopoly position in Bay oil.

EGYPT, JORDON, SYRIA, TURKEY, AND MOROCCO: These are the *MENA* countries (All these countries are strong Islamic countries with relatively low incomes).

Agriculture is a very dominant sector both in terms of contribution to GDP and support to labour force ranging between 14 to 30 percent of GDP and supporting about 20 to 45 percent of the labour force. There are some common features of the agricultural sector of these countries given below:

1. Basically a net importer of food grains.
2. Stagnant agricultural sector, with low production and profitability.
3. Since 1980's these countries have witnessed an increasing international and regional market integration.
4. The above led to a gradual shift in agriculture from food security to trade oriented agriculture based on comparative advantage and a more diversify agriculture.

A brief country wise review of their agricultural diversification experience is provided below. In these group countries diversification has taken place mainly due to

- a) Decreasing profits from cereal production,
- b) Increasing scarcity of fertile land and water
- c) Substantial growth in demand for high value crops i.e. fruit and vegetables in domestic and regional markets.

TURKEY: This country has been self sufficient in most of the basic food stuff, (still it had to import about 605 thousand tonnes of cereal in 1992). The country diversified into a number of other non-traditional crops like fruits, nuts, cotton, etc. its principle agricultural exports are cotton, tobacco, wheat, fruit and nuts. The exports of dried fruits dominated at US\$747 million in 1994. The production of fruits in 1994 amounted to 7347 thousand tonnes. Such a diversification process has enhanced the agricultural production in this country as well as has generated greater possibilities of export for this country.

MOROCCO : The principle crops of this country were wheat, barley, citrus, tomatoes, beet. The country had to import 2.7 million tonnes of cereals in 1993 due to drought conditions. The country diversified into a number of fruits and livestock to expand its export base. The total production of fruits amounted to 2201 thousand tonnes in 1994 of which the dominant fruit crops are grapes, oranges and bananas. Another area of exports in the allied sector is the marine products which constituted 14.6 percent of the total exports. Citrus fruits constituted 4.2 percent of all exports and was estimated at Dirhams 1443 Million in 1994. Marine product exports amounted to Dirhams 2092 million in 1994.

SYRIA : this country has been a principle exporter of cotton which constituted 6 percent of its total exports in 1993. By 1993 its traditional exports of petrol and textiles showed a decline. The country diversified into the production of a number of horticultural crops, livestock and fisheries. The total exports of vegetables and fruits in its fresh and preserved forms amounted to about Syrian £2388 million in 1991 which increased to Syrian £3154 in 1993. The export of livestock amounted to Syrian £ 1052 million in 1992-1993.

JORDAN : The principle cash crops of this country are fruits, vegetables and nuts which accounted for 8 percent of the export earnings of this country in 1991. In value terms it amounted to JD'000 49068. The production of fruits and vegetables amounted to 777,000 tonnes in 1993.

EGYPT : A dominantly agricultural country with agriculture and allied sectors accounting for 18 percent of the GDP and 39 percent of the labour force. The principle traditional crops are cotton, rice, wheat, and sugarcane. The country produces a diversified range of fruits and by 1992 exports of fruits and vegetables and dry fruits and nuts amounted to US\$214 million (of which oranges and Mandarins amounted to US\$ 65 million).

The above agricultural diversification experience of the selected developing countries indicate the benefits of such a process enhancing agricultural production, income as well as agricultural exports. It has also lead to a better utilisation of land and other resources. Since most of these countries are heavily dependent on exports, diversification into non-traditional horticultural crops, fisheries and livestock and other specific areas has increased the foreign exchange

earnings as well as reduced the risks arising out of concentration in one or very few exportable commodities.

Some of the countries were found to have diversified into about 20 to 25 varieties of crops, for example: Taiwan, Kenya, Korea and Thailand. The other group of countries which include Turkey, Morocco, Philippines, Egypt, Israel have diversified into about 10-15 varieties of crops and there are some countries which have diversified into 5-10 variety of crops, these include Chile, Malaysia, Jordan, Dominica, Syria.

A notable feature of the diversification process of these countries is that it has enabled them to earn foreign exchange ranging as high as US\$2.14 million (Egypt), US\$107.5 million (Kenya) and US\$1.9 billion (Thailand). This has helped the countries to expand the 'Exportable Base' in the agricultural sector and also reduce the risks of dependence on a few exports.

In all the selected developing countries reviewed the common features that underlie the successful diversification efforts as follows:

Diversification into horticultural crops has been a natural next step after achieving reasonable self-sufficiency in food.

Horticultural crops due to their high income elasticity of demand have enabled farmers to increase their own incomes and at the same time have helped nations to increase their export earnings to levels that would not have been possible with income inelastic traditional food grains. (Specially in the export dependent economies reviewed)

Parallel to the income support that diversification gives to the farmer there is an additional wealth or asset effect. For example, barren lands, or uncultivated lands fetch lower prices than lands that have been developed for horticultural cultivation. This wealth effect of horticultural crops equips the farmer with greater security in the form of assets on which he can fall back in times when his agricultural output levels are adverse. In addition the expansion of such crops have also created both direct and indirect employment opportunities, more so, because a number of horticultural crops have a high labour intensity.

ANNEXURE 2

BRIEF CASE STUDIES OF 'OUTLIERS'

The account presented in the earlier chapters so far pertains to the representative classes of farmers that were covered in our sample survey. However, in the course of the survey we came across several farmers whose experience with agricultural diversification in terms of

- i. the history of adoption of horticultural technology,
- ii. the success with such technology, and
- iii. the status as pioneers in the region,

mark them out as distinct from the farmers covered in the survey. On all the counts mentioned above the experiences of these 'outliers', deserve a separate and detailed consideration.

In what follows we present brief sketches of farmers who have reported outstanding profitability by adopting vegetable and fruit crops. The causes of their prosperity range from sheer hard work to 'Gifts of God'. For obvious reasons these 'outliers' are not comparable with one another or with the bulk of the respondents of our survey.

CASE -I

PROFILE

**Shri Vithal Maruti Dhole and Bajirao Dhole
(Yennere, Taluka Junnar, District Pune)**

Name of village	:	Yennere
Age Group	:	37-57
Education	:	B.A./ 7th Standard
Size of land holding	:	38 acres
Irrigated land	:	33 acres
Unirrigated/Rainfed land	:	—
Waste land	:	5 acres (river side)
Source of Irrigation	:	Well, Pumpset, PVC line, Drip
Quality of Soil	:	Very fertile, Superior quality
Fruits produced at Present	:	Mangoes, Pomegranate, Grapes, Chikoo, Custard apple
Commencement of Horticulture:		Begun in 1950's. Highly commercialised since 1980's
Traditional Crops	:	a) Mainly bajra and groundnut in kharif season

- b) jowar, wheat, grams and vegetables in rabi season
 - c) sunflower, groundnut, vegetables like onion, tomatoes, sugarcane.
 - d) Other fruit crops
- New Diversified Crops : vegetables, fruits, flowers.
- Reasons for Adopting Horticulture: Historical, profitable.
- Subsidy/ Non subsidy : Non subsidy. Traditional family business

Yennere is a picturesque village nestled in the mountainous ranges 17 km west of the Shivneri fort in Junnar. Vithal Maruti Dhole, Bajirao Dhole (Uncle & nephew) are jointly the most prosperous family of the village and its vicinity. In large measure their prosperity is attributable to a curious train of events that took place some 50 years ago. The grandfather of Vithal Maruti Dhole used to sell vegetables in the Bombay's Crawford Market. There he came in contact with some Gujrati traders from Balsad and in the course of conversations told them about the beauty and favourable climate of the village Yennere. The Gujrati traders began visiting Yennere during summers and monsoons to enjoy the good climate and availed of the hospitality of the Dhole's. 3 or 4 such annual holidays later, they brought with them a farmer from Balsad (incidentally a place famous for Balsad variety of mangoes) to make a plantation of mango trees for the Dhole's on some land measuring 5 acres on the banks of a minor river passing through Yennere. On this plot of land the farmer from Balsad planted 150 trees of which all survived on account of excellent fertility of soil and ample availability of sub-soil water in the river bed.

The variety of mangoes that had been planted is now famous amongst a very select elite in Bombay as 'Junnari-Alphonso'. However, whether the mango actually belongs to the Alphonso variety or not is not known to both producers or the consumers of the mango. Be that as it may, the mangoes produced and marketed by Dhole's to their affluent traditional buyers is the costliest mango sold. It commands the highest premium and is sold at prices greater than even the prices of exported Alphonso mango. The price at which the 'Junnari-Alphonso' mangoes are sold varies between Rs. 300 - Rs.450 per dozen, because of its excellent quality and size.

There was a quantum jump in the popularity of mangoes sold by Dholes only after 1980, this was the time when Bajirao Jagannath Dhole after completing BA joined

his uncle in agriculture. The two together decided to capitalise on their unique bequest. They took up the initiative of increasing the yield, size, quality of the fruit by performing intense labour and scientific treatment on the land and the mango trees. One month prior to the harvest from the trees [which curiously, falls in the period 15th June onwards to about 15th July, after the Ratnagiri Alphonso mango has gone out of market], the Dhole family camps itself on the 5 acre farm which is 5 km from their village day and night. Deep intensive care is taken of the crop with use of the best fertiliser doses, insecticides, hormone treatment. Their expenditure as can be seen from the table given, only on fertilisers, crop care, insecticides and pesticides and such other treatment works out to be about Rs.59000 for five acres. This amounts to about Rs. 12000 per acre of recurring cost which is way above Rs. 500 reported by the beneficiaries of CSS. (see chapter 8). Incidentally they have planted 30 trees per acre in contrast to the 40-45 trees planted by the CSS beneficiaries. The yield they obtain is 240 fruits per tree i.e. 20 dozens. At first glance this may seem to be a low output in numbers, however the Dhole's produce a mango, which is one and a half times the size of the biggest regular Alphonso and every fruit is selectively cared for.

The following table A 3.1 and A 3.2 provides details of the revenue and cost break-up of mangoes of these respondents.

Table A 3.1 Revenue from Cultivating Mangoes (Yennere Village, Junnar)

Area under mangoes (acres)	Nos of Trees	Fruit Bearing trees	Output per Tree No of fruits	Market price per dozen (Rs.)	Total Gross Revenue from 5 acres (Rs)	Average revenue per acre (Rs.)
5	150	150	240	@ 300/doz	900000	180000
				@ 450/doz	1350000	270000

Table A 3.2 Cost of Cultivating Mangoes (Yennere Village, Junnar)

Break up of Total Recurring Cost for 5 acres (Rs.)			Total Recurring Cost for 5 acres (Rs.)	Total Recurring cost per acre (Rs.)
Dymonia & Potash	Insecticides & Hormone & Pesticides	Crop care		
14000	30000	15500	59500	11900

From the above tables A 3.1 and A 3.2 the following striking aspects about these respondents revenue and costs can be noted.

1. The gross revenue per acre works out to a sum of Rs. 9,00,000 for 5 acres at Rs. 300 a dozen and Rs. 13,50,000 at Rs. 450 a dozen i.e. the per acre revenue in the first case is Rs. 1,80,000 and in the second case it is Rs. 2,70,000.
2. Given the per acre cost of Rs. 11900 the net revenue per acre is Rs. 1,80,000 - 11900

= Rs. 1,68,000 in the first case and Rs. 2,70,000 - 11900 = Rs. 2,58,000 in the second case.

The case of these respondents is a unique case and experience of success in mango plantation and is vastly different from the general sample covered in the study. The quality of Alphonso mangoes produced by these respondents was reported to be of a very superior quality (in terms of size, weight, taste etc.), as a result it fetches the extremely high price reported by the respondents. Even the respondents themselves were unable to account for their success, which they took it as GOD'S blessings.

