Economics of Horticultural Crops in Semi-Arid Tropics of India

By:

Sushma Arya

Institute of Social Studies , Hyderabad-500029(AP)

ACKNOWLEDGEMENT

The study entitled, Economics of Horticultural Crops in Semi-Arid Tropics of India was sponsored by Indian Council of Agricultural Research (ICAR). The study provides a critical account of the situation of Horticultural Crops in India, particularly in Semi - Arid Tropics. It specifically analyses the economics of Horticultural Crops vis a vis cereal and other crops.

I am extremely thankful to ICAR and particularly to Dr. Murthayanja, ADG, ESM, ICAR for his support and encouragement.

I am thankful to the members of the research team including Ms T. Prabha, Md. Riyaz, Ms Saloni, Ms Sumenlata, Mr. S.L.N.T. Sriniwas and Dr. Adarsh Bala who have helped throughout the course of the study.

Sushma Arya

Principal Investigator

CONTENTS

List of Tables:

List of Figures:

Economics of Horticultural Crops in Semi-Arid Tropics of India

CHAPTER -1

INTRODUCTION

Horticulture contributes very significantly to the economic and ecological development, employment generation, exports and meets the nutritional requirements of the people. Being endowed with a wide variety of agro-climatic conditions, India enjoys an enviable position in the horticultural map of the world. Though horticultural crops occupy only 6.7 per cent of gross cropped area of the country, this sector contributes 18.0 per cent of gross value of agricultural output and 52.0 per cent of export earnings from agriculture.

The total production of fruits is estimated to be 32.07 million tones from an area of 3.29 million ha. The present share is more than 7.5% of the total worlds fruit production. The country now ranks as the largest producer of fruits. About 65% of the world's mangoes and 11% of world's banana is produced in the country. Vegetables occupy 6.23 million ha with a production of 66.58 million tones. India, is again the largest producer of vegetables. However, India's per capita consumption of vegetables is only 130g/day as against the requirement of 280 g/day. As such, there is an imperative need for increasing the production and productivity of vegetables. But inspite of its

prominent position in the socio-economic ecological and nutritional scene of our nation, the progress of horticulture sector is not commensurate with the actual potential. In fact, India's horticultural progress is yet to come to its full bloom.

In view of low net returns from the cultivation of traditional cereal crops, it is often suggested that diversification in favour of horticultural crops is essential for increasing the income of farmers. This is particularly important for dry, backward regions which failed to reap the benefits of green revolution. In the wake of economic liberalization, the production as well as exports of horticultural crops have significantly increased. However, there seem to be large untapped potentials for further growth of horticultural crops, although such expansion would depend on the relative economics of various crops.

India, produces nearly 33 million tones of fruits and 71 million tones of vegetables per year (NHB, 1992-93). The value of exports of fresh fruits and vegetables increased from Rs. 180 crores in 1990-91 to Rs.4.56 crores in 1994-95. A recent study by IFPRI (1990) shows that there is tremendous potential for expanding exports of fruits and vegetables by India because of comparative advantage in labour intensive, horticultural products. Given appropriate infrastructural, technological and [policy support, fruits and vegetables could add substantially to small farmers income and employment opportunities.

Review of past studies

The past literature throw some light on the costs and returns in the cultivation of fruits and vegetables. M Sudha and Y V R.reddy (1988) analysed the economics of sweet orange cultivation, based on data collected from Cuddapah district of Andhra Pradesh. The samples comprised of 21 farmers having 2.1 hectares of land each as of 1985-86. Sweet orange comes to fruiting in 4 to 5 years after planting. It was observed that the gross returns in first harvest on an average are between Rs.2053 and Rs.3786 per hectare. The gross returns showed a steady increase from Rs.9206 per hectare in 5^{th} year to Rs. 13043 in 15^{th} year. A study by Palani Swami and Rajagoplan (1978) assessed the cost of production of chillies for small, medium and large farm groups as Rs 612.4, Rs 1571.6 and Rs 535.5 respectively with an average of Rs 555.6 for the sample as a whole. The percentage of wages to expenditure varied inversely with he farm size. The imputed value of family labour showed a similar negative relationship. Mathur (1966) estimated the cost of production of tomato, brinjal, lady's finger, cabbage and cluster beans was Rs 506.9, 594.2, 520.9, 600.8 and 523.1 respectively. This study further pointed out that human labour in general, accounted for the highest share of the total costs. The author also concluded that in the case of brinjal and cabbage the total cost spent on human labour varied inversely with the size of the farm whereas in the case of lady's finger and cluster beans the cost incurred on human labour indicated a direct relationship with farm size.

In another study on Economics of Horticulture crops versus Annual crops on dryland in Andhra Pradesh, Reddy and Sudha (1987) observed that in Telengana region, the profitability of orchards is higher than that of the arable crops. Sudha and Reddy (1992) collected data from 36 orchard located within a radius of 30 km from national highway . Villages adjacent to Faruka Nagar mandal in district Mahboobnagar of Andhra Pradesh. They studied the mode of harvesting and modes of marketing. The net returns were high in selling the produce in the market since in selling at farm a pre-harvest contract is fixed on the previous years price pattern or arbitration. The study by Ramesh Chand (1995) in the context of Western Himalayan Region revealed that agricultural diversification through vegetable crops had a huge potential for employment and income generation. Vegetable cultivation was beneficial for small and marginal farmers, because, it is more labour intensive and tends to use the family labour more intensively. Similarly, a number of other studies show that cultivation of fruit and vegetable crops hold lot of potentials for improving the income of farmers. However, the fact remains that despite such economic advantages, farmers in most regions are not able to switch over to horticultural crops due to variety of reasons. In fact, there are general location specific constraints to the cultivation of horticultural crops. In many cases, the relative advantages of horticultural crops become illusory, as lack of markets, roads, transportation, credit and technology and even long gestation periods stand in the way of their adoption. The past literature, particularly in the context of arid and semi-arid regions do not throw adequate light on various economic

aspects of horticultural crops. Hence the present study was taken up for a comprehensive analysis or not only the relative profitability but also the constraints to the cultivation of horticultural crops. Subramanyam (1989) workwd out the economics of horticulture crops in South India. He reported that he average cost of cultivation of chrysenthenum was found Rs 21,500/ha showing high capital intensive nature of crop. About 50% of the cost was on labour revealing the labour intensiveness to the crop. The returns varied from Rs 24,430 to 52.982 depending on the marketing channel. Singh (1982) used break-even analysis to find out the profitability of vegetable farming around Hyderabad. He found that the given product price of vegetable farming were highly profitable and observed an intense relationship between the size of the farm and total human labour requirement per hectare. The analysis revealed that the break-even output was less than the average output indicating profit in vegetable farming.

The major objectives of the study are as follows:

OBJECTIVES

In view or low net returns and income from the cultivation or traditional cereal crops, it is often suggested that diversification in favour of horticulture, sericulture etc. would hold promise for the future. The eighth five year plan specifically mentions about the need for such diversification for sustainable

agricultural development. This assumes significance, particularly for dry, albeit backward regions which failed to reap the benefits of wheat/rice based green revolution. However, it is necessary that the economic potentials of such diversification are properly analysed. The main objectives of this study would be as follow:

1. To examine the recent trends and patterns of agricultural diversification in favour of horticultural crops and the major constraints in growth in the semi-arid tropical regions of Andhra Pradesh and Maharashtra.

2. To analyse the relative economics (including profitability, employment generation etc.) of horticultural crops vis a vis other cereal crops in the selected regions.

3. To examine the technological feasibility and economic viability of horticultural crops and their likely impact on the rural poor of the selected regions.

METHODOLOGY:

The study is based on both secondary and primary data. The available time series data of area production and yields of horticultural crops in the semi-arid districts of Andhra Pradesh and Maharashtra were collected and analysed.

Besides, a primary level survey was conducted in two selected districts of Andhra Pradesh and Maharashtra, namely Chittoor and Nalgonda in Andhra Pradesh and Nagpur and Pune in Maharashtra. The main criteria for the selection of sample districts were the semi-arid characteristics of the area as well as the percentage share of the district (s) in the total area under fruits in the state. Further, the villages were selected in consultation with the local officials. For the purpose of detailed primary level survey, a questionnaire schedule was prepared and canvassed among 120 farmers growing both traditional cereal and horticultural crops, 60 farmers from each state. Both tabular and regression analysis techniques were used to arrive at the results.

Agro-economic characterization of selected Districts:

Chittoor: The district of Chittoor which lie in the Rayalseema region has a relatively high level of land productivity. The average productivity per hectare per hectare of land is Rs.9963 (as on 1992). The average annual rainfall is 713 mm and the irrigated area accounts for only 36 per cent of the total area. The average size of holding as per the 1990-91 agricultural census was 1.4 hectare. The density of population per sq. km. was 215. Groundnut, Rice, Sugarcane, Ragi, Jowar, Arhar and Bajra are the main crops grown. Among fruit crops, Mango, Citrus and Banana are the main crops covering about 22 thousand hectares of land. Among vegetables, potato and onion are the important crops. The average consumption of chemical fertilisers is 81 Kg per hectare.

Nalgonda: The district of Nalgonda ranks in the Telengana region of Andhra Pradesh. It has a relatively low productivity low rainfall and low irrigation. The average productivity of land was Rs.4664 per hectare. The annual rainfall was 697 MM and the gross irrigated area accounted for only 30 per cent of the total cropped area. The average size of land however was comparatively higher at 2.4 hectare. The density of population was 341 per sq.km. Rice, Castor, Jowar, Bajra, Groundnut, Arhar, Chillies and Onion are the main crops grown. Among fruit crops, Mango and Citrus are the main crops grown. These two horticultural crops account for nearly 8 thousand hectares of land.

Nagpur: The district of Nagpur has relatively low productivity of land. The average productivity of land was Rs.2405 per hectare. The average annual rainfall was 1194 cm and the proportion of gross irrigated area was as low as 12 percent. The average size of holding was 3.2 hectare. The cropping patterns comprise mainly of Jowar, Cotton, Wheat, Arhar, Soybean, Rice, Groundnut and Gram. The district is also well known for Citrus fruit which covers nearly 14 thousand hectares of land.

Pune: The district of Pune has relatively low productivity, low rainfall, and low level of irrigation. The average productivity of land was Rs.3535 per hectare. The average annual normal was 703 mm and the proportion of irrigated areas was as low as 20 percent. The average size of holding was 2.7

hectare. The main crops grown in the district include Jowar, Bajra, Rice, Groundnut, Wheat, safflower, Gram, Sugar Cane, Onion, Chillies and Garlic. Among fruit crops, mango, banana, grapes and pomegranate and Citrus are important.

CHAPTER - 2

TRENDS AND PATTERNS OF HORTICULTURAL CROPS IN ANDHRA PRADESH AND MAHARASHTRA.

Andhra Pradesh

The state of Andhra Pradesh is the largest producer of fruits in the country. The latest available data for the year 1993 shows that the total production of fruits in the state was 476642 metric tones which accounted for nearly 14.5 per cent of the total fruit production in the country. The area under fruits was 338512 hectares, with percent share of 10.6. The total production of vegetables was 1368068 metric tones and the area under vegetables was 148519 hectares. The area and production of flowers were 4886 hectare and 24360 metric tones respectively.

The major fruit crops grown in the state are banana, citrus, mango, grapes, guava, custard apple, coconut cashew, papaya and sapota. The major vegetables grown are tomato, onion, brinjal, tapioca, okra, beans and cucumber. Among flowers, rose, chrysemtnenum and orchids are important.

It may be seen from Table-1 that among semi arid districts of Rayalseema and Telengana Region, Chittor, Cuddapeh, Anantpur and Khamman are the major

fruit growing districts. Overtime, the percentage share of all these districts in the total area under fruits in the state increased, and that of the coastal region declined. However, the coastal region continue to share the major area under fruits, i.e. almost 62 percent. Table-2 further shows that the proportion of area under fruit crops increased in all the above mentioned districts. In both Chittor and Cuddapeh , it accounted for nearly 5.4 percent of the total cropped area, which is higher than the state average of 2.6 percent.

