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# PROGRESSIVE ACHIEVEMENT OF HORTICULTURAL CROPS IN INDIA

***Sangita Warade[1] & Kiran Jayade[2]***

*[1]Assistant Professor (Agri-Business Management), School of Agri-Business Management, College of Agriculture under the Juridication of Dr. Panjabrao Deshmukh Krishi Vidyapeeth (Dr. PDKV), Nagpur, Maharashtra, India*

*[2]Assistant Professor, College of Agriculture under the Juridication of Dr. Panjabrao Deshmukh Krishi Vidyapeeth (Dr. PDKV), Nagpur, Maharashtra, India*

## *ABSTRACT*

*Fruits, Vegetables, Flowers, Plantation crops and Spices are major Horticultural crops in India. The horticulture production is estimated as 283 million tonnes in year 2015- 16. China ranked first in fruit production with 154.364 million tonnes (MT) in 2013, followed by India (82.631 MT). The vegetable production also boosted from 165 lakh tons in year 1950-51 to 1683 lakhs tons in year 2014-15. The demand for flowers is increasing globally at approximately 10 percent per annum. The Indian floriculture industry is growing at a higher rate in Karnataka, Tamil Nadu and Andhra Pradesh states. India shares 0.61 percent in world floriculture industry. Plantation crops cover around 2 per cent of the total area under cultivation, but the return from the plantation crop is around Rs. 16,000 million and which contributes 12.72 per cent in the total export returns of all commodities and which is 75 per cent of total earnings from the export of agricultural produces. India is the world's largest producer, consumer and exporter of spices. India shares half in global trade of spices. India produces 75 of the 109 varieties of spices listed by ISO. So, it is necessary to identify achievement in Horticultural crops over time to get guideline for framing policies. The data are collected from the Indian Agricultural Statistic Research Institute on the Area, Productivity and Production of the Horticultural crops for the year 1991-92 to 2014-15 in the Area, Productivity and Production of the Horticultural crops in India.*

*The results show that that the good Horticultural crop production achieved in India in last 25 years. The second decade has shown good growth as compared to first decade. The growth in the area (3.06 %), productivity (1.56%) and production (4.67 %) of the Horticultural crops in India is positive and significant. The production of the flowers achieved at the rate 11.91 per cent per annum, which is followed by vegetables (1.53 per cent). Instability Index shows that the Production of Horticultural crops in India was more unstable as compared to an Area and Productivity of Horticultural crops during the period from 1995-96 to 2014-15. Amongst the crop groups, the instability was seen more in area, productivity, production of flowers, followed by fruits and vegetables (ranges from 25 to 110 per cent). The previous years' area and productivity made a positive effect on next years' production of Horticultural crops in overall period. The effect of area of production is the highest in vegetables (22.24 thousand tons per thousand hectare of area), followed by fruits (12.73 thousand tons per thousand hectare of area). The productivity of all crops except plantation crops has shown positive contribution in production.*

***KEYWORDS:*** *CGR, Instability, Horticultural Crop, India, Trend*

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## 1. INTRODUCTION

Almost all fruits are rich source of Vitamin C. In Schools, the students' diet plan is designed as per nutrition values. Fruits'pProduction has been increased over the period of time in India. Fruits' production contributed 11.60 percent in world production. The fruits like Apple, Apricots, Mangos, Grapes, Banana, Orange, Fresh, Avocados, Guava, Sapota Lichi, Papaya and Water Melons are major fruit crops grown in India. During the era of the drought and famine, getting sufficient fruits was also difficult to human life, With the growth in production of fruits, now the consumers are more consciousness and choosy about the size, colour, texture and nutritional content in the fruits. Consumer want sorted, graded, cleaned and variety of fruits. It is important to develop the stable production of fruits in the future to fulfill the need of the growing population. China ranked first in fruit production with 154.364 million tonnes (MT) in 2013, followed by India (82.631 MT), Brazil (37.774 MT), USA (26.986 MT), Spain (17.699 MT), Mexico (17.553 MT), Italy (16.371 MT) and Indonesia (16.003 MT). With the weak productivity, India does better than China and Spain. Amongst the states of the India, the major fruit-producing states are Andhra Pradesh and Maharashtra, accounting for 19% and 18% of total production respectively, followed by Gujarat, Karnataka, Uttar Pradesh, Bihar, West Bengal, Madhya Pradesh, Kerala, Assam, J&K, Orissa and Punjab.