CASE 2

PROFILE

SATYASHEEL DHAMALE, BELEWADE (MULSHI REGION)

Name of village	:	Belewade
Age	:	25 years.
Education	:	B. Com
Size of Land Holding	:	40
Irrigated Land	:	20
Unirrigated/Rain-fed Land	:	20
Wasteland	:	-
Source of Irrigation	:	Well, PVC Pipelines, Pumpset, Lift Irrigation (1990-91 minor irrigation dam)
Quality of soil	:	Black Fertile
Fruits Produced at present	:	mangoes (raiwal, alphonso and payari)
Traditional Crops	:	kharif : bajra, groundnut, nachani, pulses, rice (traditional) rabi : jowar, wheat, gram, vegetables, onions, groundnut.
New Diversified Crops	:	Vegetables: brinjal, cucumber, tomato, green peas, lady finger, potato. Fruits: Mangoes. Superior Pakistani basmati rice.
Commencement of Horticulture	:	1960's – 1970. 1980's highly commercialised
Reasons for Adopting horticulture	:	Old traditional family horticulture business and highly profitable venture, very suitable agro-climatic conditions.
Subsidy/Non-subsidy	:	Traditional family siness/subsidy under CSS 1980-81 scheme.

Belewade is an extremely prosperous village in the Mulshi region having a

traditional history of successful mango plantations. Originally Raiwal mango was the dominant variety which was later grafted to produce Alphonso (Hapus) and Payari Mangoes. The agro-climatic conditions, the soil, the rainfall are extremely favourable to the cultivation of mangoes.

The entire success story of the Dhamale family dates back to 1960's when Shri Shankar Rao Dhamale, the grandfather of Stayasheel Dhamale very progressive agriculturist adopted mango cultivation. Later the tradition was carried on and developed by Ramesh Chandra Dhamale the father of Satyasheel Dhamale who is the Former Vice-President of Zilla Parishad, Pune.

A variety of crops is produced by this family (the pre and post diversified cropping pattern can be noted from the profile of this respondent).

The Dhamale family have been the pioneers in traditional as well as superior Alphonso variety of mangoes in this region. the following tables A 3.3 and A 3.4 provides a break up of the details of the revenue and costs of the mango cultivation undertaken by this family.

From the tables A 3.3 and A 3.4 given below it can be seen that the total gross revenue from 5 acre works out to be Rs. 10,00,000; therefore the gross revenue per acre is Rs. 2,00,000. From table A 3.4 it is estimated that the cost per acre works out to be Rs. 2990. The net revenue per acre therefore can be estimated at Rs. 197010, which is an extremely high return from the horticultural venture. (For which reason this respondent could not be considered in the general sample survey of the earlier respondents). The quality of mangoes of this respondent are of a superior variety. This family has shown prosperity not only in mangoes but in all other vegetables and diversified crops. Their future prospects and plans include a 2 acres plan for prawn farming.

Table A 3.3 Revenue from Mangoes (Belewade village, Mulshi) Reference year 1995-96.

Nos. Of Trees	Area (Acres)	Nos. Of Trees Survived	Fruit Bearing Trees (Nos.)	Output Per Tree (Nos.)	Market Price Rs. Per doz.	Total Revenue (Rs.)	Average Revenue (Per Acre) (Rs.) [Column 7/2] (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
200	5	125	125	1200	80	10,00,000	2,00,000

Table A 3.4 Cost of Cultivation of Mangoes (Belewade village, Mulshi) Reference year 1995-96.

Area Under Mango (Acres) (1)	Cost of Sapling (Rs.) (2)	Chemical Fertilisers (Rs.) (3)	Pits (Rs.) (4)	Organic Fertiliser (Rs.) (5)	Insect Pesticides (Rs.) (6)	Water (Rs.) (7)	Total Initial Year Cost [addition of 2-7] (Rs.) (8)	Per Acre Cost in Initial Year (Rs.) (9)	Total Cost in Second, Third, Fourth and Fifth Years (Rs.) (10)	Total Cost Per Acre over 5 years (Rs.) (11)
5	1600	1500	350	500	750	250	4950	990	2000	2990

CASE 3.**PROFILE****VIJAY AND SUJIT MEHER,
(HAPUS BAUG AAGAR, JUNNAR TALUKA, PUNE DISTRICT)**

Name of village	:	Agar
Age Group	:	23
Education	:	M.Com.
Size of Land holding	:	35 acres
Irrigated Land	:	35 acres
Unirrigated/Rainfed land	:	-
Waste Land	:	-
Source of Irrigation	:	Well, Pumpset, PVC line, Drip
Quality of Soil	:	Medium / Black
Fruits produced at Present	:	Mangoes, Bananas, Grapes
Commencement of Horticulture	:	Early 1970's
Traditional Crops	:	a) Mainly bajra and vegetables in Kharif season b) jowar, gram in rabi season c) cucumber sugarcane, brinjal, doodhi, papaya.
New Diversified crops	:	Vegetables: brinjal, pumpkin, tomato. Fruits: mangoes, grapes, papaya.
Reasons for Adopting horticulture	:	Historical and Profitable.
Subsidy/ Non subsidy	:	Non-subsidy, Traditional family business.

Vijay Sheth Meher is an entrepreneur farmer who owns 9 acres of land in a village called 'Hapus Baugh'. To most tourists who see the board bearing the name of the village the impression conveyed is that there is a garden of most lustrous alphonso mangoes. In fact, however, the village derives its name from a colony of 'Habshis' i.e. Abyssinian Muslims who were the local rulers under the Nizam of Bijapur in the 16th century A.D. Indeed the entire area of Hapus baugh is marked by several muslim monuments and tombs.

Vijay sheth Meher, after completing his college education in Pune, decided to take up farming in the mid sixties - a hard working entrepreneur by nature, the first project he undertook was to lay down a pipeline with his own bare hands from a near by river to his 35 acres farms. The Mehers have not seen even a single year of difficulty after the pipeline was set. The farm has had water throughout the year ever since 1965. Having accomplished a solution to the water problem, Vijay Sheth Meher undertook a series of experiments on his medium sized farm. One of his pioneering experiments was to grow grapes which he has done successfully throughout service then. After 30

years of successful farming, Vijay sheth Meher who had developed in the meanwhile an intense hobby of stamp collection is occupied in this activity in Bombay.

The younger of his two sons, Sujit Meher who has an M.Com. degree of Pune University now looks after his farm along with his mother who herself takes a lot of interest in agriculture. Timely and constant guidance is however given by Vijay Meher. Vijay Sheth Meher and Sujit Meher present themselves as outlier in our survey on two accounts (i) even though Vijay Seth Meher was a pioneer in grape farming in the Junnar region he has steadfastly refused to join the grape export movement through cooperatives (ii) he has reduced his area devoted to grapes even though grape production throughout the seventies has been the principal cause of his prosperity. Each of these reasons merit a detailed comment. The Mehers are opposed to very intensive grading of the size of grapes grown by them. Such grading is vital to export of grapes. However, the Meher's find that the price received from merchant exporters from Dubai is quite remunerative in relation to the labour required to grow the grapes. In contrast the specifications imposed by the cooperatives dealing in exports to Europe leads to high rejection rates leading to distress sales and therefore low profitability.

In addition as we have seen in the earlier cases, the costs of production of grapes has been rising and prices have not kept pace, which shows declining profitability from grapes.

This family has shown a preference for sugarcane cultivation in view of the adequate availability of water and irrigation facilities. This respondent has 22 acres under sugarcane and at Rs. 15000 net return per acre his revenue from sugarcane alone works out to be Rs. 3,33,000 per season. Sugarcane has been favoured by this respondent because of its greater certainty, less tedious care, lesser possibility of being destroyed and most important because of assured irrigation.

The other crop cultivated by this respondent is Banana which gives a net return of Rs. 35,000 which is a very certain income flow. (The gross revenue from this crop is given at Rs. 75000 and with a cost of Rs. 40000 on planting and other care including water, the net revenue works out to be Rs. 75000-40000 = Rs.35000).

His major crops at present are therefore grapes and sugarcane though initially this respondent was one of the pioneers in grape farming in this region. As regards grapes broadly his initial capital investment is Rs. 1,50,000. The annuals recurring expenses have been quoted as Rs. 35000 to Rs. 40000 with an income of Rs. 1,20,000 he obtains a contribution of Rs. 80000 per acre (sales-recurring costs). Allowing for interest payments at a rate of 15 percent on bank loan taken in the initial year his net income from one acre of grape farm works out to be Rs. 57500 per acre. The

respondent sells the grapes in both the local as well as Dubai market directly and gets Rs. 14 to 15 per kilo in local market and Rs. 18 in the Dubai market. This respondent is satisfied with Dubai market because of less rigidity in quality specifications and quick payments for the exports, which is realised within 15 days.

CASE 4.

A PROFILE

**SHRI SUBHASH JADHAV
(BORI BUDRUK, JUNNAR TALUKA, PUNE DISTRICT)**

Name of village	:	Bori Budruk
Age Group	:	45
Education	:	SSC
Size of Land holding	:	5 acres
Irrigated land	:	5 acres
Unirrigated/Rainfed land	:	-
Wasteland	:	-
Source of Irrigation	:	Well, Pumpset, PVC line, Drip irrigation
Quality of Soil	:	Light ('Murmad')
Fruits produced at present	:	grapes, mangoes, chikoo, banana custard apple
Commencement of Horticulture	:	Since 1980's
Traditional Crops	:	a) Mainly bajra and groundnut in kharif season b) jowar, gram in rabi season c) sugarcane, vegetables, onion, pulses.
New Diversified Crops	:	Vegetables: brinjal, tomato, Curryleaves etc. Fruits: mangoes, guavas, grapes. Flowers: Marigold
Reasons for Adopting Horticulture	:	Optimum use of land, water, Labour and profit incentive.
Subsidy/ Non subsidy	:	Own traditional farm/agricultural business and subsidy under CSS 1980's.

The case of this respondent of Bori Budruk, Junnar Taluka, Pune District also is a case of continuous diversification in favour of vegetables and a variety of horticultural crops.

With a land size of 5 acres which was a complete wasteland 20 years ago this land was developed and today this respondent is one of the most progressive farmers of the Bori region and also is the Patil of Bori area. Beginning initially with a traditional cropping pattern of bajra, groundnut, jowar and gram the present diversified agricultural production pattern includes a variety of fruits, vegetables, flowers and a future plan of poly-house for vegetable cultivation.

He has initiated farmers to undertake mango cultivation as a means to increase income and for better land utilisation, under the Capital Subsidy scheme and himself has been the leader in this region. In the initial stages he allotted 2.5 acres for mangoes with 100 trees, however due to mixed saplings, i.e. Alphonso, Payari and Keshar he was unable to get very remunerative returns and in fact has reduced his mango plantation and area under mangoes.

His other major horticultural crop is grapes. He has 3 acres under grapes and gets on an average 10 -12 tonnes per acre at Rs. 12 - 14 per Kg. His gross revenue per acre thus works out to be Rs. 1,43,000 per acre. (The detailed analysis on cost and revenue of grape cultivation is provided in chapter 8 section __).

His other interesting areas of diversification have been as follows:

Marigold : where he states that with a cost of barely Rs. 1200 - 1500 per acre inclusive of labour and water charges he is able to earn get a gross return of about Rs. 50,000 per acre .

Curry Leaves : He has devoted 1/2 acre to this crop and the cost per acre is 10,000 to 20,000 and gross revenue amounts to almost Rs. 50,000 per acre.

Tomatoes : This respondent has also cultivated tomatoes which are produced under conventional conditions and yields 40 tonnes per acre.

The total yield of tomatoes has been reported at 1600 'petis', each 'peti' consists of 25 kg. The cost per 'peti' has been quoted at Rs. 70, therefore his gross revenue works out to be Rs.112000.

The respondent has provided a detailed cost - revenue break up of producing tomatoes in poly-house conditions. Under conditions of poly- house tomatoes would yield 20 boxes as daily output X 360 days = 7200 boxes. The price has been given as Rs. 70 per box. The gross revenue per acre per annum works out to be Rs. 5,40,000. It should be noted that the output flow will be throughout the year. About Rs. 40,000 (is of course) is the gross cost which could be incurred on labour, temperature, maintenance and other scientific requirements. Thus the net revenue would work out to

be Rs. 5,00,000 per acre. The initial cost of providing the Poly-house facilities is Rs. 31 lakh per acre. The poly-house further has the advantage of assured production, no disease and greater durability.

The high levels of revenue quoted by this respondent from the diversified range of horticultural crops, along with his obvious status and wealth mark him out as an 'outlier'.

CASE 5.