Table-3 shows the patterns of fruit cultivation in Andhra Pradesh by district. Mango and citrus are the major fruit crops in the Rayalseema region and Mango, banana, citrus, guava and custard apple are important fruit crops in the Telengana region. In Chittoor district, mango occupies nearly 97 percent of the total area under fruits, while in Nalgonda, citrus accounts for 58 per cent of the total area under fruits, followed by mango (39 per cent).

Table-4 indicates the changes in the area under vegetable crops by district. It may be seen from the table that in most of the districts belonging to Rayalseema and Telengana regions, there were significant increases in the area under vegetables. The vegetable crops account for nearly 2-3 percent of the total cropped area in Chittoor district, while in Nalgonda district it was only 0.3 per cent (Table-5). It would be further seen from table-6 that in Chittoor, tomato, brinjals, onions and beans and okra are the main vegetable crops

grown, while in Nalgonda district, gourds, tomato and okra are the main vegetable crops.

Considering the state as a whole, tomato accounts for nearly 35.3 per cent of the total vegetable area, followed by onion (17.3per cent), brinjals (10.1 per cent), bhindi/okra (7.8 per cent), gourds (4.3 per cent) beans (3.2 per cent)and other vegetables together (22 per cent).

Figures 1 to 6 show the trends in the area under various fruit and vegetable crops in Andhra Pradesh state as a whole and in the selected districts if Chittoor and Nalgonda for the period 1982-83 to 1990-91. It could be seen from these figures that area under both fruits and vegetables have increased over time, but the different crops showed varying trends. Area under mango marginally increased, while the area under banana and citrus remained more or less unchanged. In the case of vegetables, onion showed remarkable improvement, but area under sweet potato and tapioca remained unchanged.

Figures 7 and 8 indicate the fruit and vegetable combination regions in the state.

Maharashtra

The state of Maharashtra ranks second in fruit production in the country. As of 1993, the area under fruits was 294,014 hectares and the production of fruits

was 431380 metric tones. It contributed nearly 9.2 per cent to the country's total area under fruits and 13.1 per cent to the total fruit production in the country. The area and production of vegetables were 201633 hectare and 3570887 metric tones respectively. The shares of the state in the total area and production of vegetables were 3.95 and5.0 per cent respectively. The main fruit crops grown in the state are banana, citrus, mango, pomegranate, grapes, papaya, sapota and ber. The major vegetables include onion, tomato and potato.

Table-7 shows the important horticulture crop in various districts of Maharashtra. Tables 8 to 10 shows the patterns of fruits and vegetable cultivation in various districts.

Figures- 9 to 14 further show to the trends in the area under fruits and vegetables in Maharashtra State as a whole and in the selected districts of Pune and Nagpur. It may be seen from Figure-9 that area under Chikoo slightly increased during 1988-89 to 1993-94, but area under mango and cashew declined in the state - In the case of Pune district, area under pomegranate initially increased between 1982 to 1986, but thereafter it declined. In the case of banana also, there were similar trends. But area under all other fruit crop stagnated. In the Nagpur district, the area under total vegetable, in the state slightly improved overtime, but those under major vegetable crops like potato and onion stagnated. The similar trend was

grown, while in Nalgonda district, gourds, tomato and okra are the main vegetable crops.

Considering the state as a whole, tomato accounts for nearly 35.3 per cent of the total vegetable area, followed by onion (17.3per cent), brinjals (10.1 per cent), bhindi/okra (7.8 per cent), gourds (4.3 per cent) beans (3.2 per cent)and other vegetables together (22 per cent).

Figures 1 to 6 show the trends in the area under various fruit and vegetable crops in Andhra Pradesh state as a whole and in the selected districts if Chittoor and Nalgonda for the period 1982-83 to 1990-91. It could be seen from these figures that area under both fruits and vegetables have increased over time, but the different crops showed varying trends. Area under mango marginally increased, while the area under banana and citrus remained more or less unchanged. In the case of vegetables, onion showed remarkable improvement, but area under sweet potato and tapioca remained unchanged.

Figures 7 and 8 indicate the fruit and vegetable combination regions in the state.

Maharashtra

The state of Maharashtra ranks second in fruit production in the country. As of 1993, the area under fruits was 294,014 hectares and the production of fruits

observed also in the selected districts of Pune and Nagpur (Fig. 13 and Fig. 14). Figures 15 and 16 show the fruit and vegetable combination regions in the state respectively.

TABLE 1 : AREA UNDER FRUIT CROPS IN ANDHRA PRADESH DURING THE YEAR 1984-85 AND 1993-94

DISTRICTS	1984-85			1993-94		
	Total Area	% share in the State	% share in the Region	Total Area	% share in the State	% share in the Region
Srikakulam	16959	3.5	5.1	14066	1.04	8.3
Vizianagaram	27743	5.7	8.3	14447	1.06	8.5
Visakhapatnam	32318	6.6	9.7	29104	2.15	17.0
East Godavari	55051	11.2	16.6	32220	2.38	19.1
West Godavari	80033	16.4	24.16	49552	3.66	29.4
Krishna	79467	16.3	23.9	27420	20.2	16.3
Guntur	9225	1.89	27.8	1272	0.94	0.75
Prakasam	8270	1.69	24.9	1991	1.4	0.01
Nellore	23498	6.9	70.9	2975	2.2	1.7
COASTAL ANDHRA	331237	67.9	-	168057	12.4	-
Kurnool	17042	3.4	15.5	1456	10.7	-
Anantapur	28168	5.7	25.6	3139	2.3	-
Cuddapah	33686	6.9	30.7	7135	5.2	-
Chittoor	40597	8.3	36.9	17502	12.9	-
RAYALASEEMA	109808	22.5	-	205128	15.2	-
Ranga Reddy	2041	0.418	3.9	1251	0.92	1.2
Hyderabad	33	0.6	0.03	16	0.11	0.01
Nizamabad	1544	0.31	3.0	135	1.1	1.2
Medak	909	0.18	1.7	662	4.9	6.3
Mahaboob Nagar	1179	0.24	2.2	1434	10.6	13.8
Nalgonda	2027	0.41	3.9	1184	8.7	11.3
Warangal	2274	0.46	4.4	803	5.9	0.07
Khammam	28579	5.8	55.6	8290	61.3	79.8
Karimnagar	5319	1.09	10.3	1279	9.4	12.3
Adilabad	7374	1.5	14.3	2593	19.1	24.9
Telangana	51374	10.5	-	10387	76.8	-
Andhra Pradesh	487356	-	-	13510	-	-

Table 2: CHANGES IN THE PROPORTION OF AREA UNDER FRUIT CROPS (BY DISTRICTS)IN ANDHRA PRADESH DURING 1984-85 TO 1991-9

District	Proportion of area under fruit crops	
	1984-85	1991-92
Ravalaseema Region	2.4	2.8
Kurnool	0.5	0.6
Anantapur	1.9	2.5
Cuddapah	4.9	5.4
Chittoor	4.9	5.4
Telenqana Region	0.7	1.1
Rangareddy	0.6	1.2
Hyderabad	1.9	1.6
Nizamabad	0.2	0.2
Medak	0.6	0.4
Mehboobnagar	0.2	0.3
Nalgonda	0.2	0.8
Warangal	0.2	0.6
Khammam	3.7	6.1
Karim Nagar	0.5	0.6
Adilabad	0.6	0.6
Coastal Region	4.0	3.7
Andhra Pradesh Average	2.4	2.6

Table 3: Patterns of fruit cultivation in Andhra Pradesh, 1993-94

District	Percent share of various fruit crops in area						
	Banana	Mango	Citrus	Grapes	Guava	Sapota	Other Fruits
Srikakulam	4.5	79.2	0.03	-	-	0.07	16.2
Vizianagaram	8.8	91.0	0.01	-	-	0.7	-
Visakhapatnam	11.1	88	0.6	-	1.1	0.2	-
East Godavari	31	57	9.2	-	1.1	0.9	0.8
West Godavari	13.1	72.8	12.7	-	0.4	0.87	0.2
Krishna	2.7	93.5	1.9	-	1.0	0.6	0.3
Guntur	69.2	6.5	15.5	-	1.0	6.8	0.9
Prakasham	1,3	25	46.5	-	7.8	17.0	2.4
Nellore	4.2	20.7	87.1	-	0.3	2.5	5.1
Kurnool	38.9	20.8	31.8	-	1.6	0.4	6.5
Anantapur	1.0	11.3	80.9	1.0	3.7	0.4	1.7
Cuddapah	13.8	42	36	-	0.6	0.3	7.2
Chittoor	0.9	97.1	1.8	0.3	0.1	0.02	-
Rangareddy	2.4	14	12	49.4	20.6	0.9	0.7
Hyderabad	-	-	-	66.6	33.3	-	0.06
Nizamabad	20.2	58.3	10.1	0.5	6.2	0.1	4.6
Medak	4.4	39.9	21.4	6.3	16.9	0.5	10.6
Mehboobnagar	1.5	53.2	15.4	0.9	25.8	0.13	3.0
Nalgonda	0.2	38.7	57.6	0.3	2.5	0.34	0.36
Warangal	14.5	62.0	21.2	-	1.9	-	0.4
Khammam	1.5	95.8	1.9	-	0.3	0.02	0.5
Karim Nagar	1.2	38	0.3	-	0.12	-	60.3
Adilabad	2.6	93.1	0.7	-	0.3	-	3.3
Andhra Pradesh	10.6	52.7	19.3	4.7	5.3	1.1	6.3

TABLE 4 : AREA UNDER VEGETABLE CROPS IN ANDHRA PRADESH DURING THE YEARS 1984-85 AND 1993-94

DISTRICTS	1984-85			1993-94		
	Total Area	% share in the State	% share in the Region	Total Area	% share in the State	% share in the Region
Srikakulam	2263	5.7	7.8	1558	1.6	4.0
Vizianagaram	1006	2.5	3.4	2177	2.3	5.6
Visakhapatnam	2797	7.0	9.6	8869	9.6	22.9
East Godavari	12315	31.0	42.6	4940	5.3	12.8
West Godavari	2096	5.2	7.2	3319	3.6	8.6
Krishna	2189	8.5	7.5	4667	5.0	12.1
Guntur	3333	8.4	11.5	5333	5.7	13.8
Prakasam	1740	4.3	6.0	5904	6.4	15.3
Nellore	1229	3.0	4.2	1443	1.5	3.7
COASTAL ANDHRA	28893	72.8	-	38577	41.8	-
Kurnool	2400	6.0	42.3	6911	7.5	38.75
Anantapur	813	2.0	14.3	1025	1.2	5.7
Cuddapah	529	1.3	9.3	1090	1.1	6.1
Chittoor	1706	4.3	30.1	3244	3.5	18.1
RAYALASEEMA	5665	14.28	-	17832	19.3	-
Ranga Reddy	2754	6.9	51.3	10706	111.6	42.8
Hyderabad	57	0.14	1.5	228	0.24	0.9
Nizamabad	79	0.19	1.9	407	0.44	1.6
Medak	835	2.1	15.5	821	0.89	3.2
Mahaboob Nagar	794	2.0	14.8	7025	7.6	28.1
Nalgonda	244	0.61	4.5	905	0.98	3.6
Warangal	148	0.37	2.7	1001	1.0	4.0
Khammam	216	0.54	4.0	1908	2.0	7.6
Karimnagar	337	0.84	6.2	2004	2.1	8.0
Adilabad	215	0.54	4.0	1454	1.5	5.8
Telangana	5364	13.5	-	24993	27.1	-
Andhra Pradesh	39658	-	-	92141	-	-

Table 5: CHANGES IN THE PROPORTION OF AREA UNDER VEGETABLE CROPS (by District) DURING 1984-85 TO 1991-92

District	Proportion of Area under Vegetable Crops 1984-85	1991-92
Coastal Andhra	0.6	1.3
Rayalaseema	0.2	1.6
Kurnool	0.3	2.4
Anantapur	0.1	0.4
Cuddapah	0.1	1.4
Chittoor	0.4	2.3
Telangana	0.1	0.9
Rangareddy	0.9	5.0
Hyderabad	9.0	20.3
Nizamabad	0.02	0.6
Medak	0.2	1.0
Mehboobnagar	0.1	1.2
Nalgonda	0.04	0.3
Warangal	0.03	0.2
Khammam	0.05	0.4
Karimnagar	0.07	0.7
Adilabad	0.03	0.3
Andhra Pradesh	0.3	1.2