Vegetables are daily food needs. No one can complete his meal without vegetables. The Indian population is now more conscious about the nutrition value of vegetables. In Schools, the students' diet plan is designed as per nutrition values. Vegetables Production has been increased over the period of time in India. Vegetables are the best source of the vitamins and minerals that contribute to growth and the maintenance of good health. Vegetables are also rich in nutrients called antioxidants, which recover cellular damage and help to prevent heart disease, cancer, heart attack. With the increase in irrigated area in India from 17 percent in year 1950-51 to 47 percent in year 2015-16, the vegetable production also boosted from 165 lakh tons in year 1950-51 to 1683 lakhs tons in year 2014-15. During the shortage period, getting sufficient vegetables was important to human life, With the growth in production of vegetables, now the consumers are more consciousness and choosy about the size, colour, texture and nutritional content in the vegetables. Consumer want sorted, graded, cleaned and variety of vegetables. It is important to develop the stable production of vegetables in the future to fulfill the need of the growing population.

Now days, flowers have been an essential part of life and it is inevitable in people's celebrations like Weddings, graduations, funerals, Mother's Day, St. Valentine's Day, Easter and Christmas. In a few decades, flower production is converted from hobby to business. The business of floriculture has emerged as a hi-tech business under the controlled climatic conditions (greenhouse). Floriculture in India is getting higher importance. Commercialized Floriculture is an important part of the export. The liberalized policy of the WTO has acted as a path for the development of export-oriented flowers production. The world floriculture trade depends on quality and demand of the flowers. Developed countries in Europe, America, and Asia account for more than 90% of demand. The major flowers producing countries are Netherlands, USA, Japan, Germany and Canada. The demand for flowers is increasing globally at approximately 10 percent per annum.

The Indian floriculture industry is growing at a higher rate. Karnataka, Tamil Nadu, Andhra Pradesh are major states in the country. India shares 0.61 percent in world floriculture industry. Out of total cut rose production, Karnataka State contributes approx 75% in flower production which is followed by Maharashtra, Tamil Nadu, Bihar, West Bengal, Uttar Pradesh, Haryana, Punjab, Jammu and Kashmir, Andhra Pradesh and Madhya Pradesh.

The Commercially grown Plantation crops are the tea, coffee, cocoa, coconut, rubber, oil palm, arecanut, palmyrah, cashew, cinchona etc. Plantation crop play significant role in Indian Economy and contributes in export of the India. Plantation crops contributes 2 per cent in the total area under cultivation (3.82 percent of total crop area) still it gives return of Rs. 16,000 million and shared 12.72 per cent of the total export returns of all commodities, i.e. 75 per cent from the export of agricultural produces. The plantation crop industry gives direct as well as indirect employment to many people. The Tea industry creates direct and indirect employment for 20 lakhs people combine. The Cashew industry generates employment for the 3 lakhs people, while 2 lakhs farmers are employed in cashew cultivation. Plantation industry is the base of many by-product industries and also the support of many rural industries. Plantation crops conserve the soil and ecosystem.

The Spices are a good source of minerals. Spices can be any part of the tree like seeds, bark, leaves, flowers, fruits, etc. Spices are used for coloring and flavoring the food. Spices have antioxidant property. Spices are also used as preservatives. The Spice business has been spread throughout South Asia and Middle East since 2000 BCE with cinnamon and black pepper, and in East Asia with herbs and pepper. India is the largest producer, consumer and exporter of the spices in the Worlds' Spice consumption. India shares around 50% in world trade of spices. India produces 75 of the 109 varieties of species listed by the ISO. Indians' Spice Export is expected to raise up to US$3 billion by 2016-17. The major buyers of Indian spices have been the United States, China, Vietnam, UAE, Malaysia, UK, Germany, Saudi Arabia, Thailand and Sri Lanka. India, known as the home of spices, boasts a long history of trading with the ancient civilization of Rome and China. Today, Indian spices are the most famous for aroma, texture, taste and medicinal value. India has the largest domestic market for spices in the world. India is the major producer of dried Red chilli in the world. India has been the second largest producer of the Garlic in the world after China. In the India, the Andhra Pradesh State is largest spice producing state, next is Rajasthan. Rajasthan State is the largest producer of Red Chili's in India. The Jammu & Kashmir is largest nut producing state (88.4%) in the India.