**A PROFILE
SHRI RAGHUNATH MARUTI PAWAR
(PARUNDA, JUNNAR TALUKA, PUNE DISTRICT)**

Name of village	:	Parunda
Age Group	:	45
Education	:	Primary
Size of land holding	:	15 Acres
Irrigated land	:	10 acres
Unirrigated/Rainfed land	:	3 acres
Wasteland	:	2 acres
Source of Irrigation	:	Well, Pumpset, PVC line, Drip irrigation, Canal water
Quality of Soil	:	Black
Fruits produced at Present	:	mangoes, chikoo, pomegranate, custard apple
Commencement of Horticulture	:	mainly in late 1970's and early 1980's.
Traditional Crops	:	a) bajra, groundnut, rice, pulses, vegetables in kharif season b) jowar, wheat, potato, gram in rabi season c) vegetables, sugarcane, onion, pulses.
New diversified crops	:	Vegetables: tomatoes, Fruits: Mangoes, grapes, chikoos, pomegranate, custard apple
Reasons for Adopting Horticulture	:	Water saving, Wasteland development, Labour use, income and output enhancement and profit motivation.
Subsidy/ Non subsidy	:	Own initiative and subsidy.

This respondent is the only progressive and successful case of agricultural diversification in the Parunda village. Earlier an agricultural labourer, in 1972 he bought some wasteland and inferior quality land and started agricultural cultivation.

Apart from his traditional crops by early 1980's he produced and sold Alphonso mangoes in the Crafford market, Bombay. Originally the mango saplings were bought from Gujarat. The construction of Bandhara and the Kolhapur dams about 10 -12 years back, facilitated his diversification process. Most of his success can be attributed to his hard work, vigilance and care. Presently he produces a variety of fruits like Chikoo, Mangoes, pomegranate, custard apple and vegetables (given in the table) and even flowers.

In 1991 he undertook cultivation of mangoes under the EGS linked horticultural development scheme of the Government of Maharashtra and planted 80 trees.

In spite of having only primary education and belonging to the agricultural labourer's class, he has the practical and technical knowledge of grafting, planting, details of insecticides, pesticides, and also a keen market sense (being himself a Dalal in the Bombay market for sometime). He has taken extreme scientific care of his plantations and is an extremely progressive and modern farmer (his plot of land is at lower level compared to the Vaishnavwadi village).

He has attributed a major part of his success to an irrigation project (Dharan) of 1990 i.e. 'Shri Bramhanath Panni Sahakari Sanstha' which was initiated through Mr. R.K. Pokharkar, S.D.O., Irrigation Dept. The respondent was instrumental in initiating this scheme and in fact gave the initial membership fees of all the member-farmers for this project. (i.e. Rs. 60 per member and other payments). Presently there are 127 members in this scheme which covers an area of 112 hectares of land.

This irrigation scheme is managed by the member farmers under the leadership of Mr. Pawar.

The following are the rates of water for the members of the scheme -

Rs. 290/- per hectare for wheat

Rs. 350/- per hectare for Vegetables

Rs. 170/- per hectare for other crops

As seen, this respondent has initiated changes in the cropping pattern and diversified into fruits flowers and vegetables. It is expected that within a few years time the other farmer members will also take advantage of his leadership. (Every year on 15 August he undertakes plantations of 60 - 70 trees, i.e 'Vruksh Walli' and also has been interviewed on the TV for his successful, agricultural and horticultural ventures).

The gross revenue obtained from the fruit crops by this respondent is worked out in table A 3.5.

Table A3.5 Gross Revenue From Various Fruit Crops

Fruit crop	Total area under fruit crop (acres)	Nos. of tree planted	Nos. of trees survived	Average output per tree	Price per dozen (Rs.)	Total gross revenue (Rs.)
Chikoo	1.5	45	40	2000	15	100000
Mango	2	80	70	250	120	175000
Custard apple	1.5	230	230	72	30	41400
Total	5	-	-	-	-	316400

As can be seen from the above table the gross revenue of this respondent from the total of 5 acres of fruit plantation amounts to Rs.316400 i.e. Rs.63280 per acre. The costs will have to be deducted from this to arrive at the net revenue from these crops. (It should be noted that this revenue does not include the revenue from the traditional crops, vegetables and flowers).

What was found striking about this respondent was the variety of horticultural crops that he has diversified into which fetches him a very high gross income. His case has been considered in this section on 'outliers' because of his success with agricultural diversification even in the remote village of Parunda (Junnar).

ANNEXURE 3

COST AND REVENUE ESTIMATES OF SELECTED HORTICULTURAL NON-HORTICULTURAL CROPS IN THE JUNNAR-NARAYANGAON & MULSHI REGIONS

In the course of our sample survey we collected information on estimates of income from a variety of horticultural and non horticultural crops and we had the opportunity of making a detailed cross verification of these income estimates. These estimates are reproduced region-wise and crop-wise in the following sections.

Whilst not all the data are of direct relevance to the subject of this study, we thought it fit to report these figures all the same, (a) to enable other researchers to benchmark their estimates and (b) to identify the area wise suitability of different crops.

1. COST AND REVENUE ESTIMATES OF FOODGRAINS AND HORTICULTURAL CROPS IN THE JUNNAR-NARAYANGAON REGION.

Information regarding the per acre cost and revenue of various food grains, cash crops, vegetables and fruits were obtained from some of the beneficiaries in the above region. A summary of this information is provided in the tables A 3.1 & A.3.2 given below.

Table A 3.1 Cost And Revenue Estimates Of Various Food Grains In The Junnar-Narayangaon Region. (per acre) Reference Year 1995-96

Item (1)	Cost (Rs.) (2)	Yield (Quintals/Tonnes) (3)	Market Price (per Kg./Tonnes) Rs. (4)	Total Revenue (RS.) (5)= 3 x 4	Net Surplus(Rs.) (6)
FOODGRAINS					
Jowar	1500	12	6	7200	5700
Rice	3000	7	9	6300	3300
Bajra	1500	12	6	7200	5700
Wheat	3000	12	6	7200	4200
PULSES					
Green gram (Harbara)	1500	8	15	12000	10500
CASH CROPS					
Groundnut	2000	8	13	10400	8400
Sugarcane	8000	40 tonnes	1100	44000	36000

Source: Based on information provided by the respondents in the Junnar -Narayangaon region.

A. **FOODGRAINS (see table A 3.1)**

- i. Among the foodgrains, jowar and bajra crops show the highest net revenue per acre of approximately Rs. 5,700/- (see table A 3.1). Although rice fetches a higher price,

its output is very low and the cost being high the surplus the lowest at Rs. 3,300/- p.a. Wheat ranks third as regards net revenue in the group of foodgrains.

ii. Gram provides a net revenue per acre of Rs.10,000 with a very low per acre cost at Rs. 1500. This crop gives the highest income among all the seasonal and conventional crops. By and large the agroclimatic conditions in the area are not suitable for the production of the other pulses.

iii. In the subgroup of oilseeds, this region was found to be suitable only for groundnuts which provides a surplus of about Rs. 8,400/- per acre. In the kharif season the main crops in this area were found to be rice bajra, groundnut. (groundnut is also a rainy season crop). Jowar, wheat, grams are the dominant crops of the rabi season.

iv. Sugarcane was found to be the most common cash-crop in this region, because of the accessibility of the sugar factory, namely Vighnagar Co-operative Sugar Factory. The net revenue per annum from this cash crop is reported at Rs. 36000. The agro-climatic, soil and irrigation facilities (due to the dams in the region) are conducive for the production of sugar cane. The yield per acre has been quoted at 40 tonnes per acre, a relatively high yield.

Table A 3.2 Cost And Revenue Estimates Of Various Horticultural Crops In The Junnar/ Narayangaon Region. (per acre) Reference year 1995-96.

Item 1	Cost (Rs.) 2	Yield/ tonnes 3	Market Price per kilo/ dozen (RS) 4.	Total Revenue (Rs.) 5	Net Revenue (Rs.) 6
VEGETABLES					
Export chilies	5000	5	10	50000	45000
Walwad Beans	7000	5	12	60000	53000
Lady Finger	15000	12	5	60000	45000
Tomato	12000	30	2	60000	48000
Cucumber	5000	10	3	30000	25000
Brinjal	5000	15	3	26000	21000
Capsicum	10000	5	5	25000	15000
Potato	15000	10	3	30000	15000
Onion	10000	10	2	20000	10000
FRUITS					
Grapes	80000	11	13	143000	63000
Mangoes	5000	500 (fruits)	80 (per doz)	40000	35000
Guava	5000	20	2	40000	35000
Custard apple	4000	5	7	35000	31000
Chikoo	3000	3	10	30000	27000
Banana	24000	N.A.	-	75000	51000

Source: Based on information provided by the respondents in the Junnar -Narayangaon Region.

B. VEGETABLES AND FRUITS (see table A 3.2)

Among the vegetable crops in this region there are four crops i.e. walwad (green beans), tomatoes, export quality chillies and ladyfingers which provide a net revenue per acre in the range of Rs. 45000 to 53000. (See table A 3.2).

The other four vegetable crops namely cucumber, brinjal, potato and capsicum yield a net revenue of Rs. 25000/, Rs. 21000/, and Rs. 15000 per acre respectively. Thus as far as the agro-climatic conditions of the region are concerned and given the irrigation facilities, diversifying into such vegetable crops can be strongly advocated to augment incomes in this region. A number of farmers were seen to have diversified into production of fruit and vegetable crops. The extent to which farmers can diversify would however be limited by the land size, and quality of land.

FRUITS

Among the group of fruit crops, grape fetches the maximum net revenue of Rs. 58000 per acre, however, adoption of grape crops require heavy initial capital expenditure and very intensive and timely care. Given the potential of its very high revenue and export demand, this crop was found to be quite popular amongst the farmers of this region. The other popular fruit crop of this region was found to be mangoes, which yields a net revenue per acre of Rs. 35000. This crop has an added advantage of lesser water requirement and possibility of being grown on inferior lands as well as wastelands. Guava, custard apple, chikoo, were the other fruit crops found to yield a net revenue in the range of Rs. 27000 to Rs. 35000 per acre. Banana yields a very high return at Rs. 51000 but it was not found to be very popular mainly due to its intensive water requirement and due to the agro-climatic features which are not very conducive to this crop.

Most of the farmers in this area do not have large size farm holding therefore agricultural diversification has generally been undertaken by substitution of land from sugarcane to grape farm plots as well as instead of sugarcane, some farmers have opted in favour of export quality chili and capsicum production.

It has been found that small holders by and large have shown more interest in grape growing and large farmers continue to have their sugarcane plots because of availability of irrigation facilities, low cost of labour and fertilisers, low cost of inputs insecticides as compared to grape farming and assured income from factories and low vulnerability to disease. Finally, sugarcane does not require the intensive and timely care as grape farming does.

In fact it was also noted that a large part of the reclaimed land which otherwise was permanent fallow or waste land has been brought under new horticultural crops due to the recent facilities of electric pump sets, PVC pipelines, drilling, irrigation etc. Therefore the diversification decisions have not adversely effected foodgrains production nor have disturbed the conventional crops of pulses, oilseeds and other cash crops.

2. COST AND REVENUE ESTIMATES OF FOODGRAINS AND HORTICULTURAL CROPS IN THE MULSHI REGION

Information on the relative costs and return per acre of various alternative crops was also collected from the respondents of the Mulshi region. The details of this information are provided in tables A 3.3 and A 3.4.

(A) FOODGRAINS :

- i. In the foodgrains category, rice and nachani yield the maximum net revenue of about Rs. 3000/- per acre, however, this crop was found to be grown very marginally in the recent years. Rice was found to be the main crop grown by the most of the respondents. In fact in Belewade region of Mulshi there is evidence of a progressive farmer diversifying into Pakistani Basmati rice for exports, which fetches a very high price.
- ii. The cropping pattern also shows a dominance of wheat and jowar in the rabi season, which is grown both for subsistence as well as to meet the market requirements. The net revenue from this crop ranges between Rs. 2500 to Rs. 2800 per acre.
- iii. Among pulses, the farmers in this region have shown a definite preference for gram (harbara) which earns Rs. 9200 per acre with considerable ease of cultivation (this estimate is for gram grown on irrigated land).

Table A 3.3 Comparative Cost And Revenue Of Foodgrains And Vegetables In The Mulshi Region. (per acre) Reference 1995-96.