Table 6: **Patterns of vegetable cultivation in Andlua Pradesh, 1993-94**

Districts	% share of each crop in the total area						
	Tomato	Onions	Brinjal	Bhendi	Gourds	Beans	Other vegetable?
Srikakulam	6.9	21.8	21.5	3.1	0.5	2.6	43.6
Vizianagaram	14.4	19.1	23	9.6	0.7	5.7	27.5
Visakhapatnam	21.7	3.6	194	5.8	0.6	19.7	29.2
East Godavari	2.5	0.6	9.6	1.4	0.3	0.8	84.8
West Godavari	6.5	-	22.3	9.0	7.2	3.6	51.6
Krishna	24.9	0.6	16.9	10.2	13.9	8.8	26.9
Guntur	14.4	5.5	11.5	8.9	14.7	1.8	432
Prakasham	55.8	5.8	5.5	9.5	5.0	3.5	14.9
Nellore	11.5	-	23.4	12.2	3.8	0.6	48.5
Coastal Andhra	17.4	4.6	14.2	6.2	4.6	5.4	47.6
Kurnool	49.2	26.5	3.1	20	0.6	0.6	-
Anantapur	25	25	195	0.8	1.8	0.2	27.7
Cuddapah	18.4	636	8.1	1.2	1.9	1.0	5.8
Chittoor	61	6.1	12.9	3.9	0.8	6.1	9.2
Rayalaseema	45	26	8.0	12.0	0.9	2.0	6.1
Rangareddy	40.3	13.5	10.9	7.0	3.4	4.0	20.9
Hyderabad	18.8	-	11.1	5.1	0.8	0.8	63.4
Nizamabad	16.7	29.5	5.3	1.9	6.9	0.6	39.1
Medak	21.1	21.9	3.0	3.4	0.3	5.6	44.7
Mehboobnagar	41.7	28.8	11.1	9.7	1.2	1.1	6.4
Nalgonda	20.6	1.4	6.2	13	32.3	-	26.5
Warangal	35.2	7.7	13.2	8.8	2.3	1.6	31.2
Khammam	27.6	1.7	19.5	14.3	8.4	2.6	25.9
Karim Nagar	33.2	17.4	9.6	8.8	3.8	3.4	23.8
Adilabad	47	12.6	15.6	7.7	1.2	6.2	9.7
Telangana	35.3	17.3	10.1	7.8	4.3	3.2	22

Table 7: Area under fruit crops in Maharashtra during the years 1984-85 and 1990-91

	1984-85			1990-91		
Districts	Total area (ha)	% share in the state	% share in the region	Total area (ha)	% share in the state	% share in the region
Greater Bombay	100	0.01	0.337	1000	0.90	3.817
Thane	2300	0.16	7.744	1400	1.26	5.344
	1100	0.08	3.704	500	0.45	1.908
Ratnagiri	9900	0.68	33.333	5300	4.77	20.229
Sindudurg	16300	1.11	54.882	18000	16.22	68.702
KONKAN	29700	2.03		26200	23.60	
Nasik	4700	0.32	9.216	4800	4.32	6.486
Dhule	3400	0.23	6.667	600	0.54	0.811
Jalgaon	40500	2.76	79.412	40400	36.40	54.595
Ahmadnagar	2400	0.16	4.706	2000	1.80	2.703
NASIK	51000	3.48		74000	66.67	
Pune	5300	0.36	54.082	1500	1.35	21.429
Satara	600	0.04	6.122	800	0.72	11.429
Sangli	1000	0.12	18.367	2400	2.16	34.286
Sholapur	1500	0.10	15.306	1700	1.53	24.286
Kolhapur	600	0.04	6.122	600	0.54	8.571
PUNE	9800	0.67		7000	6.31	
Aurangabad	2500	0.17	17.007	2600	2.34	15.854
Jalana	1600	0.11	10.884	1400	1.26	8.537
Parbhani	4400	0.30	29.932	4500	4.05	27.439
Beed	2200	0.15	14.966	2400	2.16	14.634
Naded	2800	0.19	19.048	3500	3.15	21.341
Osmanabad	1000	0.07	6.803	1900	1.71	11.585
Latur	200	0.01	1.361	100	0.09	0.610
AURANGABAD	14700	1.00		16400	14.77	
Buldana	1300	0.09	7.222	1500	1.35	34.884
Akola	1900	0.13	10.556	900	0.81	20.930
Amarawati	13400	0.91	74.444	700	0.63	16.279
Yeotmal	1400	0.10	7.778	1200	1.08	27.907
AMRAVATI	18000	1.23		4300	3.87	
Wardha	3500	0.24	20.000	1300	1.17	54.167
Nagpur	13100	0.89	74.857	500	0.45	20.833
Bhandara	600	0.04	3.429	100	0.09	4.167
Chandrapur	100	0.01	0.571	200	0.18	8.333
Gadchiroli	200	0.01	1.143	300	0.27	12.500
NAGPUR	17500	1.19		2400	2.16	
Maharashtra	1466100			111000		

Table 8: Patterns of fruit cultivation in Maharashtra, 1991

Districts	Banana	Mango	Citrus	Grapes	Pome
Greater Bombay	100.0	0.0	0.0	0.0	0.0
Thane	64.3	28.6	0.0	0.0	7.1
Raigarh	25.0	100.0	0.0	0.0	0.0
Ratnagiri	3.6	96.4	0.0	0.0	0.0
Sindudurg	5.4	90.5	0.0	0.0	0.0
KONKAN	16.6	81.5	0.0	0.0	0.6
Nasik	6.4	14.9	8.5	72.3	0.0
Dhule	83.3	0.0	16.7	0.0	0.0
Jalgaon	95.8	0.0	4.0	0.0	0.0
Ahmadnagar	7.4	3.7	63.0	3.7	7.4
NASIK	82.0	1.6	8.0	7.1	0.4
Pune	15.4	3.8	23.1	9.6	30.8
Satara	25.0	0.0	0.0	12.5	37.5
Sangli	20.8	0.0	4.2	54.2	4.2
Sholapur	15.4	0.0	30.8	42.3	11.5
Kolhapur	0.0	33.3	0.0	0.0	16.7
PUNE	16.4	3.4	18.1	25.9	20.7
Aurangabad	46.2	0.0	42.3	0.0	7.7
Jalana	57.1	0.0	28.6	0.0	14.3
Parbhani	82.2	8.9	13.3	0.0	2.2
Beed	12.5	16.7	20.8	37.5	8.3
Naded	88.6	2.9	8.6	0.0	0.0
Osmanabad	5.3	57.9	5.3	10.5	21.1
Latur	100.0	0.0	0.0	0.0	0.0
AURANGABAD	56.7	12.2	18.3	6.7	6.7
Buldana	0.0	0.0	13.3	73.3	6.7
Akola	20.0	15.0	30.0	5.0	5.0
Amarawati	1.5	1.5	95.0	1.0	0.5
Yeotmal	64.7	5.9	23.5	0.0	0.0
AMRAVATI	7.1	2.8	80.2	5.5	1.2
Wardha	28.9	2.6	68.4	0.0	2.6
Nagpur	95.9	0.7	0.7	2.8	0.7
Bhandara	0.0	100.0	0.0	0.0	0.0
Chandrapur	0.0	100.0	0.0	0.0	0.0
Gadchiroli	0.0	100.0	0.0	0.0	0.0
NAGPUR	,0.0	100.0	0.0	0.0	0.0
Maharashtra	40.7	12.8	33.3	4.8	6.0

Table 9: Area under vegetables crops in Maharashtra during the years 1984-85 and 1990-91

	1984-85			1990-91		
Districts	Total area (ha)	% share in the state	% share in the region	Total area (ha)	% share in the state	% share in the region
Greater Bombay	200	0.12	10.53	0	0.00	0.00
Thane	1100	0.66	57.89	1200	0.66	70.59
Raigarh	100	0.06	5.26	100	0.06	5.88
Ratnagirl	300	0.18	15.79	300	0.17	17.85
Sindudurg	200	0.12	10.53	100	0.06	5.88
KONKAN	1900	1.13		1700	0.94	
Nasik	28700	17.13	62.26	26900	14.89	63.29
Dhule	7800	4.66	16.92	4600	2.55	10.82
Jalgaon	3100	1.85	6.72	2400	1.33	5.65
Ahmadnagar	6500	3.88	14.10	8600	4.76	20.24
NASIK	46100	27.52		42500	23.53	
Pune	30600	18.27	59.65	36600	20.27	61.00
Satara	8900	5.31	17.35	12500	6.92	20.83
Sangli	2400	1.43	4.68	2700	1.50	4.50
Sholapur	6700	4.00	13.06	7200	3.99	12.00
Kolhapur	2700	1.61	5.26	1000	0.55	1.67
PUNE	51300	30.63		60000	33.22	
Aurangabad	2100	1.25	7.61	2200	1.22	6.20
Jalana	2000	1.19	7.25	1800	1.00	5.07
Parbhani	3600	2.15	13.04	2800	1.55	7.89
Beed	14100	8.42	51.09	19200	10.63	54.08
Naded	1800	1.07	6.52	1100	0.61	3.10
Osmanabad	2700	1.61	9.78	7400	4.10	20.85
Latur	1300	0.78	4.71	1000	0.55	2.82
AURANGABAD	27600	16.48		35500	19.66	
Buldana	2600	1.55	19.26	3700	2.05	26.43
Akola	3000	1.79	22.22	3500	1.94	25.00
Amarawati	5300	3.16	39.26	4500	2.49	32.14
Yeotmal	2600	1.55	19.26	2300	1.27	16.43
AMRAVATI	13500	8.06		14000	7.75	
Wardha	2600	1.55	10.88	2800	1.55	11.62
Nagpur	13700	8.18	57.32	13400	7.42	55.60
Bhandara	5000	2.99	20.92	4700	2.60	19.50
Chandrapur	2100	1.25	8.79	2700	1.50	11.20
Gadchiroli	500	0.30	2.09	500	0.28	2.07
NAGPUR	23900	14.27	100.00	24100	13.34	
Maharashtra	167500			180600		

Table 10: Patterns of vegetable cultivation in Maharashtra, 1991

	% share of each crop in the total area			
	Potato	Sweet potato	Onion	Rabi vegetables
Greater Bombay	0.0	0.0	0.0	0.0
Thane	0.0	0.0	33.3	66.7
Raigarh	0.0	50.0	0.0	0.0
Ratnagiri	0.0	0.0	0.0	100.0
Sindudurg	0.0	0.0	50.0	50.0
KONKAN	0.0	5.3	26.3	63.2
Nasik	3.0	0.4	63.2	10.8
Dhule	2.2	4.3	76.1	0.0
Jalgaon	4.2	0.0	54.2	4.2
Ahmadnagar	5.8	1.2	45.3	2.3
NASIK	3.5	0.9	60.5	7.5
Pune	23.8	0.5	39.6	5.7
Satara	35.2	0.8	32.8	2.4
Sangli	7.4	11.1	22.2	29.6
Sholapur	0.0	4.2	72.2	5.6
Kolhapur	0.0	83.3	4.2	8.3
PUNE	21.7	4.7	39.9	6.2
Aurangabad	9.1	0.0	45.5	0.0
Jalana	4.5	0.0	18.2	18.2
Parbhani	3.6	3.6	25.0	21.4
Beed	2.6	2.6	18.2	8.3
Naded	0.0	0.0	27.3	9.1
Osmanabad	1.4	1.4	8.1	5.4
Latur	0.0	0.0	20.0	20.0
AURANGABAD	2.8	1.9	18.7	9.2
Buldana	0.0	0.0	67.6	2.7
Akola	0.0	0.0	48.6	20.0
Amarawati	2.2	8.9	37.8	13.3
Yeotmal	0.0	8.7	34.8	13.0
AMRAVATI	0.7	4.3	47.9	12.1
Wardha	0.0	3.6	10.7	14.3
Nagpur	0.7	0.7	4.5	6.0
Bhandara	0.0	2.1	10.6	23.4
Chandrapur	0.0	3.7	11.1	7.4
Gadchiroli	0.0	0.0	20.0	20.0
NAGPUR	0.4	1.7	7.5	10.8
Maharashtra	8.7	1.7	35.9	8.8

CHAPTER - 3

RELATIVE PROFITABILITY OF HORTICULTURAL CROPS VIS A VIS OTHER CROPS

The results of our field level survey indicates that fruit and vegetable crops yield relatively higher returns than those of cereals. It may be seen rom Table that in the case of Andhra Pradesh, the net returns from Chilly were as high as Rs. 23580 per acre in Chittoor and Rs. 22050 per acre in Nalgonda. The net returns from Mango were Rs. 7118 per acre in Chittor and Rs. 10,290 per acre in Nalgonda. As companed to this, the net returns from Rice was only Rs. 4005 per acre in Chittoor and Rs. 3808 in Nalgonda. In the case of Ragi and Jowar, this was even lesser.