Item 1	Costs (Rs.) 2	Yield (Quintals/ tonnes) 3	Market price (Quintals/tonnes/K g) (Rs.) 4	Total Revenue (Rs.) 5	Net Surplus (Rs.) 6
Foodgrains					
Rice	2500	6	900	5400	2900
Wheat	2000	8	600	4800	2800
Jowar	1500	6	650	3900	2400
Bajra	1400	5	800	4000	2600
Nachani	1000	8	500	4000	3000
Pulses					
Harbara (Irrigated)	1800	8	1375	11000	9200
Masur	1000	5	1600	8000	7000

Table Continued...

Vegetables					
Walwad Beans	16500	65	1046	68000	51500
Tomato	6500	15(Tonnes)	1500	22500	16000
Capsicum	5000	15	1000	15000	14500
Cucumber	1500	15	600	9000	7500
Green Peas	600	7	800	5950	5350
Lady's Finger	5000	9	1000	9000	4000
Brinjal	1100	5	800	4000	2900
Fruits					
Grapes	70000	10 (tonnes)	12/Kg	120000	58000
Mangoes (Kule- Bhalgudi)	2500 ^A	-	-	15000 ^B	12500 (Max.)
Mangoes (Belewade)	2500	-	-	27500	25000 (Avg.) 35000
Guava	5000	-	-	40000	34000
Chikoo	6000	-	-	-	-

Source: Information provided by respondents of the Mulshi region.

A. Average cost per acre is given in the range of Rs. 2000-3000

B. Maximum revenue per acre in this group of villages.

FRUITS AND VEGETABLES

1. Among the vegetable crops, green beans (Walwad) cultivated by only a few farmers yields a net revenue of Rs. 51500 per acre followed by Capsicum and Tomato which fetches a net revenue of Rs. 14000 to Rs. 16000 per acre. The other vegetables yield a net revenue in the range of Rs. 2900 to Rs. 7500 per acre.
2. A number of farmers in the region have diversified into vegetable crops in order to earn higher incomes from such short gestation crops.
3. There is a wide variation in the net earnings from Mangoes (Alphonso) in this region, with the possibility of earning 15000 per acre (Kule-Bhalgudi villages of Mulshi). On the other hand in the Belewade village of Mulshi (having a history of success in mango cultivation) the net income from Alphonso mangoes is estimated at Rs. 93500 i.e. almost Rs. 1 lakh per acre on an average, due to the extreme favourable agroclimatic and soil conditions.
4. Chikoos, Guava are the other fruits which are be grown in this region and which yields a net revenue of Rs. 34000 to Rs. 35000 per acre.

With some technological and financial assistance this region can develop horticultural crops both fruits and vegetables as a means to increase the extremely low levels of incomes which foodgrains alone provide. It has been recognised as a viable area of diversification.

ANNEXURE 4

INCOME ESTIMATES IN THE JUNNAR AND MULSHI REGIONS.

On this basis of the average yield and cost figures reported in annexure 3, this annexure computes estimates of farm incomes from various crops (i.e. food grains and horticultural crops) in the 2 study regions i.e. Mulshi and Junnar [once again it is emphasised that the material reported here was collected incidentally in the course of our sample survey and is fairly cross verified]. The same income estimation has not been undertaken for the Shirur region because of lack of detailed data.

Based on the region wise land and cropping patterns of the Mulshi & Junnar region this annexure attempts to provide estimates of incomes for farmers who have adopted a diversified cropping pattern i.e. inclusive of fruits and vegetables. (Such estimates have been worked out with the purpose of showing the extent to which farm incomes can be enhanced by adopting horticultural crops.) These estimates have been worked out on the basis of the information provided by the respondents on their land holding, cropping pattern, cost of production, average price that they receive for various crops etc.) details of this is already documented in chapter 7 and chapter 8. (see chapter 7 section 4.1, 4.2, 5.1, 5.2, and chapter 8).

1. MULSHI REGION

1.1 The Kule-Bhalgudi group of villages (Mulshi)

From this group of villages 14 respondents were contacted and interviewed (see chapter 7 section 4.1). Information regarding the land distribution and proportion of irrigated, unirrigated, and wasteland of the respondents in this set of villages of Mulshi is provided in table A4.1 (based on table 7.5).

(Based on the above distribution of irrigated, rainfed and wasteland pattern of land holdings in this group of villages a rough estimate of the income in the post-diversified situation can be made.)

(The total land area covered by these respondents is 183.5 acres of which the total irrigated land is 40.5 acres i.e. 22% of total area covered has irrigation facility. 85.5 acres falls in the rainfed or unirrigated category accounting for 46.5% of the total land. 57.5 acres is under wasteland category which amounts to 31.5% of the total land.)

In the case of an average farmer having 5 acres of land holding, about one acre would be irrigated, about 2.5 acres would be in the category of rainfed land, about 1.5 acres would be in the category of wasteland (irrigated land: 22 percent, unirrigated land: 46.5 percent and wasteland: 31.5 percent, see table A4.1). On an average therefore 1 acre irrigated land may give him revenue of about Rs. 15,000/- from vegetables production. 1.5 acres of waste land (use for mango plantations) may give another Rs. 20,000/- and 2.5 acres of rainfed plot used for foodgrains: would fetch him the following income; Rice : Rs.3,000/-, Masur: Rs. 3,000, Wheat: Rs. 2,800/- and pulses (Gram): Rs.5,000/-. (The majority of the respondents have adopted the cropping pattern on the lines stated above see chapter 7 section 4.2 and tables 7.12A and 7.12B). Thus the small holders gross revenue potential works out to be Rs. 48,800/- with the post diversified cropping pattern (from which costs will have to be deducted). Prior to the 30 years, the small farmers income in this region from foodgrains and pulses was about Rs. 10000 to Rs.15000. (Crop-diversification and infrastructural reforms have positively increased the average farmer's income potential and improved the standard of living).

In the case of farmers with about 10 acres of land holding, their income in the post-diversified situation can be estimated as follows. Following the land distribution land pattern given in table A 4.1 this representative farmer will have about 2 acres irrigated land, about 3 acres wasteland and about 5 acres rainfed land. 2 acres irrigated land used for vegetable crops can earn about Rs. 30,000, fruit crops on the waste land could earn a minimum of Rs. 30,000 and the foodgrains would yield a revenue of Rs. 28,000. Thus a farmer having 10 acres holdings can earn a gross revenue of about Rs. 88,000/- per annum.

These estimates can be further scaled down by 20% as provision for errors & omissions, in which case a small farmer would be likely to get Rs. 39,160 and on the other hand, the large farmer would have the potential of earning Rs. 70,400/- per annum. From these incomes the costs of cultivation of the respective crops would have to be deducted.

1.2 Belewade Region

The size distribution of land holdings and the proportion of irrigated, unirrigated and wasteland category of land in this village of Mulshi is provided in table A 4.1. The total area covered in the Belewade village belonging to 6 respondents has been given as 144 acres. Of which all the 6 respondents own more than 10 acres of land. 81 acres is in the irrigated category i.e. amounting to 56.2% of the total area, 46 acres is rain-fed i.e.

accounting for about 40% of the total area and only 17 acres is wasteland i.e. accounting for 10 to 11 percent of the total land. Due to the irrigation facility farmers with 10 acres land holding in this village would have a potential of earning about Rs. 1 lakh per acre with a the diversified cropping pattern. (Based on information in tables 7.12A, 7.12B and 7.5).

Table A 4.1 Size Of Holdings; Proportion of Irrigated, unirrigated and Waste land (Kule-Bhalgudi and Belewade Vilages, Mulshi)

Ia. Size distribution of holdings (Kule-Bhalgudi Villages)		IIa. Size distribution of holdings (Belewade Village)	
Size of Holdings (acres)	Nos. of respondents	Size of holdings (acres)	Nos. of respondents
0 - 5	4	0 - 5	-
5 - 9	1	5 - 9	-
More than 10 _(a)	<u>10</u>	More than 10	<u>6</u>
	15		6
Ib. Proportion Of Irrigated/ Unirrigated/ Wasteland		IIb. Proportion Of Irrigated/ Unirrigated/ Wasteland	
1.	Total nos. of Respondents : 15	1.	Total nos. of Respondents : 6
2.	Total area (acres) : 183.5	2.	Total area (acres) : 144
3a.	Irrigated land (acres) : 40.5	3a.	Irrigated land (ii) : 81
b.	% of irrigated land to total : 22%	b.	% of irrigated land to total : 56.2%
4a.	Unirrigated land(acres) : 85.5	4a.	Unirrigated land(acres) : 46
b.	% of unirrigated land to total : 46.5%	b.	% of unirrigated land to total : 31.9%
5a.	Wasteland : 57.5	5a.	Wasteland : 17
b.	% of wasteland to total : 31.5%	b.	% of wasteland to total : 11.8%

Source: Based on table 7.5.

The number of farmers having more than 10 acres of land (i.e. above 4-5 hectares) are shown to be in the majority because of the joint family system of land holdings. In effect they actually fall in the small/medium category of farmers by the 'accepted norms' of definition.

2. JUNNAR REGION

This section deals with the income estimates of the respondents in the Bori, Parunda and Vaishnavwadi villages of the Junnar region, on the lines of the earlier

analysis. (For details of the cropping pattern, costs of production, land holding pattern, etc. see chapter 7 section 5.1, 5.2, and tables 7.17, 7.22A and 7.22 B and chapter 8).

2.1 Bori-Budruk Village.

Table A 4.2 provides the data on the size distribution of land holdings and the proportion of irrigated, unirrigated, and wasteland in this village of Junnar (on the basis of information provided in table 7.17). Based on this data, estimates about the potential income of the small of the large farmers in this Village can be made as follows.

The total land covered by the respondents of this village is 133 acres of which 71 acres is irrigated accounting for 53.3% of the total land holding 55 acres of land falls under rainfed category accounting for 41.3% of total land and the wasteland is only 7 acres accounting for 5.3 percent of the total land (table A4.2).

Since the soil, agroclimatic conditions, irrigation facilities, technical knowledge of growing horticultural crops are well developed in this village, the farmer in this village with 10 acres of land holding can earn a potential income in the post diversified situation as given below.

- a. 2 acres irrigated land used for vegetables would yield a gross income of about Rs. 15,000 per acre or Rs.30000 for two acres.
- b. 2 acres of grape farm will yield a minimum of Rs. 1,00,000/-
- c. One acre plot of sugarcane is likely to give him Rs. 30,000/-
- d. Four acres rainfed land will atleast give him Rs. 40,000/-
- e. Since percentage of wasteland is negligible, his miscellaneous income from that will be about Rs. 2,000/-

Thus a farmer having on an average 10 acres of holding in this village can earn a potential gross revenue of about Rs. 2 lakhs, with the above kind of diversified cropping pattern.

On the other hand a farmer having 5 acres holding is likely to earn atleast Rs.80,000/- p. annum, in the post diversified situation. (During the course of the sample survey improvements in the standard of living, and improvement in the wealth and asset position of many of the farmers was observed).

Even the small farmers of this villages were found to have practiced intense crop-diversification during the recent twenty years; and this has positively raised their incomes, living standard and property assets.

2.2 Parunda, Vaishnavwadi Villages

The average break-up of the land holdings in this set of villages is as follows (See table A 4.2). The total land area covered is 73 acres; of which only 15 acres only is irrigated i.e. 20% of the total land. About 65% is rain-fed and 11 acres fall under the wasteland category accounting for 15% of the total land. In this set of villages with the given break-up of the proportion of irrigated, unirrigated and wasteland is 20 percent, 64 percent and 15 percent respectively (see table A 4.2). The potential income of the large and small farmer can be estimated as follows (based on the lines of the earlier analysis).

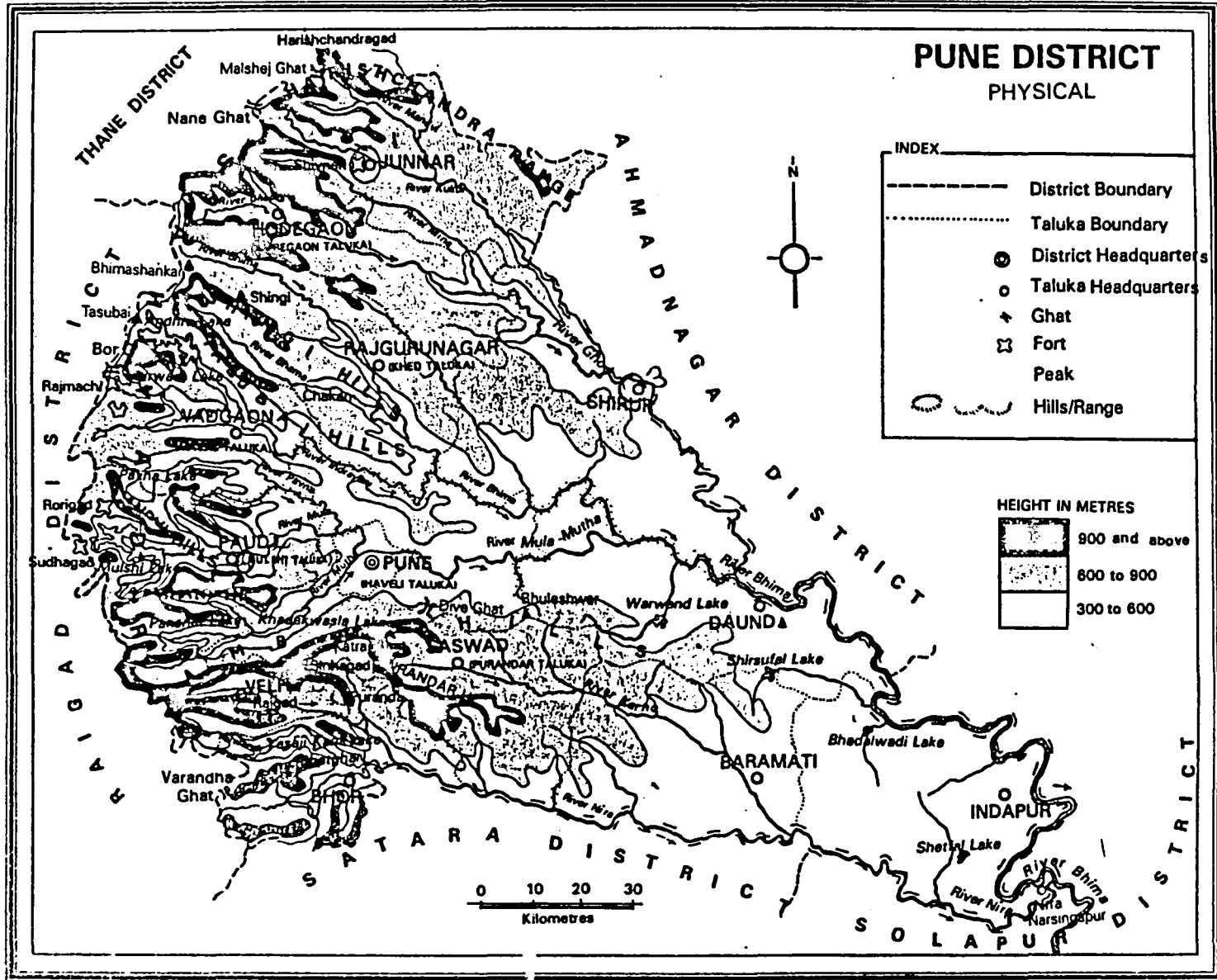
A farmer with 10 acres of land would be able to earn about 30000 from about 2 acres of irrigated land (vegetable crop) 6.5 acres of rainfed land used for food grains, pulses would may yield a revenue of Rs 45000 and 1 acre of wasteland at the minimum may give him atleast Rs 10000 from fruit crops. A gross revenue of about 75000 may be generated with such diversified cropping pattern. A small farmer on the other hand with a similar diversified cropping pattern can earn a gross income of about 35 to 40000 per acre.

Table A 4.2 Size of Holdings and Proportion of Irrigated, Unirrigated and Wasteland (Bori, Parunda, and Vaishnavwadi Villages, Junnar)

I. SIZE DISTRIBUTION OF HOLDINGS (Bori, Parunda and Vaishnavwadi villages combined)	
SIZE OF HOLDINGS (ACRES)	NOS.
0 - 5	17
6 - 10	1
11 - 15	2
16 - 20	2
21 & above	2
TOTAL	24

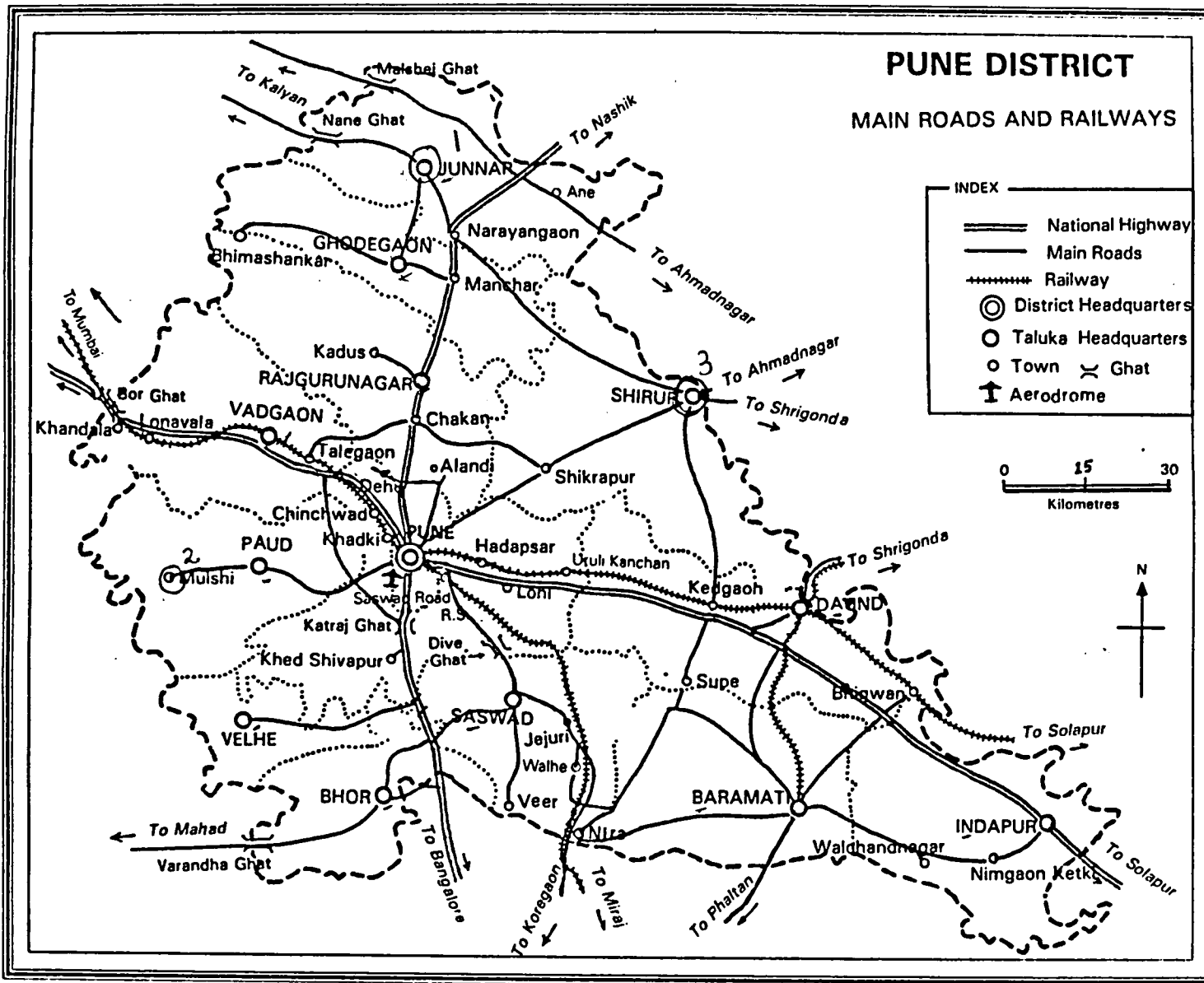
II a. Proportion of irrigated/ unirrigated/ wasteland (Bori-Budruk Village)	II b. Proportion of irrigated/ unirrigated/ wasteland (Parunda Vaishnavwadi Villages)
1. Total acreage (acres) : 133	1. Total acreage (acres) : 73
2a. Irrigated land (acre) : 71	2a. Irrigated land (acre) : 15
b. %age of irrigated land to total area : 53.3%	b. %age of irrigated land to total area : 20.5%
3a. Unirrigated land(acres) : 55	3a. Unirrigated land(acres) : 47
b. %age of unirrigated land to total area : 41.3%	b. %age of unirrigated land to total area : 64.3%
4a. Wasteland area : 7	4a. Wasteland area : 11
b. %age of wasteland to total : 5.3%	b. %age of wasteland to total : 15%

Source : based on table 7.17



1. JUNNAR REGION
2. MUVSHI REGION
3. SHIRUR REGION

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ANNEXURE _ 6 ; INSTRUMENTS USED TO COLLECT DATA
FROM RESPONDENTS FARMERS

यादी २९व्यात पेश्यात पत्रासपत्रा शालेय्य कल्याणतेनाया विकासय्या संदीया क. २०००, २०००, २०००

पत्रासपत्रा

पणे विधा, ज्या डिस्ट्रिक्ट पदवीकरता सादर होणाऱ्या प्रत्येकाचे प्रश्नान्वली

प्रबंध अभ्यासक

प्रा. श्री. सुनवनी परचुरे, सिंजायाय, २०००, २०००

मागेदर्शक प्राध्यापक

डा. अशोक मित्रा, गोखले राज्य कृषिशास्त्र संस्था, २०००

१. मधुडलेल्या खेड्याचे नांव : ता. जि. तला.

२. गंधारकाटे गांव व पत्ता :

ज्य. शिक्षण. कुटुंबातील सर्व व्यक्ती. संस्था

शतीच्या कामात मदत देणार कुटुंबासदस्य किती

३. धनकांच्या जमिनीचे एकूण क्षेत्र

यातून आगाइत क्षेत्र

आगाइत क्षेत्र :

आण पडजमिन :

४. जलसिंचनाची कोणती व्यवस्था आहे ?

कालव्याचे पाणी / उपजलसिंचन / विहीर आगाइत / गावतलाव / अन्य साधने

५. सिंचनाला सहाय्य देणारी कोणती सुविधा आहे ?

अ) बीज पंप व पाइप लाइन क) स्प्रिंकलर इ) अन्य साधने

ग) ड्रिफ्ट इरिगेशन ः) मदती ठियवः सिंचन

६. जमिनीची जात, पेत, रज्जी व गुणवत्ता .

७. कोणता पत्रा पत्रा तुम्हा पेत .

८. जमिनीच्या वर्षापासून काढापवे, घेणे मुरु कोणे .

९. फळ्यागाडतीपूर्वी कोणती पत्रे तुम्हा घेत आता .

आगाताल पत्रे :

रज्जी देगागाताल पत्रे .

१०. सध्या कोणती नगदी पिके तुम्ही नेत आहात :

उद. उस. कापूस, तंबाखू, कांद, भुईभूग, डाळी, फुले, भज्या, इ.

११. फळबागाईतीनंतर सध्याची पिक रचना कोणती आहे ?

पारंपारिक जुनी पिके

नवी सुधरीत पीकरचना

तांदूळ गहू ज्वारी नाचणी कडधान्ये डाळी

१२. पारंपारिक पीकरचनेत बदल करण्यासाठी फळबागाईत करण्याचा निर्णय घेण्याचे कारण कोणते ?