Table –11 further shows that in Maharashtra in both Pune and Akola where we conducted the survey, fruit crops like Grapes, Pomegrenate, Banana and Orange and other cash crops like sugarcane yielded comparatively higher returns. The net returns per acre from grapes were Rs. 36010, followed by Rs. 21500 for banana and Rs. 15000 for Pomegrenate. The Cereal crops yielded relatively low returns. Also the net return from Chilly in Maharashtra were lower than those in Andhra Pradesh. In Andhra Pradesh, the net returns were relatively higher in the case particularly of chilly and mango than that of other crops. Another important aspect of economics of horticulture Crops, grapes,

banana, orange and pomegrenate require high input use which may be beyond the reach of resource poor farmers.

LABOUR USE IN HORTICULRE CROPS

Table –12 shows that fruits and vegetable crops like Chilly, grapes, orange and banana use relatively higher amount of labour per acre, but mango, onion and tomato are less labour absorbing than even cereal crops, However, the labour employment may get augmented even in the case of these crops, through development of marketing and processing facilities.

MAJOR CONSTRAINTS TO FRUIT AND VEGETABLE PRODUCTION.

It may be seen from Tables -13 to 16 that there are several constrains in the Production of fruits and vegetable crops. In the case of Andhra Pradesh the mango growers in both Chittoor and Nalgonda districts. Indicated that high establishment cost, high costs of production, non-availability of good planting materials, low price due to pre-harvest contract, absence of proper transport arrangement, high storage cost and high commission charges acted as constraints. For vegetables, pests and diseases, inadequate transport facilities, absence of cold storage and price uncertainly were the major constraints.

In Maharashtra also, lack of transport facility, price uncertainly and non availability of credit turned out to be the major constraints in fruit production

and price uncertainty, of cold storage, shortage of water and non-availability of credit acted as the main constraints.

Tables -17 and 18 indicate the requirements for productivity improvement in fruit and vegetable crops in Andhra Pradesh and Maharashtra. It is clearly borne out from these tables that good planting material, organised market and crop insurance are the key to horticulture based diversification.

Table -11 : Relative costs and Returns on various crops in selected districts.

District	Crop	Operating Cost (Rs./ acre)	Net Returns **(Rs./acre)**
Chittoor	Rice	7926	4000
	Ragi	2520	1090
	Mango	4908	7118
	Chilly	11203	23580
Nalgonda	Rice	6500	3808
	Jowar	3210	1460
	Mango	5380	10,290
	Chilly	9250	22050
	Onion	5000	7450
Pune	Wheat	3200	2560
	Sugar cane	18930	14688
	Onion	6565	8350
	Tomato	850	7500
	Bringal	4000	5850
	Chilly	3800	4100
	Grapes	44300	36010
	Pomegrenate	7500	15000
Akota	Wheat	3500	3400
	Jower	2850	2000
	S.Cane	4000	6200
	Orange	10283	8260
	Chilly	4600	5370
	Lemon	8628	7400
	Banana	19508	21500
	Bringal	6000	8000

Table -12 : Per acre labour use in various crops:

District	Crops	Labour use (Mandays per acre)
Chittoor	Rice	105
	Ragi	54
	Mango	47
	Chilly	124
Nalgonda	Rice	102
	Jowar	55
	Mango	50
	Chilly	117
	Onion	43
Pune	Wheat	35
	Sugar Cane	65
	Onion	40
	Tomato	45
	Brinjal	25
	Chilly	20
	Grapes	180
Akota	Wheat	30
	Jowar	28
	S.Cane	85
	Orange	100
	Chilly	45
	Lemon	80
	Tomato	65
	Banana	100
	Brinjal	65
	Onion	78

Table-13 : Constrains in Fruit Production in Chittoor and Nalgonda District of Andhra Pradesh.

	% or Respondents who indicated constraints in Mango production		
	Constraints	Chittoor	Nalgonda
1.	High establishment cost	85	90
2.	High cost of production	100	85
3.	Pests and diseases	68	50
4.	Non-availability of Good planting	40	52
	Material		
5.	Inadequate credit facility	50	62
6.	Climatic aberrations	60	50
7.	Lack of organised Market	80	85
8.	Low price due to pre harvest	90	100
	Extract		
9.	Absence of proper transport	50	80
	Arrangement		
10	High storage cost	50	70
11	High commission charges in market	60	65

Table-14: Constraints to vegetable production in Chittoor and Nalgonda District of Andhra Pradesh.

		Chittoor		Nalgonda	
		Chilly	Onion	Chilly	Onion
1	Climatic factor	-	-	-	-
2	Non-availability of good planting				
	Material	-	-	-	-
3	Scarcity of labour	15	5	10	10
4	Irregular power supply	83	100	70	95
5	Pest & Disease	100	100	80	85
6	Scarcity of water	33	50	80	80
7	High cost of production	25	20	20	30
8	Lack of organized market	8	10	8	5
9	Inadequate transport facility	75	100	100	100
10	Absence of cold storage	-	100	100	100
11	Price uncertainly	100	100	100	100

Table -15: Constraints in Fruit Production in Pune and Akola Districts of Maharashtra.

% of Respondents indicating the constraints

	Constaints		PUNE		AKOLA		
		Custard Apple	Grape	Pomegr enate	Orange	Lemon	Banana
1.	Shortage of Water	50	55	50	60	50	50
2.	Shortage of Labour	60	50	65	50	60	70
3.	Lack of Transport	100	100	85	50	60	55
4.	Price uncertainly	100	100	100	80	80	90
5.	Lack of Cold storage	-	50	50	50	60	50
6.	Non-availability Of credit	60	100	100	80	80	60

Table -16: Constraints in Vegetable Production in Pune and Akola Districts of Maharashtra.

% of respondents indicating the constraints

	Constraints	PUNE				AKOLA	
		Onion	Tomato	Brinjal	Chilly	Chilly	Brinjal
1.	Shortage of water	25	28	58	33	64	85
2.	Shortage of Labour	48	47	36	44	41	44
3.	Lack of Transport facility	30	27	34	30	28	33
4.	Price risk	72	74	58	80	70	55
5.	Lack of cold Storage	74	75	36	51	41	75
6.	Non-availability of Credit	72	65	88	75	65	51

Table -17: Requirement for Productivity Improvement in Fruit Crops.

		Indicated by Farmers					
		Chittoor	Nalgonda	Pune	Akola	Akola	Akola
	Requirements			Grape	Banana	Orange	Lemon
1.	High breeding plant	90	100	45	12	10	-
	Material						
2.	Regular bearing varieties	50	100	-	-	-	-
3.	Timely availability of credit	25	36	15	10	30	20
4.	Assumed market	50	60	25	30	20	20
5.	Availability of water	-	-	-	43	48	70
6.	Availability of labour	-	-	15	10	23	35

Table -18: Requirements, for productively Improvement in vegetable as Indicated by farmers in Andhra pradesh.

% of respondents indicating the requirements

		Chittoor		Nalgonda		Pune		Akola	
	Requirements	Chilly	Onion	Chilly	Onion	Tomato	Brinjal	Chilly	Brinjal
1.	Water availability	75	80	89	85	24	50	33	41
2.	Timely availability of inputs	80		80	70	20	40	30	35
3.	High yielding varieties	100	100	100	100	100	80	68	69
4.	Timely availability of credit	60	50	60	80	25	50	20	26
5.	Assumed market	50	50	68	85	100	75	84	90
6.	Crop Insurance	30	12	32	15	100	50	30	36

CHAPTER - IV

SUMMARY AND CONCLUSIONS

In recent years, there has been a significant rise in the area and production of fruit and vegetable crops in both Andhra Pradesh and Maharashtra. The recent economic liberalization has activated the growth process further. The favourable factors include the introduction of hybrid seeds and export promotion strategy.

The present study was based on both secondary and primary data. The primary level survey was conducted in the districts of Chittoor and Nalgonda in Ahdhra Pradesh and Pune and Akola districts in Maharashtra. The secondary data were collected from the Directorate of Horticulture in both the states.

The main findings of the study are summarised below:

i) In Andhra Pradesh, mango continues to be main fruit crop in both Nalgonda and chittoor. Due to various constraints, farmers could not switch over to new fruit crops in recent years. Particularly, the small and marginal farmers find it difficult to go for fruit crops, due to long gestation period. Production of cereal crops for self-subsistence is their primary concern.

ii) In the case of vegetables, small and marginal farmers did not have such disadvantage. But lack of marketing transportation and storage facilities as well as pests and diseases acted is major constraints.

iii) The study clearly bears out that fruit and vegetable crops in Andhra Pradesh give relatively much higher return than crops like rice, Jowar and Ragi. Still, the farmers are slow to adopt horticulture crops due to various constraints.

iv) In Maharashtra, grapes and pomegrenate were the major fruit crops in Pune district, which have shown remarkable growth in recent times, The net returns from these crops are several times higher than those of existing cereal crops. In Akola, Orange, Lemon and Banana are the major fruit crops. The net returns from banana are ten times higher than that of Jowar.

Nevertheless, in both Pune and Akola, fruit growers face several constraints, including shortage of transport facility, price uncertainly, lack of cold storage and non-availability of credit.

v) The vegetable growers in Maharashtra also received comparatively higher returns , Tomato, Onion, Brinjal and Chilly are the main vegetable crops in Pune, while Chilly and Brinjal are the main

vegetable crops in the study area of Akola district. The net returns from Brinjal were Rs. 8000 per acre in Akola and Rs.5850 per acre in Pune. The returns from Chilly were however relatively lower, in Maharashtra, as compared to Andhra Pradesh.

The vegetable growers indicated several constraints, including price uncertainty, lack of cold storage, non-availability of credit, storage of labour, storage of water etc.

vi) From the point of view of labour employment, both fruit and vegetable production required relatively less labour per unit of area. However, if production takes place on commercial scale, employment intensity of fruits and vegetable may increase due to marketing, transportation and processing activities.

CONCLUSIONS AND POLICY IMPLICATIONS

Farmers in both Andhra Pradesh and Maharashtra recognise the value of horticultural crops. But their primary concern is food production for self-consumption. However, there is tremendous scope for further growth of horticulture crops in the study areas. But this would require early removal of various constraints indicated by the farmers. Particularly, appropriate technology including high yielding, disease free and regular bearing of mango

varieties may augment the area and production of mango. Besides, production of all fruits and vegetables required timely availability of credit, organised market, crop insurance, and facilities of transportation and cold storage.

Thus, several technological, infrastructural and policy changes would be required to promote horticultural crops in the semi-arid tropics of Andhra Pradesh and Maharashtra. However, investment in both technology and infrastructure will show high returns in the case of both fruits and vegetables.

The results of the study have important policy implications. Since absence of organised markets and inadequate credit, storage and transport facility act as the major bottlenecks, Government will have to step up these infrastructural facilities which are essential for accelerated horticultural development.