- अ. पण्याची बचत होते
- ब. उपलब्ध पड जमिनीचा सधन / उत्पदक उपबोग
- क. उपलब्ध श्रमाचा जास्तीतजास्त वापर
- ड. जमिनीच्या उत्पदकतेते सुधारण करणे
- इ. तुमच्या स्वतःच्या प्रेरणेने आणि लाभाच्या खात्रीने
- ई. महाराष्ट्र शासनाकडून देअु वेलेल्य भंडवली अनुदानामुळे
- उ. महाराष्ट्र शासनाच्या रोजगार हमी योजनेच्या फळबागाईतीकरता उपलब्ध असलेल्वा विशेष अनुदानामुळे
- ऊ. इतर खजगी संस्थेमार्फत मिळालेल्य आर्थ सहाय्यामुळे
- ए. राज्यच्या कृषि फलोद्यान विभागातर्फे मिळालेल्य विम्हार योजनांचा लाभ
- ऐ. अन्य कोणतेही कारण

१३. फळवागाईत करण्याकरता कोणती व किती गुंतवणूक केली त्याचे तपशील द्या (गुंतवणूक रुपयत द्या)
१. नवी जमीन खरेदी
 २. जमीनीची कस सुधारणे
 ३. चांगली जमीन वाहतुकीने आणून जमीन सुधारणे
 ४. रोपे खरेदी
 ५. शेणखताची खरेदी
 ६. खड्डे घेणे
 ७. खते - फॉस्फेट, रासायनिक खते खरेदी
 ८. काटक नाशक, औषधे खरेदी
 ९. पिकावरील रोगप्रतिबंधक औषधे
 १०. कुंपण किंवा बांध बांधणे
 ११. पाण्याची सोय (टिबक, सिंकलर, पंप इ.)
 १२. कृषि अवजारे व साधने यांची खरेदी
 १३. फलोद्यान बनविण्याकरता आवश्यक असलेली संरचना तयार करणे
 - १४ इतर कोणत्याही प्रकारची गुंतवणूक

१४. फळवागाईतीकरता तुमची एकूण गुंतवणूक किती झाली ? शसकीय / वेगवेगळे

१५. त्या गुंतवणुकीचे तपशीलवार वर्गीकरण द्या

- अ. गुंतवणुकीत उपलब्ध झालेल्या भांडवली अनुदानाचा भाग । टक्केवार;
- ब. इतर कोणत्याही अनुदानाचा प्रतिशत भाग
- क. बँक कर्जाचा हिस्सा
- ड. व्यक्तिगत गुंतवणुकीचा भाग

१६. रोपे, बियांचे कोणते उपलब्ध झाली.

१७. त्या कोणती जाती तुमच्या भागात सुयोग्य वाटल्या ? त्यांच्या किंमता किती होत्या

१८. फळपीकाच्या दुसऱ्या वर्षापासून प्रतिवर्षी होणाऱ्या वैकल्पिक खर्चाचे तपशील द्या. वार्षिक मने संपूर्ण क्षेत्राचा - क्षेत्राचे आकारमान द्या.

१. जमीन तयार करणे

२. नवे खड्डे घेणे

३. काटेरी झाडांचे कुंपण दुरुस्त करणे

४. माती व खत मिश्रणाचे खड्डे करणे

सुपर फॉस्फेट

बी. एच. सी

५. नवी झाडे लावणे

६. खते देणे

७. औषधे फवारणे

८. आंतरमशागत करणे

९. पीकसंरक्षण

१०. पाणी (पाळ्या) देणे

११. झाडे एकाचवेळी लावली काय ? झाडे बांध्यावर लावी की सलग जमीनीच्या सलग क्षेत्रात लावता ? झाडांकरता किती क्षेत्र दिले ?

१०. किती झाडे लावली. त्यातील किती उगली. त्यातील फळे देणारी झाडे किती ?

११. झाडे कोणत्या वर्षी लावली ? कोणत्या वर्षापासून झाडे फळे देऊ लागली ? किती वर्षे झाडांचा फळ मिळत आहेत ?

१२. एका झाडाचे सरासरी फल उत्पादन प्रतिवर्षी किती आहे ?

१३. फळबागाईतीतून सरासरी वार्षिक उत्पन्न किती मिळते ? (बाजारात दलालमार्फत विकून, फळे येण्याच्या पूर्वी झाडे कॅम्पटदराला विकून, सहकारी किंवा सरकारी संस्थेमार्फत विकून किंवा स्वतः बाजारात विकी करून) या पैकी कोणत्या पध्दतीने तुम्ही फळांची विक्री करता ?

२४.

खालील रकाने भरा.



एकूण खर्च

एकूण विक्री उत्पन्न

लाभ / तुट

- १ ले वर्ष
- २ रे वर्ष
- ३ रे वर्ष
- ४ थे वर्ष
- ५ वे वर्ष
- ६ वे वर्ष
- ७ वे वर्ष
- ८ वे वर्ष
- ९ वे वर्ष
- १० वे वर्ष

२५. फलोद्यानाच्या नुतनीकरणकरता आवश्यक असलेला कालखंड देऊन उद्यान उभारणीकरता होणारा दीवळ खर्च किती असतो. उदा. दूध नांडव व नव्याने केलेले दूध उद्यान
२६. फल बागाईती बरोबर दुग्ध व्यवसाय, परंपलन, शेळी प्रकल्प, पेट्टी इ. जोडउत्पन्नांचे व्यवसाय आपण करता काय ? फळबागाईतीचे प्रत्यक्ष व अप्रत्यक्ष लाभ या जोड उद्योगांना उपलब्ध आहेत काय ?
२७. तुमच्या फळांना देशातील तसेच परदेशातील खात्रीच्या बाजारांपेक्षा मिळाल्या आहेत काय ? या बाजारपेठात माल पाठविण्यासाठी कोणत्या मध्यस्थ संस्थांची तुम्हास मदत होते ?
२८. तुमच्या फळांच्या उत्पादाची आवश्यक त्या प्रकिया करून अधिक उत्पन्न मिळवून देणाऱ्या योजना तुमच्या भागात आहेत काय ? त्याचा लाभ तुम्हास मिळतो काय ?
२९. निर्यातीकरता कोणत्या प्रकारच्या उत्पादनांना परदेशी मागणी असते ? गुणवत्तेच्या त्यांच्या अपेक्षा काय असतात ? तुमच्या उत्पादनांचा दर्जा, परदेशी बाजारात मान्य झाला आहे काय ?

३०. प्रतिवर्षी तुमच्या उत्पादनापैकी किती प्रमाणात परदेशी निर्यात होते ? देशातील भाव आणि परदेशा बाजारातील भाव यात फरक किती ?
३१. तुमच्या भागातील सर्वात जास्त विक्रीची उत्पादने किती होते ? तुमचे तितके न होण्याची कारणे कोणता
३२. पारंपारिक पध्दतीने लावलेल्या फळझाडांचे उत्पादन व उत्पन्न तसेच नव्या जाती व नव्या पध्दतीने केलेल्या फळझाडांचे उत्पादन व उत्पन्न यात फरक किती असतो ?
३३. निर्यात केलेल्या उत्पादनाचे सरासरी वार्षिक विक्री उत्पन्न किती असते ?
३४. निर्यात करतांना कोणत्या प्रमुख अडचणी येतात ?
३५. गेल्या दहा वर्षात तुमच्या फलोद्यानाच्या उत्पादनखर्चात एकूण किती टक्याने वाढ झाली ? तसेच त्या अवधीत, तुमच्या विक्री उत्पन्नात (भाव वाढल्यामुळे किंवा अन्य कारणांनी) एकूण किती टक्याने वाढ झाली ?
३६. फळबागाईत करतांना तुम्हाला कोणत्या समस्या गंभीर व अवघड वाटतात ?
- उत्पादनखर्च बेसुमार वाढणे
 - किंमतीची अनिश्चिता
 - मध्यस्थंकडून होणारी फसवणूक व शोषण
 - नफ्याची अनिश्चिता
 - साठयण, शेतगृहे, प्रक्रिया उद्यान
 - वाहतूक
 - सरकारी अनुदाने सहाय्य असंबंधी
 - खते, मजूनी, रोपे यांचे खर्च वाढणे
 - फळबागांना होणारे रोग व उत्पादनहानि किती वेळ.
 - फळबागांचे संरक्षण
 - अन्य कोणतीही.

३७. तुमचे वार्षिक सरासरी प्रतिएकरी फळ उत्पादन किती असते ? गेल्या दहा वर्षातील सरासरी प्रतिकिलो किंमत किती आहे ?
३८. फळबागाईतीबरोबर आंतरमशागत करून तुम्ही आतापावतेतो किती पिके घेतली ? कोणती पिके घेतात त्यांचा खर्च वजा जाता किती निव्वळ फायदा मिळविला ?
३९. फलोद्यानाचे तुमचे उत्पन्न स्थिर व सुनिश्चित झाले आहे काय ? त्याचा कल वाढता आहे की घटता . तुम्हांला महामंगो किंवा महाग्रेफ या साठ्या शिखर संस्थकडून मिळालेला लाभ समाधानकारक वाटतो का . विशेषतः या संस्थकडून नेमका कोणता फायदा तुम्होला मिळला आहे.
४०. फळबागाईतीनंतर तुमच्या एकूण मालमत्तेत नेमकी झालेली वाढ तपशीलाने द्या. तसेच तुमच्या फलोद्याना झालेल्या जमिनीच्या पूर्वीच्या व सध्याच्या बाजारकिंमतीत फरक स्पष्ट करा.
४१. फळबागाईतमुळे तुमचे रोजगार दिवस वाढले का. कामगार वाढले का.
४२. तुमच्या कुटुंबाला पूर्वी लागणारे धान्य व सध्या लागणारे धान्य, वरील धान्य तुमच्या घराचे उत्पादन आहे काय ? किंवा तुम्ही बाजारातून विकत घेता काय ?
४३. तुम्ही फळवागेसाठी सबसिडी घेतल्यावर सरकारी अधिकारी त्याची पाहाणी करण्यासाठी येतात का .

COST-BENEFIT ANALYSIS OF AN AVERAGE FARM-FIRM-
GROWING GRAPES

Q.1. Have much acreage have you allotted for your grape-farm ?

Q.2. Please give the detailed break-up of your Capital
expenditure required for necessary preapration of a
grape farm

Q.3. Give the detailed break-up of your annual recurring
expenditure for each operation of production :-

Weeding,
Prunning,
Crop protection,
Insectides,
Pesticides,
Fertilizers,
Water Doses,
Any other
Total :

- Q.4. How much is the average yield of grapes per acre of your farm ?
- Q.5. Give the present rate of profits per acre of your grape farm.
- Q.6. Give the figures of your various costs prior to 1990 and the yield and the net profit of the year 1990. Compare them with the present cost structure, yield, market price and the rate of profit.
- Q.7. What has been the average price per kilo of grapes receive by you.
- Q.8. What are the main problems and difficulties that you face in grape-growing of export-quality ?
- Q.9. What is your system of Marketing your grapes produced in the domestic market ?
- Q.10. Are you happy with the present position in grape-farming ? If not, what else is in your mind to rediversify and expect a higher income and profit. What are your alternative options ?

- Q.11. What is the labour requirement in a year for grape production - is there a distinct increase in employment of labour ?
- Q.12. What are the prospects of income/profit by adopting alternative options of diversification ?
- Q.13. Have you thought of "Green House" plantation ?
If yes - what are the net advantages of the same in terms of yield, income, cost and profits ?
- Q.14. Please give your comments and observations regarding your experience of growing grapes for export market. Please give your pertinent suggestions for the improvement of the conditions of export quality grape-growers.

ANNEXURE - 7 INSTRUMENT USED TO COLLECT DATA FROM
COOPERATIVE SOCIETIES

Ph.D. Thesis : Topic

Economics of Agricultural Deversification with
special reference to recent horticultural
development in Western Maharashtra.

Researcher - Prof. Mrs. Sunayani Parchure
Ph.D. Registration in
Economics Faculty of
Poona University.

Guide- Dr. Ashok Mitra,
Gokhale Institute,
Pune.

Questionnaire related to Export Marketing of Grapes from
Junnar Region.

1. What is the total tonnage of grapes which is annually exported from Western Maharashtra and its average earning of foreign exchange ?
2. Which are the various sub-regional centres from having leading positions in export marketing of grapes ?
e.g. Nasik, Junnar/Narayangaon, Baramati, Pune, Shrirampur, A'Nagar, Sangli, Tasgaon, Kolhapur etc.
3. What are their approximate shares of the total quantum of annual exports ?
4. What is the share of 'Mahagrapes' in the total volume of exports ?
5. Give the regional centres which have direct channel of marketing abroad and their respective shares in the total volume of exported grapes without dependence on 'Mahagrapes'.
6. What are the reasons why you prefer self-reliance in grape-exports ?
7. What are the main drawback, deficiencies and disadvantages in exporting grapes via medium of 'Mahagrapes' ?

9. How much is the total tonnage of Grape exports of Junnar Region ?
10. Identify old and established as against new and upcoming sub-regional centres which are exporting grapes ?
11. State the number of agriculturists - members of Junior (your) society and Vighnahr Society of Otur.
12. State the total number of containers of grapes that your society has exported during the recent part viz (1986-1996) state the annual export earnings belonging to the same period.
13. Which quality/qualities of grapes your society exports ?
14. Mention the exact period in which progressive farmers in Junnar area started growing grapes. (It must have been after the construction of Manikdoh, Kukadi and several other dams in the area)
15. What is the approximate total acreage under grapes belonging to members of your society ?
16. Has your society built its own cold-storage - If yes - at what capital cost. What is its annual recurring expenditure of running it ?
17. Who is your authorised agent - mediator firm - helping you in export market ?
18. Mention the names of the countries - foreign metro markets- destinations to which your grapes are exported.
19. What is the total expenditure on selecting, grading, packaging, forwarding, loading, unloading, storage, insurance and transporting of your exported grapes ? Give the break-up in percentage shares.

19. What are the commission, charges that you pay annually to your middlemen ?
20. What is the amount of foreign exchange you have to sacrifice, on account of damage, rejection or transit-loss per year ?
21. What is the price of grapes per keg. of grapes that you get in foreign market ?
22. What is the gross cost of one kilo of exported grapes ?
23. How much surplus the society gets per Kg. of grape ?
24. How much is the net price that the society pays to its members ?
25. State the various schemes and supports of your society of extension services, as well, as, financial advance-payments off the season and during the fruit bearing season, to the member-farmers.
26. State fully the trends in the cost-pattern and the international market prices for over last 10 years.
27. If the costs are continuously increasing and prices remaining constant, the member farmers must be facing with the problem of declining trend of profits. To what extent, is this true ? Compare net profits per acre of grape farming for over a decade.
28. During last three-four years, do you find a tendency of considerable reductions in the acreage under grapes and consequent decline in the annual production of grapes done by your members ?
29. Have you noted atleast slow/marginal disinterest in grape-growing or diversification from grapes to some other profitable lines ?

30. What are the main problems that your society in particular and the exporters at large, in Maharashtra have been facing in recent time ?

31. Give your general comments and observations regarding the prospects of grape-exporting in the context of present trends of production, profit rate, international competition, the rigidity of prices in foreign markets - the standards that the importers expect etc. etc.

32. Please supply copies of annual reports of your society.

33. Give your suggestions to improve the conditions of the grape-exporters in Maharashtra.

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BIBLIOGRAPHY AND REFERENCES

Advani A.J. (1995)., *Developing Horticultural Business - Could We Join The Winners. Market Overview And Country Case Studies On Selected Horticulture Products* Agricultural Communication And Enterprise Program ACE, Bombay, India March 2-3-95.

Agarwal A.N., Varma H.O Varma, Gupta R.C. (1995)., *India Information Yearbook*.

Alagh Y.K. (1994) "Macroeconomic policies for Indian agriculture." in Bhalla ed.. (1994).

APEDA (1993)., *Export Statistics For Agro and Food Products*. APEDA.

Arora V.P.S And Tewari Kanchan (1994)., "Trade Experience Of Indian Agriculture-Composition, Performance And Growth". *Indian Journal Of Agricultural Economics* July-September No3. Volume Xlix.

Asian Productivity Organisation (1985)., *Economics Of Fruit Production And Consumption*. APO: Tokyo.

Asian Productivity Organisation (1985)., *Fruit Production And Marketing In Asia And The Pacific*. APO: Tokyo.

Asian Productivity Organisation (1988) *Agricultural Trade Policy in Asia*. APO, Tokyo.

Asian Productivity Organisation (1990) *Agricultural Diversification: report of a study meeting (1989)* APO, Tokyo.

Asian Productivity Organisation (1991) *Agricultural Trade Policy in India*. APO, Tokyo.

Asian Productivity Organisation (1993) *Agriculture diversification in monsoon areas. Report of the APO study meeting 18-23 Jan 1993*. Tokyo, Japan.

Aziz Sartaj.(1990)., *Agricultural Policies For 1990's* Center for Development Studies. OECD: Paris.

Bansil PC (1992), *Agriculture Statistical Compendium Vol. I & Vol. II*., Techno-Economic Research Institute, New Delhi.

Basu DN (1975) *Demand and consumption directions A long range perspective for India. Consumption pattern and life style 2000 AD* Operation Research group. Baroda.

Bhalla G.S. (Edited) (1994)., *Economic Liberalisation And Indian Agriculture*. Institute For Studies In Industrial Development: New Delhi.

Bhatia M.S. (1994) "Agricultural pricing, marketing, and international trade under new economic environment" *Indian Journal Of Agricultural Economics* July-September 1994 No 3 Vol XLIX Indian Society of Agriculture Research. Bombay.

Brian Hunter ed. (1997-98) *Statesman Year Book*, 134th edition. Macmillan Press Ltd. London.

Brown Lester Et.al. (1994), *State Of The World "Facing Food Insecurity.* A World Watch Institute Report On Program Towards A Sustainable Society.

Butler J.B. (1949)., *Economics Of Fruit Farming in Costs Of Orchard Establishment*, Report Of WYE College, London No. 1.

Center for Development Studies Pune (1995-96) Unpublished data on exports of mangoes and grapes. CDS Pune.

Chadha K.L. Pareek O.P. (1990) "Fruit Production, research and development in India". In Singh RB (1990).

Chand Ramesh (1996)., "Agricultural Diversification And Small Farm Development In Western Himalayan Region". In T. Haque ed. (1996).

Chambers Robert, Pacey Arnold, Lori Ann Thrupp (Ed.) (1989)., *'Farmers First'* Intermediate Technology Publication.

Chandok H.L. and the Policy group. (1990) *India Data base - The Economy. Annual time series data. Vol. I and II.* New Delhi.

Chaudhary Primit (1972)., *Readings In Indian Agricultural Development.*, George Allen And Unwin Ltd., London.

Cheema G.S And Dani PC (1928)., *Economic Value Of Fruit Farming In Western India.* Department Of Agriculture, Bombay, Bulletin No 153

CMIE (1992). *Basics Statistics relating to the Indian economy* Centre for Monitoring Indian Economy, Mumbai.

CMIE (1997). *Approach paper to the Ninth Five Year Plan (1997-2002)* Planning Commission reprint document, Centre for Monitoring Indian Economy, Mumbai.

CMIE (1997). *Monthly review of the Indian Economy* Centre for Monitoring Indian Economy, Mumbai.

Commissioner Agriculture: Maharashtra state (1997), *Maharashtra Agriculture scaling new horizons.* Pune.

Dantwala M.L (1991)., "Strategy Of Agricultural Development Since Independence" in *Indian Agricultural Development Since Independence: Selection Of Essays.* Oxford And IBH Publishing House, Pvt. Ltd. Bombay.

Dastane S.R. (1995), *Maharashtra Dastane Ramchandra* and co: Pune.

Dept of Agriculture & Cooperation, (1992) *Indian Agriculture in Brief 24th edition* Ministry of agriculture: New Delhi.

Dept of Agriculture and Cooperation (1993) *Agricultural situation in India* Oct Vol.. XLVIII No 5. Ministry of agriculture: New Delhi.

Dept. of Horticulture Pune (1994-95) Unpublished data and records of beneficiaries of the Capital Subsidy Scheme in Pune district. Dept. of horticulture Pune

Dev M.S. and Mungekar B.L. (1996)., "Maharashtra's agricultural development. A blue print". *Economic and political weekly* March 30.

Devgiri DV, Urmani NK, Tupe B.P. (1993) "Prospects and problems of horticultural development some experiences" in LL Somani, ed. (1993) *Recent advances in Dry land agriculture* part 2. Scientific publishers: Jodhpur.

Directorate of information and public relations (1990-1994) Rojgar Hami Yojanatoon Pholotpadan Vikasachi Mahatwakankshi yojana. Government of Maharashtra. Mumbai.

Dhawan K.C. Singh B, PriharRs, BrarSS, Arora B.S. (1996) Diversification of Indian Agriculture Vis-à-vis food security. *Indian Journal of Agricultural Economics. Conference Nos Oct-Dec 1996. Vol. 51, No 4.*

Economic Times (1996)., 6th September. Times Of India, Bombay.

Europa Publication Ltd., (1995), *The Europa World Year Book. Vol. I & Vol. II*, Europa Publication Ltd., London.

Express Investment Week (1995)., *Food Processing-Fascinating Future.* Volume 5. Issue No 33, August.

Food and Agricultural Organisation (1992). *Production Year Book* FAO: Rome.

Food and Agricultural Organisation (1994)., *Commodity Review And Outlook 1993-94.* Economic And Social Development Series No 52 Issue No 071-1002. FAO: Rome.

Gadam S.N. (1992), *Evaluation study of grape cultivation scheme in Nasik district (Maharashtra).* GIPE mimograph series No 34. Gokhale Institute of Politics and Economics, Pune.

Gadgil DR (1968) "Planning for agricultural development in India" *Readings in agricultural development* ed AM Khusro; Allied Publishers Pvt. Ltd Calcutta.

Gadre N.A, Ingle A.A, Wahile D.P (1994)., "Indian's Trade In Fruits And Vegetables-Scope For Steady Exports". *Indian Journal Of Agricultural Economics* July-September.

Gill K.S. (1993) *Agricultural situation in India* "Indian Agriculture in the new environment" Challenges and Opportunities Vol. XLVIII No. 5.

Government of India (1990-95) *8th 5 year plan Horticulture and plantation crops* Report of the working group constituted by the planning commission Yojna Bhavan. New Delhi.

Government Of India (1992-97)., *Eighth Five Year Plan 1992-97, Vol. I. & II.* Planning Commission: New Delhi.

Government Of India (1997-2002) *Approach paper to the Ninth 5 year plan*, planning commission. New Delhi.

Government Of India (1993)., *India 1993, (Reference Annual)*, Ministry Of Information And Broadcasting: New Delhi.

Government Of India (1994-95), *Economic Survey* Ministry Of Finance, Economic Division: New Delhi.

Government Of India (1995-96), *Economic Survey* Ministry Of Finance, Economic Division: New Delhi.

Government Of India (1996-97), *Economic Survey* Ministry Of Finance, Economic Division: New Delhi.

Government of Maharashtra (1992-97) *Eighth 5 year plan. Maharashtra state part I* Planning Dept.: Bombay.

Government of Maharashtra (1994-95) *Economic Survey Of Maharashtra.* Directorate of Economics and statistics, Planning Department, Bombay.

Government of Maharashtra (1995-96) *Economic Survey Of Maharashtra.* Directorate of Economics and statistics planning Department, Bombay.

Government of Maharashtra, (1996-97), *Economic Survey* Directorate of Economics & Statistics, Planning Department, Mumbai.

Government of Maharashtra, Horticulture & social Forestry dept. (1982), *The Capital Subsidy Scheme.* Dated 16th July 1982. Resolution No HRT 22027. Bombay 400 032..

Government of Maharashtra, Horticulture & social forestry dept (1986), *The Capital Subsidy Scheme* Resolution No. HRT/ 2786/85 Dt. 27.10.86. Bombay.

Government of Maharashtra, Horticulture & social forestry dept. (1982-1983) *Horticultural Production Plan*, 28th April 1982. No. 22014, Mantralaya, Bombay.

Gulati Ashok, (1993)., "Agricultural Policy In Light Of New Trade And Industrial Policies". *Indian Journal Of Agricultural Economics*, January.

Gulati Ashok, et.al. (1994). *Export Competitiveness Of Selected Agricultural Commodities*. A study sponsored by APEDA, New Delhi.

Haque T. (1996) '*Diversification Of Small Farms In India, Problems And Prospects*.' National Centre For Agricultural Economics And Policy Research, New Delhi.

Hindu The (1995), *The Hindu Survey of Indian Agriculture*. Hindu Group: Chennai.

Horticultural Development Programme (1992) *EGS linked horticultural development program. A study*. Yeshwant Rao Chavan academy of development administration. YASHADA: Pune.

Indian Journal of Agricultural Economics (1996) *Conference Volume Vol 5; NO 4, Oct-Dec 1996*. Indian Society of Agricultural Economics, Mumbai.

International Conference On Horticulture Development (1995)., *Horticulture Development Sharing Experiences With Winners. Market Overview And Country Case Studies On Selected Horticulture Products*, Agricultural Communication And Enterprise Program Ace Bombay, India March 2-3-95.