The exploitation of farmers by pre-harvest contractors also gives a signal that all contractors arrangements have to be regulated for ensuring stable income to the farmers and for minimising the price spread by reducing the number of channels /agencies involved between the producers and the consumers. For this, local level private entrepreneureship and co-operate marketing may have to be developed along competitive terms. The questions of effective Price Protection and crop insurance also assume importance in this regard.

Moreover, the study points out that development of disease resistant high yielding/good quality seed or plant materials as well as post harvest technologies would be the important factors to induce small and marginal farmers to grow horticultural crops.

Finally, there is need for a cluster approach to agricultural diversification which will ensure a regular and adequate supply of commodities, markets and other necessary infrastructures.

The following problems have been experienced in the development of horticulture crops in the study states:

1. Lack of infrastructure facilities and lack technical know- how with the local staff responsible for horticultural development..

2. Poor extension services provided by the State Departments of horticulture.

3. One of the important constraints in the development of horticulture/plantation crops in the country is the lack of quality planting materials.

The following remedial measure may help in developing the horticultural sector in the study states:

- There is a need to strengthen the backward and forward linkages. The government should ensure that the growers should get remunerative prices of their produce. Marketing sectors needs to be given top priority along with post-harvest handling of the crops.

- Production and availability of genuine quality planting material should be ensured.

- Area specific package of practices should be developed and disseminated for optimization of productivity.

- Horticultural schemes should be used for promoting dry land and wasteland development.

- There should be stress on water management in horticultural crops - drip and sprinkler irrigation systems should be popularised.

- Captive Farms should be developed for the benefit of producers and processors

- Immediate steps should be taken to overcome disease problems like mango malformation and banana bunchy top and similar disorders affecting the productivity in other horticultural crops.

- Storage and preservation facilities, processing, marketing and export should be developed for integrated development of horticultural sector.

- Crops suited to particular areas should be popularised in a manner that the area become a huge horticultural estates and commercial venture with an eye on processing and export may start coming up in the area.

In view of the fast changes taking place, world over and recent economic liberalisation, it became necessary to make our produce more competitive in the international market-both price and quality-wise. Our produce should be residue free and must qualify international permissible limits of quality and environmental parameters set by different countries so that we may face the recent non-tax barriers imposed by EEC countries in the name of environmental standards, are big challenges before us. If we could do this, the returns to our farmers will increase significantly and result in improvement in their quality of life.