International Monetary Fund, (1997) *Direction of Trade Statistics Year Book IMF*, Washington DC. USA.

Jaffee Stephen And Gordon Peter. (1993)., *Exporting High Value Food Commodities*. World Bank Discussion Papers. World Bank: Washington D.C..

Kaul G.L. (1995) "Development of horticultural strategies and Approaches of the 8th plan," In NHB Technical Communications (1995a).

Khusro A.M. .(Ed.) (1968)., *Readings In Agricultural Development*, Allied Publishers Pvt. Ltd: Calcutta.

Kirit Parikh Narayana NSS, Panda Manoj, Ganesh Kumar (1995) "Review of Agriculture strategies for agricultural liberalisation" *Economic & political weekly* Volume XXX No 39 Sept 30.

Kumar P. and Mathur VC (1996) Structural Changes In Demand For Food In India. *Indian Journal of Agricultural Economics* Vol 5; NO 4, Oct-Dec 1996.

Kumar Praduman (1996)., "Structural Change Is Consumption And Small Farm Diversification". In T. Haque ed. (1996).

Maji. CC & K.M.B. Rahim, (1996). "An Investigation Into Small Farm Diversification, Some Case Studies In West Bengal". In T. Haque ed. (1996).

Malathi Ashok and Bhide Shashank (1995) 'What do the reforms have for agriculture,' *Economic And Political Weekly* Volume XXX Nos 18-19 May 6-13.

Maria R Saleth. (1996)., "Diversification As A Strategy For Small Farm Development Some Evidence From Tamil Nadu" In T. Haque ed. (1996).

Marie J. M. (1994)., *Agricultural Diversification In A Small Economy- The Case For Dominica*, Institute Of Social And Economic Research, Eastern Caribbean Occasional Paper No 10.

Meier G.M. (1984) *Leading issues in Economic Development 9th edition*. Oxford University Press: London.

Mellor John (1973) "Accelerated growth in Agricultural Production and Intersectoral transfer of resources." *Economic Development & cultural change*.

Mellor, John W. (1988)., *Agricultural Development In The Third World- The Food Development, Foreign Assistance, Trade Nexus*. International Food Policy Research Institute, World Food Corporation, Belgium.

Ministry Of Agriculture (1992)., *Indian Agriculture In Brief 24th Edition*. Directorate Of Economics And Statistics Department Of Agriculture And Co-Operation, New Delhi.

Ministry of commerce (1980), *Committee on Export Strategy* GOI, New Delhi.

Ministry of Information and Broadcasting (1993) . *India Reference Manual* GOI, New Delhi.

Mokshapathy (1988) *Handbook of complete statistics on processed fruits and vegetables exported from India during 1977-85*. CFTRI offset press Mysore, Karnataka.

Mukherjee Pranab (1994) *Inaugural Address* in Bhalla ed. (1994).

National Bank for Agricultural Reconstruction and Development, (1984) Circular number NB, EAPD, 1950, SFO 3 484/85 dated 3 July 1984. NABARD: Pune.

National Bank for Agricultural Reconstruction and Development, (1992) Circular number NB, DPD, FS 23/92-93. dated 24 June 1992. NABARD: Pune.

National Bank for Agricultural Reconstruction and Development, (1993) *Grape Gardens In Nasik District*, Evaluation Study Series No. 4 NABARD: Pune R.O.

National Horticultural Board (1992-93), *Horticultural Data Base* NHB Gurgaon.

National Horticultural Board (1993-94), *Horticultural Data Base* NHB Gurgaon.

National Horticultural Board ,(1994-95),*Horticultural Data Base* NHB Gurgaon.

National Horticultural Board (1994). *Monthly Bulletin*, Horticulture Information Services. Volume VI/123/7/94. Gurgaon.

National Horticultural Board Technical Communications (1995a). *Post Harvest Management of Horticultural produce*. NHB, Gurgaon.

National Horticultural Board (1995b)., *Emerging Trends In Temperate Fruit Production In India*. National Horticulture Board Technical Communication. Government Of India, Gurgaon.

Nayyar Deepak And Sen Abhijit. (1994), "International Trade And Agricultural Sector In India." in Bhalla ed. (1994).

Nurul Islam (1990)., *Horticultural Exports Of Developing Countries Past Performance, Future Prospects And Policy Issues*. International Food Policy Research Institution Research Report 80, Washington D.C., USA.

Pandey R.M. (1993). "Horticulture prospects in the new environment" *Agricultural situation in India* October 1993, Vol XLVIII No. 7. Department of Agriculture and Cooperation-Ministry of Agriculture.

Pandey VK and Sharma KC (1996) Crop Diversification & Self Sufficiency Is Foodgrains. *Indian Journal of Agricultural Economics* Vol 5; NO 4, Oct-Dec 1996.

Patnaik Gokul (1995)., "Growing Opportunities in Horticulture". *Market Overview And Country Case Studies On Selected Horticulture Products*, Agricultural Communication And Enterprise Program Ace, Bombay, India March 2-3-95.

Pearce David (1994)., *Dictionary Of Modern Economics* General Edition.

Petit Michael and Shauki Barghouiti (1992)., World Bank Technical Papers No 180. *Diversification Challenges And Opportunities in Shauki Barghouiti*. et.al (1992).

Prasad K.N. (1994)., *Four Decades Of Indian Agriculture, Volume I*, Manas Publication: New Delhi.

Ramachandran G. (1988)., *Agricultural Trade Policy In Asia*, Asian Productivity Organisation: Tokyo

Rana R.S. (1985)., *India, Fruit Production And Marketing In Asia And The Pacific*, Asian Productivity Organisation: Tokyo.

Randhwa Narendra(1994) *Liberalisation and implications for agricultural policy: an over view* in Bhalla ed. (1994).

Rao M. Manibhushan (1991)., *A Textbook Of Horticulture*. Center For Advanced Study In Botany: Madras. Macmillan India Ltd, New Delhi.

Rao U.M. (1995)., "Beyond Surpluses Food Security In Changing Context". *Economic And Political Weekly XXX No. 4, January*.

Rudra Ashok (1972)., "Relative Rates Of Growth Of Agriculture And Industry" in Primit Chaudhary, ed. (1972).

Sable Ram (1994)., *Commercialisation Of Agriculture In Maharashtra*, Vishwakarma Publication, Bombay.

Samar K. Datta (1996)., *Sustainability Of Small Producer Unit Through Co-Operatives. Lessons From Several Case Studies*. In Haque T. ed. (1996).

Sargent E.D. and Rogers ST. (1970) The Economics prospects for horticulture. Agricultural adjustment unit symposium.

Sarma J.S. and Gandhi V.P. (1990), "Production and Consumption of foodgrains in India. Implications of accelerated economic growth and poverty alleviation." *Research report 81, July 1990*. International food policy research institute.

Satyasai KJS & Viswanathan K.U (1996) Diversification in India agriculture and Food Security. *Indian Journal of Agricultural Economics* Vol 5; NO 4, Oct-Dec 1996.

Sawant S.D. and C.V.A. Chuttan (1995)., "Agricultural growth across crops and regions - Emerging trends and pattern" *Economic And Political Weekly XXX No. 12, March*.

Shah. D. and Mitra. A.K. (1997) *Agricultural Exports Of India (With Special Reference To Non Traditional Commodities) Future Prospects And Policy Issue*, June 1997. Agro economic research centre. Gokhale Institute of Politics and Economics, Pune.

Shauki Barghouti. et.al (1992). *Trends in agricultural diversification-regional perspectives*. World Bank Technical Papers No. 180.

Shiro Kabe (1994)., *Development Of Alternate Crops And Cropping System In Asia*. Direction Of The Agricultural Diversification-Basic Requirements For Production Diversification.

Shukla Tara Ed. (1969)., *Economics Of Underdeveloped Agriculture*. Vora And Company Publishing, Pvt. Ltd. Bombay.

Singh Ajit (Edited) (1994)., *Export Of Agricultural Commodities 2000 A.D. A Perspective*. Wiley Eastern Limited: New Delhi.

Singh R.B. (1990)., *Fruit Production In The Asia And Pacific Region*. FAO Regional Office: Thailand.

Singh R.P. (1996)., "Farm Level Diversification In Dry Land Regions Of India". In T. Haque ed. (1996).

Singh S.P (1992)., *Fruit Crops For Wasteland*. Scientific Publishers, Jodhpur.

Singhal Vikas (1995) *Handbook of Indian Agriculture*. Vikas Publishing house, New Delhi.

Subramanyam K.V. And M. Sudha (1996)., "Diversification Of Small Farms Through Horticultural Crops". In T. Haque ed. (1996).

Sudha M., YVR Reddy, CKR Shetty (1993)., "*Economic Evaluation Of Dryland Agriculture Part (2)*" L. L. Somani Scientific Publishers, Jodhpur.

Schultz T.W.(1953)., *The Economic Organisation of Agriculture* McGraw Hill: New York.

Tata Services Ltd. (1994-95). *Statistical Outline Of India* Bombay House: Bombay.

Tata Services Ltd. (1995-96). *Statistical Outline Of India* Bombay House: Bombay.

Tata services Ltd., (1996-97) *Statistical outline of India*, Bombay House, Bombay.

Tikekar S.N. And Raskar B.S. (1994)., "Export Potential Of Grapes". *Indian Journal Of Agricultural Economics* July-September. No3.

Todaro Michael P. (1995)., "Current Issues In Economic Development". in *Reflections In Economic Development, Selected Essays Of Michael P. Todaro*, Edwards Elgar Publishing Ltd.: New York.

Trimmer C. Peter (1990) "Agricultural diversification in Asia, Lessons from 1980s issues for 1990's" in Shawki, Barghouti, Lisa G., Dina U. ed. *Trends in agriculture diversification. Regional perspectives* World Bank Technical Paper No 180 Washington DC.

Trimmer Peter (1993)., "The Agricultural Transformation". In *Handbook Of Development Economics Volume I*. Edited Hollis Chenery and T. N. Srinivasan. North Holland, Amsterdam.

UNCTAD/GATT (1995) Market News Service MNS (1995) *Fresh Fruits and Vegetables*, Middle East No 15/1995.

Uppal DK, and Abbas HK. Ed. (1992-93) *Horticultural Database* National Horticultural Board, Ministry Of Agriculture, NHB Gurgaon.

Vadamalai media *Agriculture-Industry Survey* (1991) Vadamalai media Ltd. editorial consultant V. I Suarmurti. Coimbatore.

Vadamalai Media (1992) *Agriculture Industry Survey* Vadamalai Media Ltd., Coimbatore.

Vadamalai media *Agriculture-Industry Survey* (1994) Vadamalai media Ltd. editorial consultant V. I Suarnurti. Coimbatore.

Vadmalai Media (1994), *Agricultural Research Year Book, A Supplement Of Agriculture Industry Survey*, Vadmalai Media Pvt. Ltd.: Coimbatore.

Yardarajan S. And S. Elangovan (1996)., "Scope For Commercialisation Of Smal Farm Agriculture". In T. Haque ed. (1996).

Yighnahr and Abinav grape growers societies (1995-96) Unpublished data. Junar, Narayangaon Pune.

Viva Techcom Consultants, Private Limited (1992)., '*A Survey And Study To Asses Benefits And Spread Effect Of The Micro Watershed Management And Horticultural Demonstration' Project At Kahwale, Taluka Karad District Satara (Maharashtra)*. Kalyani Gorakshan Trust, Karad.

Vyas A.K.(1994)., *An Introduction To Agriculture*. Printwell Jaipur.

Vyas VS (1996) *Diversification in Agriculture, Concept, Rationale and Approches*. . *Indian Journal of Agricultural Economics* Vol 5; NO 4, Oct-Dec 1996.

Weathen John ed. (1993) *Encyclopaedia of Horticulture. Volume III*. Discery Publishing House New Delhi.

Wilson G.W (1971)., *Distribution Costs And Efficiency For Fresh Fruits And Vegetables*. Agricultural Research Unit X9 (J37) 510k46 937cc N7.

World Bank Staff Working Papers No 500 (1981)., *India-Demand And Supply Prospects For Agriculture*. October. World Bank: Washington D.C..

World Bank Staff Working Papers No. 596 (1983)., *Prospects For Food Production And Consumption In Developing Countries*. World Bank: Washington D.C