Fig. 1: Trends in area under fruits in Andhra Pradesh state

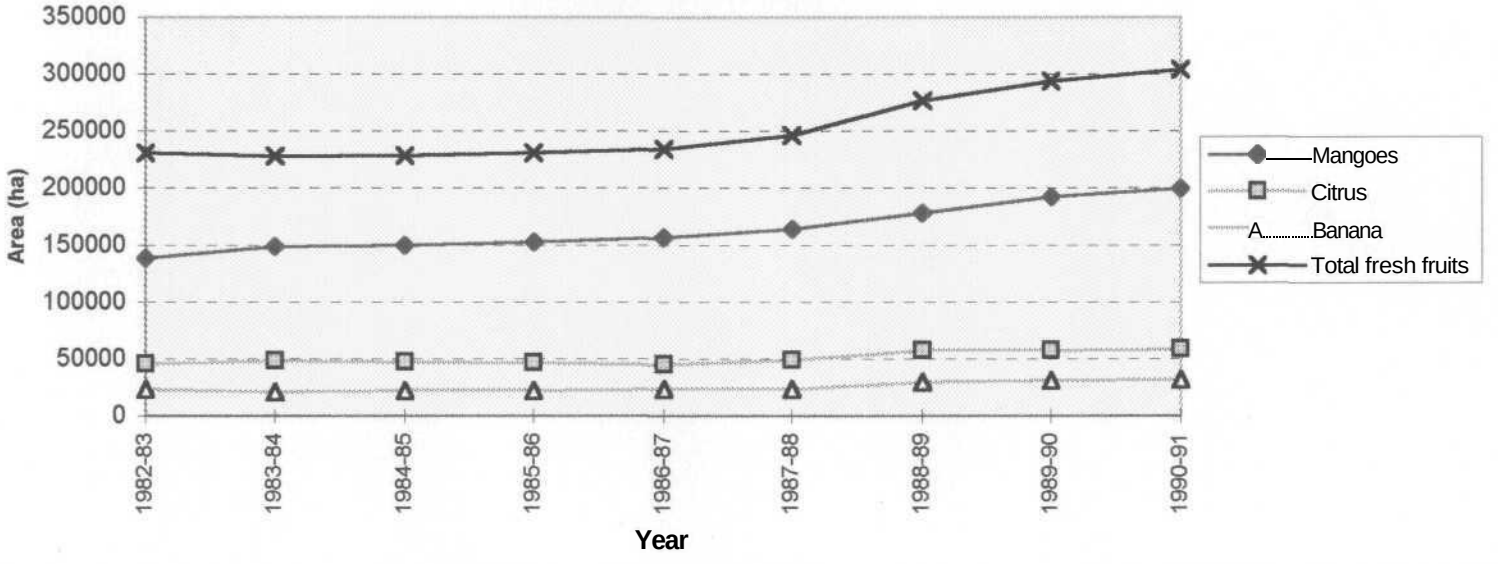


Fig. 2: Trends in area under fruits in Chitoor disrtict, Andhra Pradesh

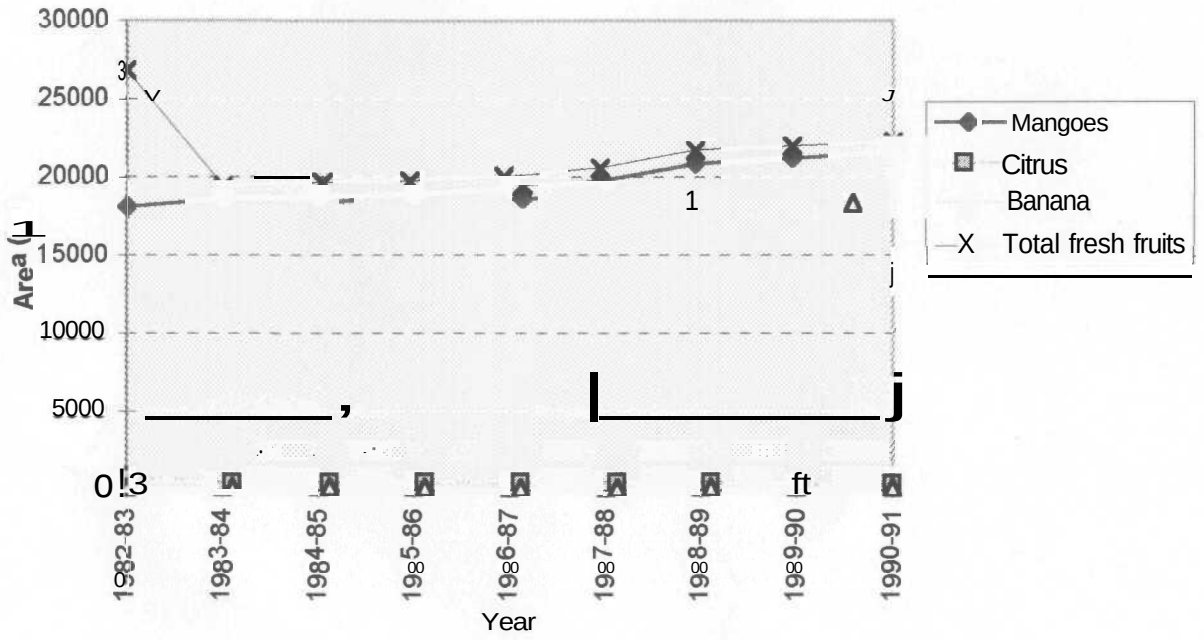


Fig. 3: Trends in area under fruits in Nalgonda district, Andhra Pradesh

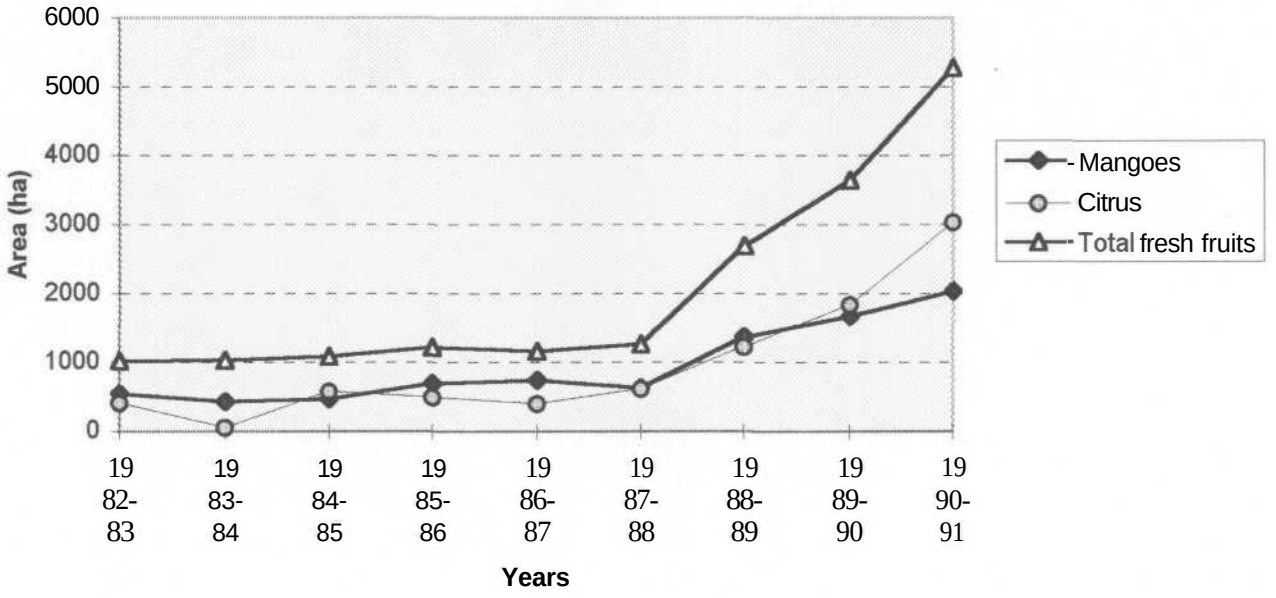


Fig. 4: Trends in area under vegetables in Andhra Pradesh state

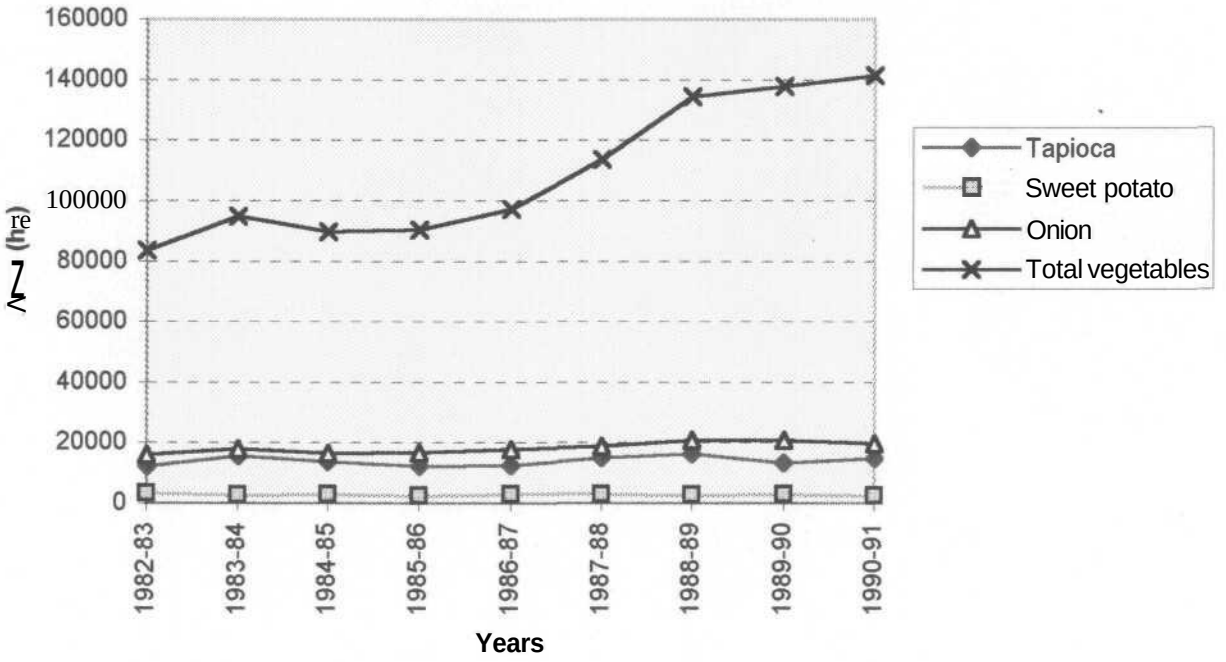


Fig. 5: Trends in area under vegetables in Chitoor district, Andhra Pradesh

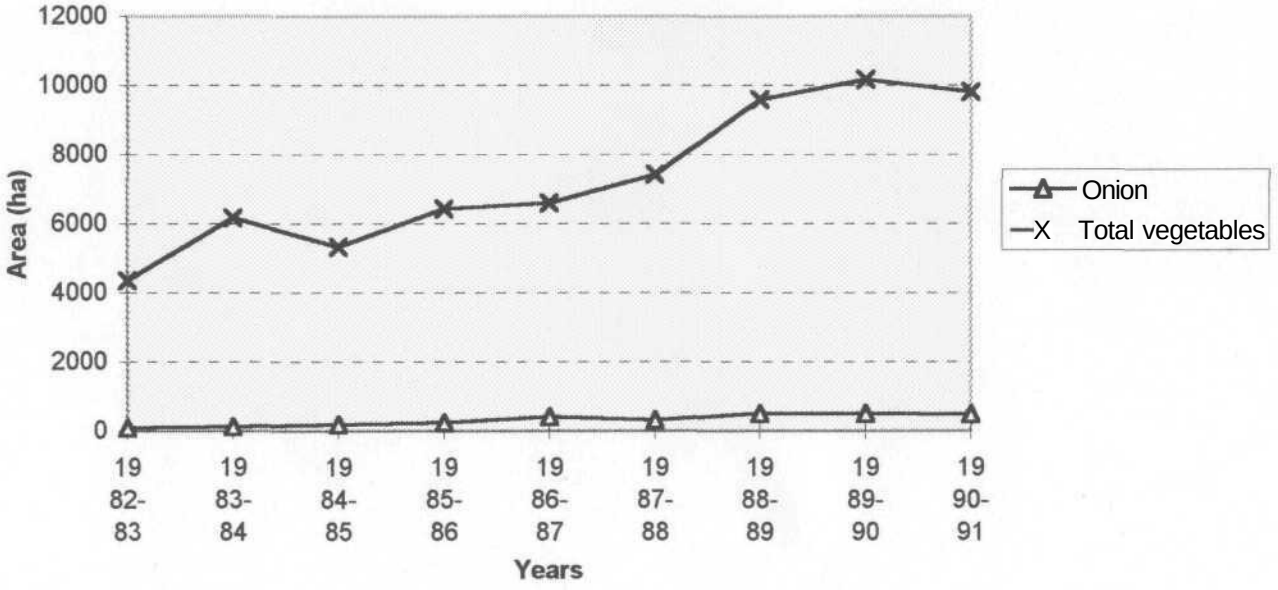


Fig. 6: Trends in area under vegetables in Nalgonda district, Andhra Pradesh

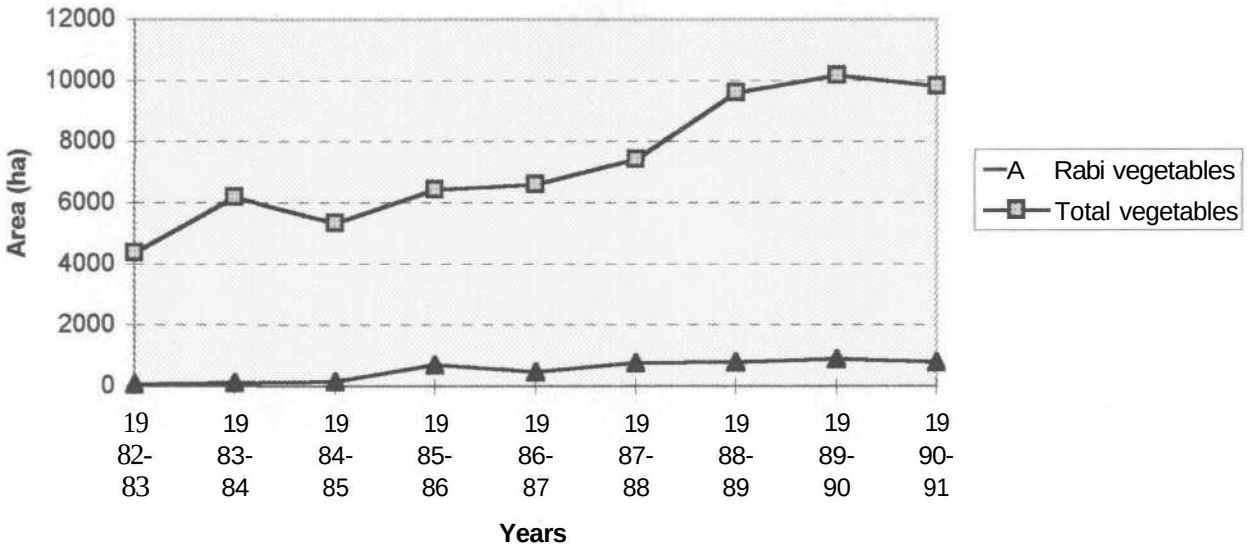


Fig. 7

ANDHRA PRADSEH

FRUIT
COMBINATION REGIONS

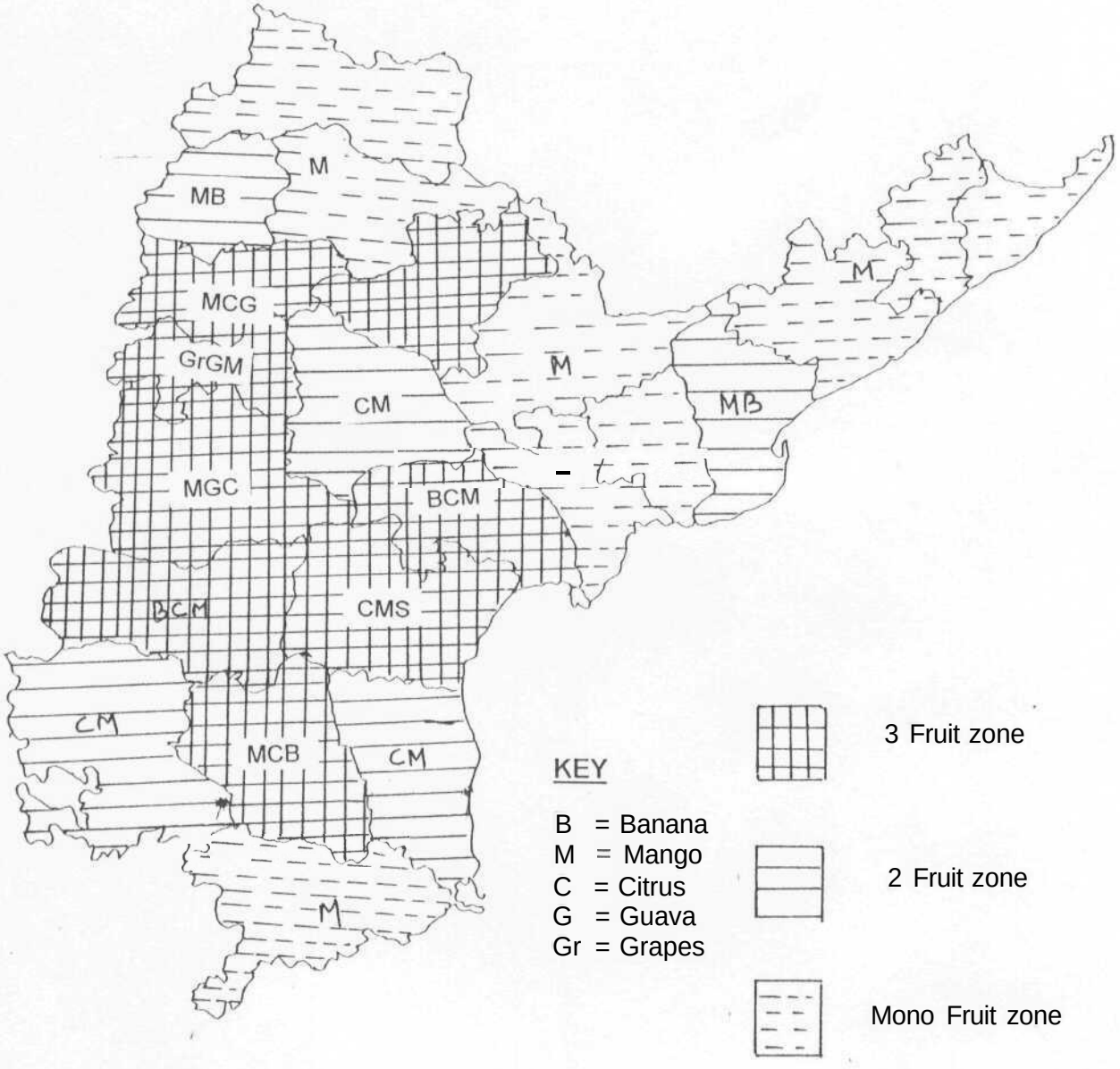


Fig. 8

ANDHRA PRADSEH

VEGETABLE COMBINATION REGIONS

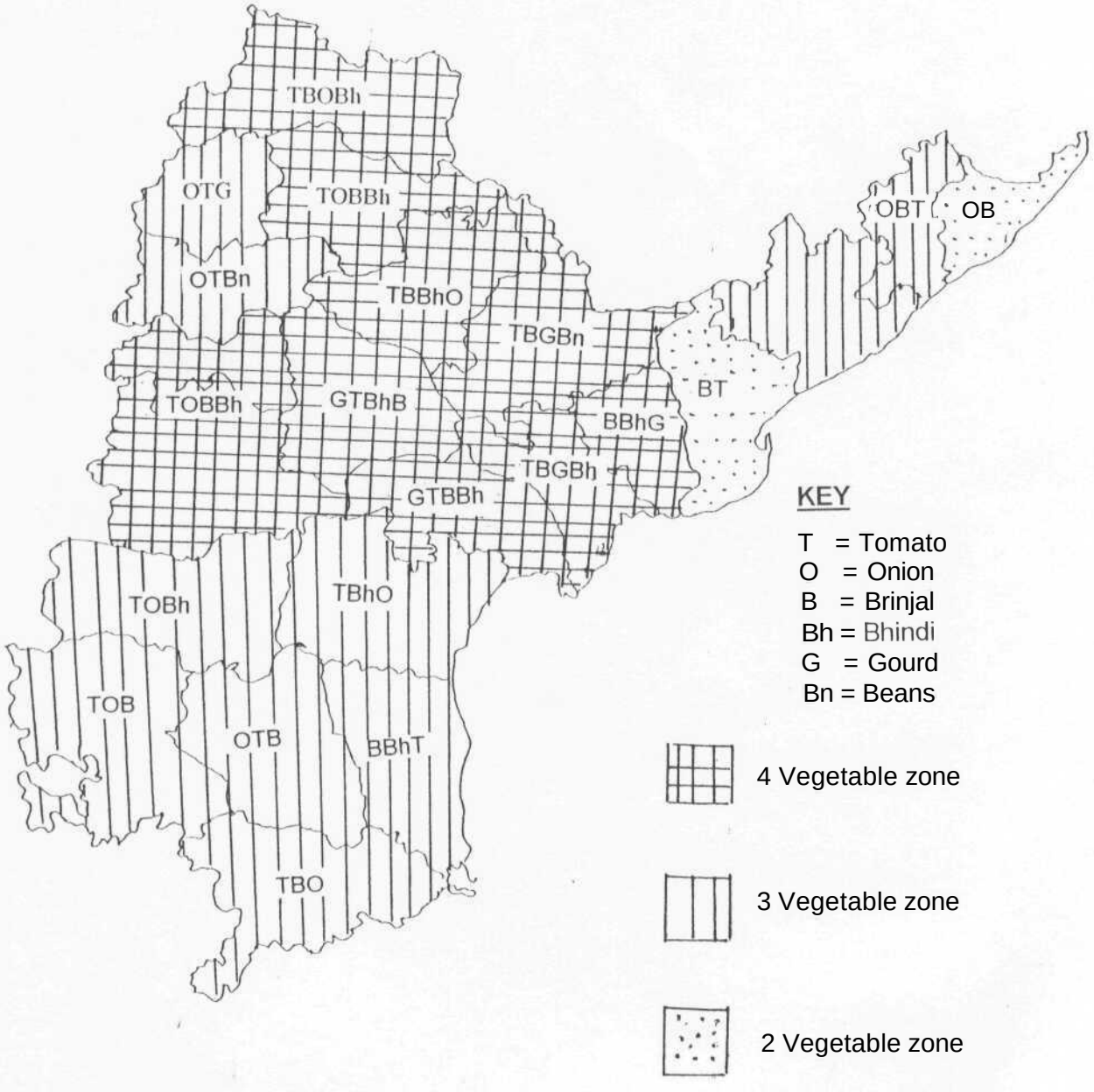


Fig. 9: Trends in area under fruits in Maharastra

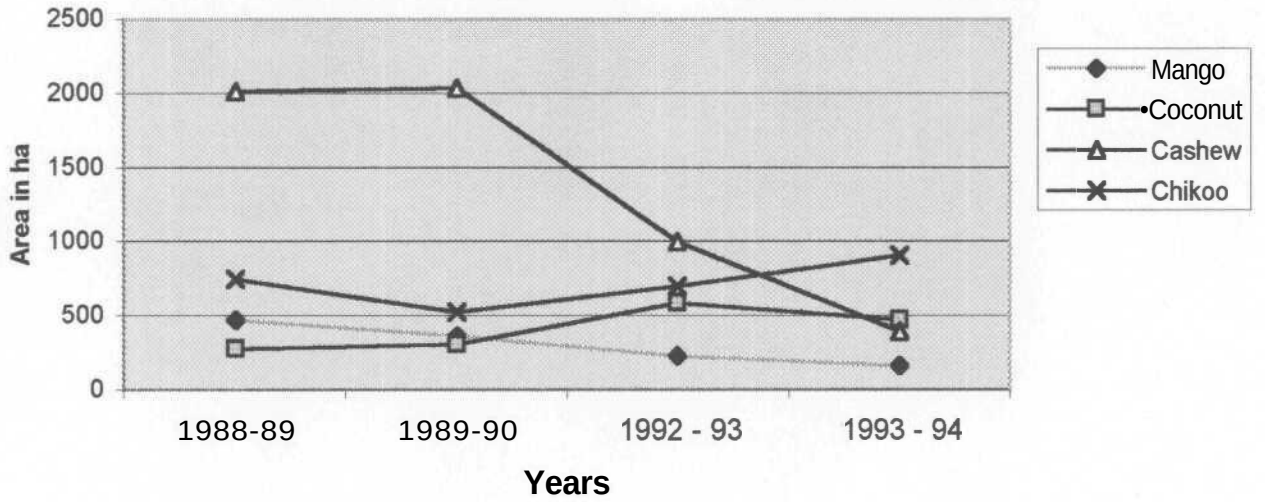


Fig. 10: trends in area under fruits in Pune district, Maharashtra

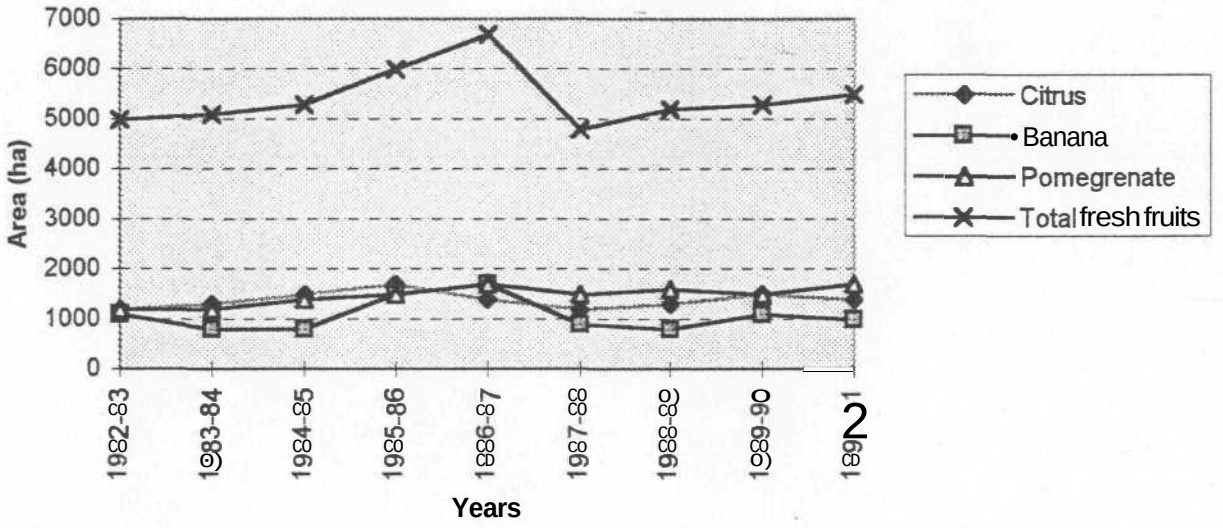


Fig. 11: Trends in area under fruits in Nagpur district, Maharashtra

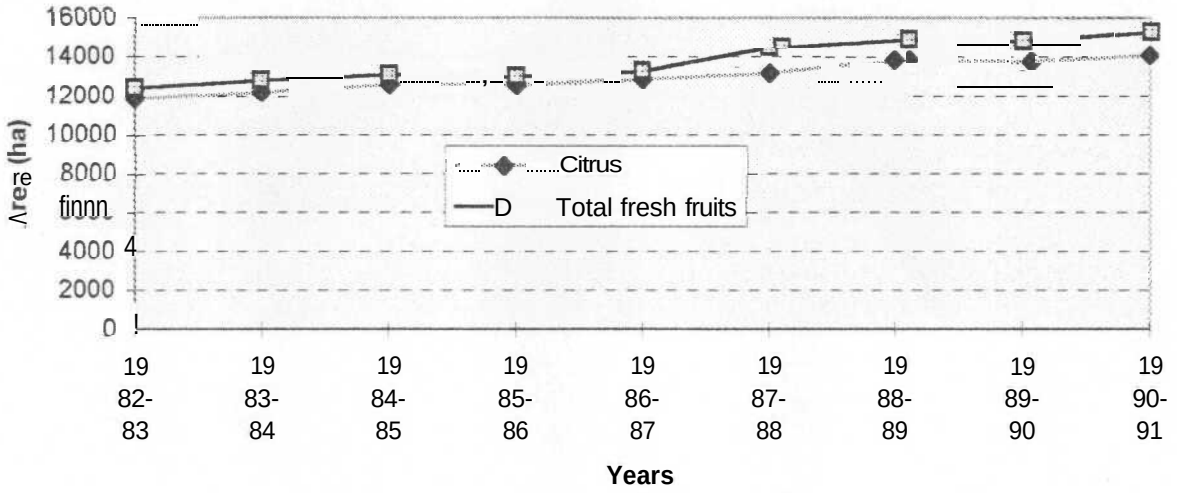


Fig. 12: Trends in area under vegetables in Maharashtra state

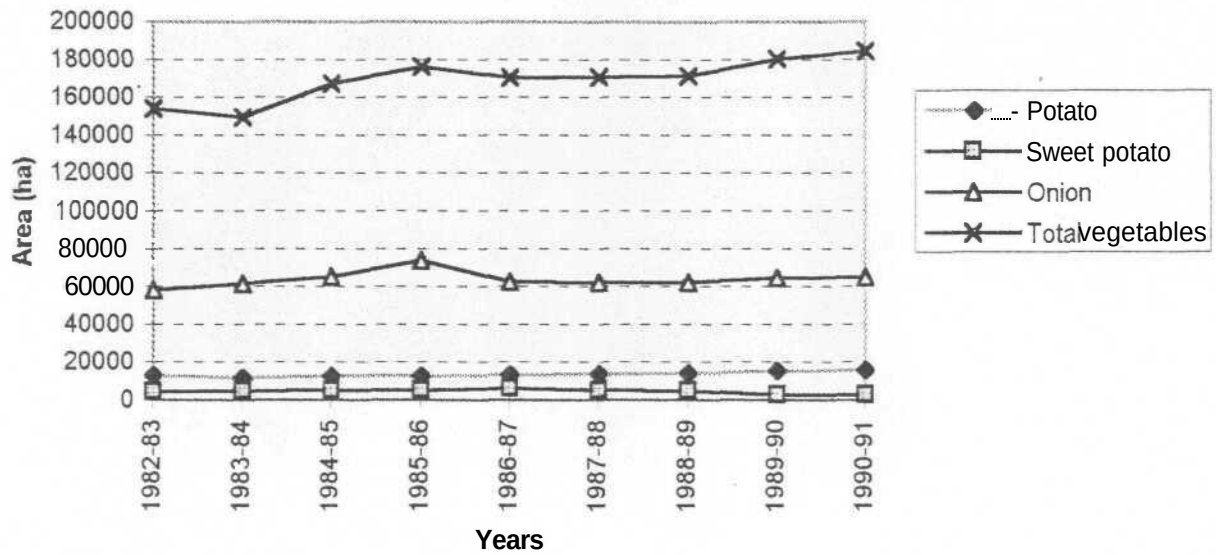


Fig. 13: Trends in area under vegetables in Pune district, Maharashtra

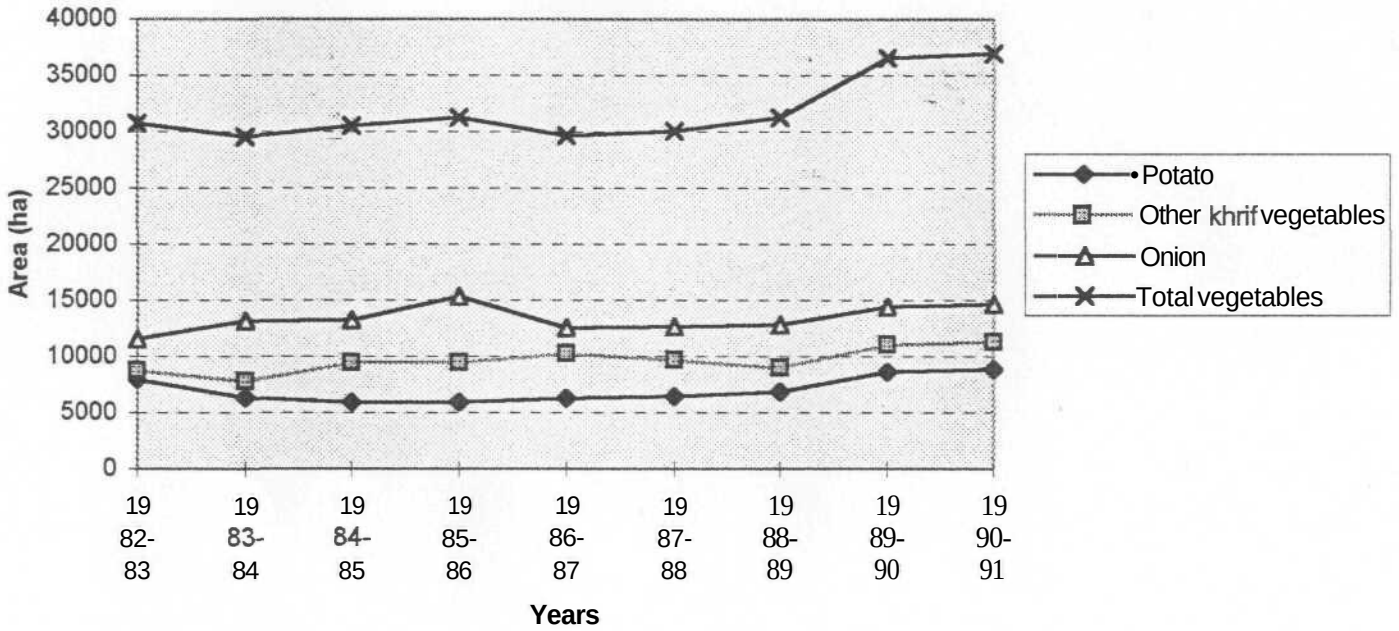


Fig. 14: Trends in area under vegetables in Nagpur district, Maharashtra

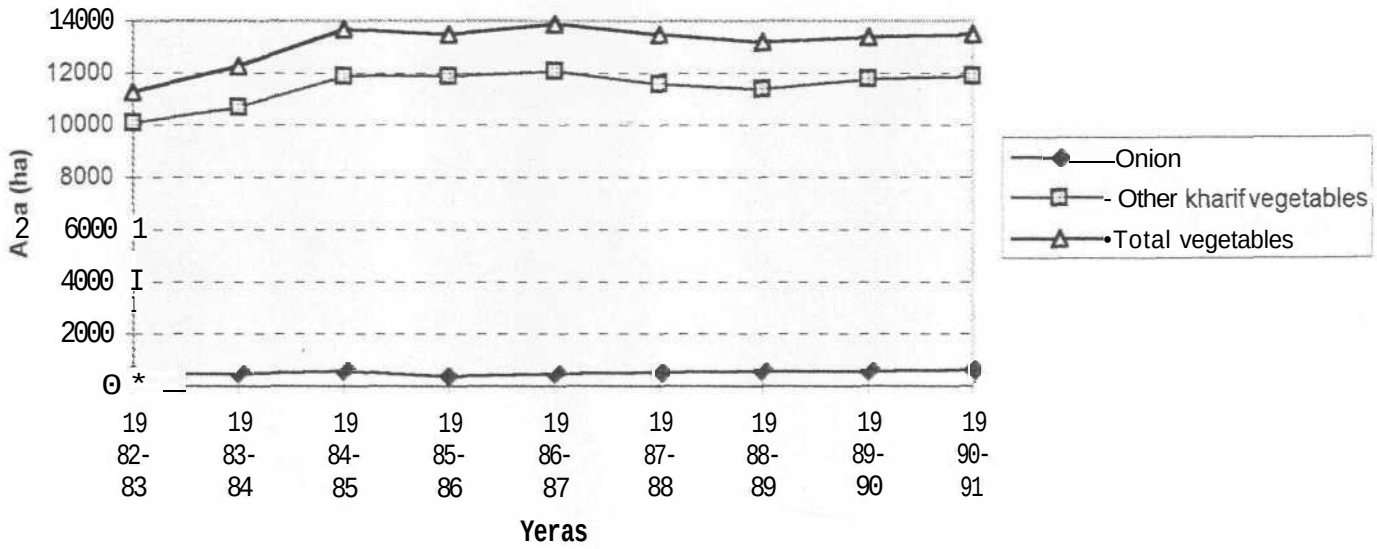


Fig. 15

MAHARASHTRA

FRUIT
COMBINATION REGIONS

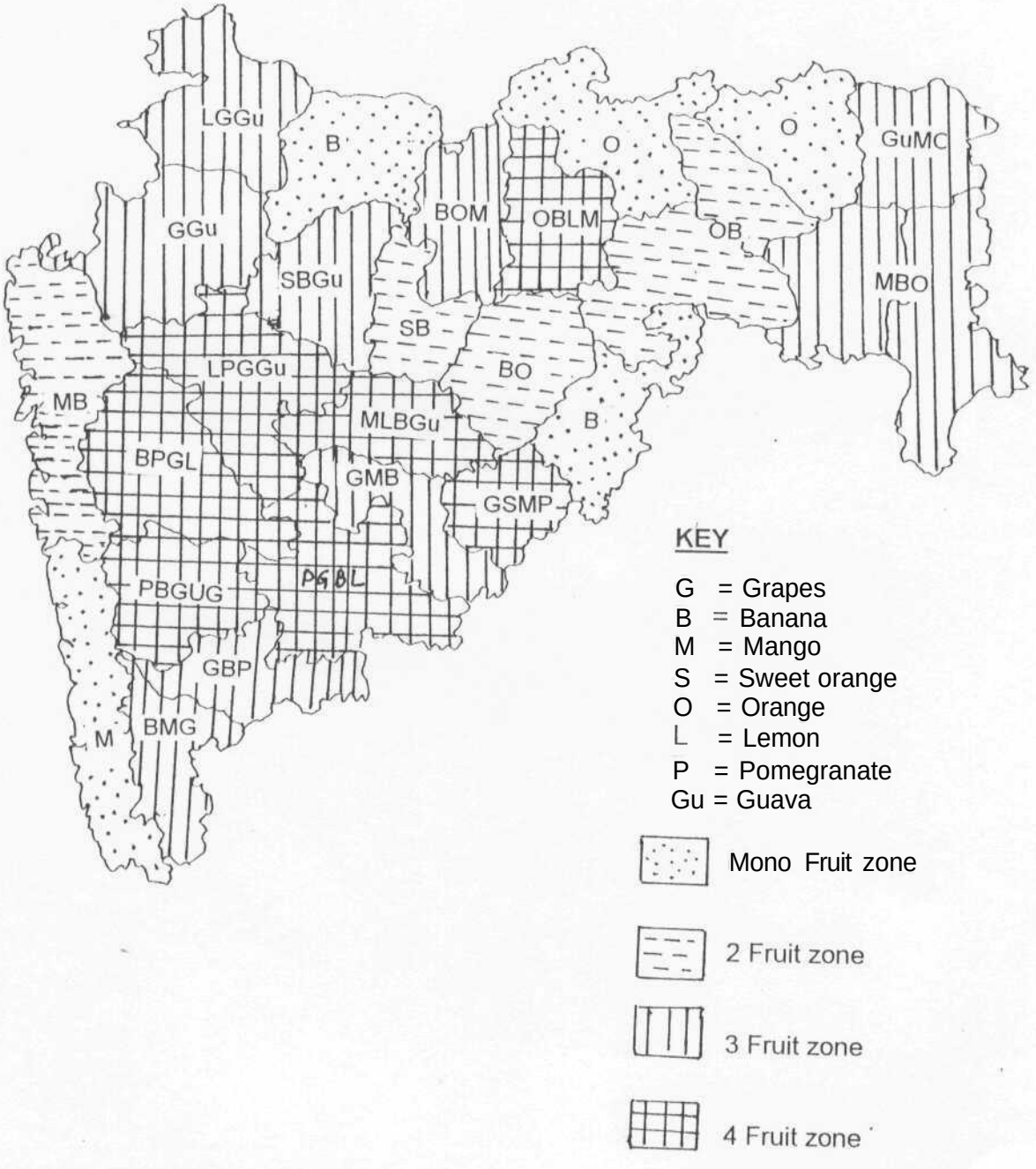
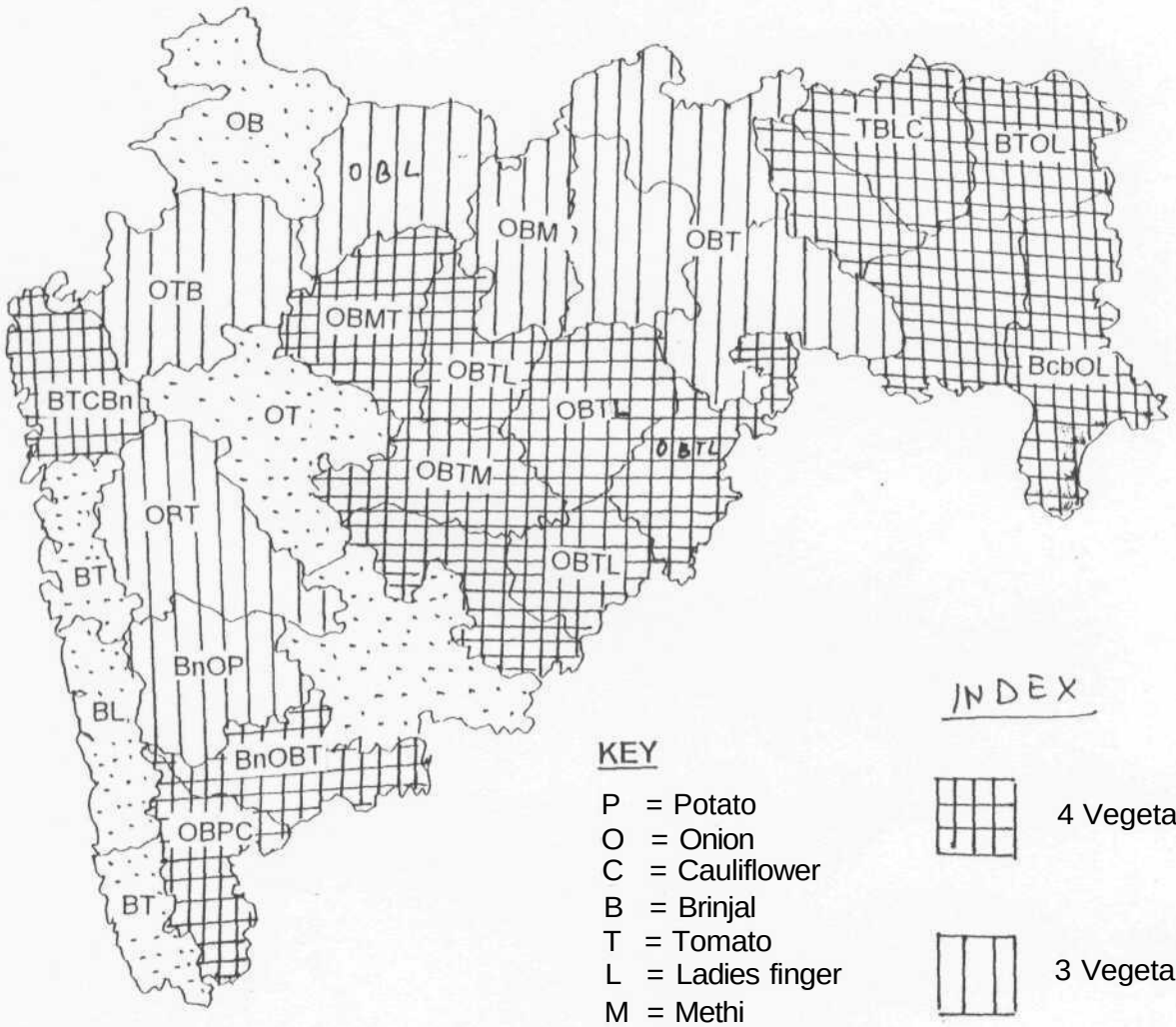


Fig. 16

MAHARASHTRA

VEGETABLE COMBINATION REGIONS



INDEX

KEY

P = Potato
O = Onion
C = Cauliflower
B = Brinjal
T = Tomato
L = Ladies finger
M = Methi
Bn = Beans
Cb = Cabbage

4 Vegetable zone

3 Vegetable zone

2 Vegetable zone

References:

Mathur, A,R. 1966. Economics of vegetable production and marketing in and around Hyderabad. M.Sc(Agri) Thesis submitted to APAU.

Palani Swami, S and V. Rajagopalan. 1978. Labour requirement of crops. Madras Agri. Journal 65(8): 520-523.

Singh, M. K. 1982. Production and marketing of vegetables around Hyderabad. M. Sc. (Agri. Thesis APAU, Hyderabad.

Subramanyam, K.V. 1989. Economics of cultivation of horticulture crops in South India. Technical Bulletin No. 7 IIHR, Banglore p. 44-61

Sudha, M and Y.V.R. Reddy. 1988. Economics of sweet orange cultivation Indian Horticulture 33 (3):27629.

Sudha, M and Y.V.R. Reddy. 1992. Marketing of Guava. Indian Horticulture, 37 (1):25627.