Considering the importance of the study, the present paper on 'Progressive Achievement of Horticultural Crops in India' Production in India' is taken to find the growth rate and instability indices in area, production and productivity and also to know the impact of the area and productivity on the production. The objectives of the paper are as follows;

## 2. OBJECTIVES

The objectives of the research paper are as follows

- To study the Production scenario of Horticultural crops' groups in India
- To estimate the growth (CGR) in the Area, Productivity and Production of the selected Horticultural crops' groups in India;
- To find the stability of the Area, Productivity and Production of selected Horticultural crops' groups in India;
- To estimate the effect of Area and Productivity on Production of the Horticultural crops' groups in India;

## 3. METHODOLOGY

This methodology will throw light on the source of data, period of the data, crop included, methods considered to achieve the objectives.

### Source of the Data

The data are collected from the Indian Agricultural Statistic Research Institute (IASRI) on the parameter of the Area, Productivity and Production of the Horticultural crops' groups.

### Period of the Data

The yearly data is collected from the year 1991-92 to 2014-15 on the variables via; Area, Productivity and Production of the Horticultural crop groups like Fruits, Vegetables, Flowers, Plantation crops and Spices.

### Analytical Tools

The analytical tools are used to find the growth, instability and effect of area and productivity on production are as follows;

### Estimation of Growth in Horticultural Crops' Groups

In the present research paper, the Compound Growth Rates in Area, Productivity and Production of Horticultural crops are estimated as per the following formula

The exponential function of the following type was used.

$$Y=ab^t$$

Where

Y = Area, Productivity and Production

t = time period in the years

b = trend value (coefficient)

a = intercept.

Compound Growth Rate= (Antilog b-1) x 100. (Chand and et al. 2012)

The significance of the growth in the selected crop groups is tested with the help of 't' test.

For getting normal base year, the triennial averages are taken as the base year.

### Estimation of Instability

The instability of Area, Productivity and Production of Horticultural crops' groups is estimated by the Coefficient of Variation and Cuddy Della Index is used. The formula is as given fallows

- Coefficient of Variation (CV): Standard Deviation / Mean the following Cuddy Della Index (Ix) is used in comparison with CV to avoid over estimation.
- Cuddy Della Index (Ix) is as follows:

$$I_x = CV\sqrt{(1-\overline{R}^2)}$$

Where, CV = Coefficient of Variation ($\sigma/\overline{X}$)

$\overline{R}^2$ = Adjusted coefficient of multiple determination

### Effect of Area and Productivity on Production Estimation

To find the impact of Area and Productivity on Production of Horticultural crops' groups in India, the Crop Acreage Response Model is used. It estimates the effect of lagged years' area and productivity on the current production of the Horticultural crops is estimated.

$$Y = a + b_1A_{t-1} + b_2P_{t-1} + u$$

Y = Production of Horticultural crops' groups (000 tons)

a = Intercept

$A_{t-1}$ = Area under Horticultural crops' groups (000 ha)

$P_{t-1}$ = Productivity of Horticultural crops' groups (ton/ha)

$b_i$ (1 to 2)= Coefficients of respective variables

## 4. RESULTS AND DISCUSSION

This section will focus of the extracts of the data analysis regarding the progress of the Horticultural crops' groups in India are presented and discussed in this section in the line of objectives mentioned.

### Production Scenario of Horticultural Crops in India

The table number 1 depicts the area, production and productivity scenario of the Horticultural crop groups in India. The table indicates the area, production and productivity of Horticultural crops groups in India over the decade since 1991-92 and the current year 2014-15.

**Table 1: Horticultural Production in India**

| Area: Area 000 ha, Production 000 Tons, Productivity tons / ha | | | | | |
|---|---|---|---|---|---|
| **Crop** | **Particulars/Year** | **1991-92** | **2001-02** | **2011-12** | **2014-15** |
| Fruits | Area | 3101 | 3889 | 6690 | 6852 |
| | % change | 100 | 125 | 216 | 221 |
| | Production | 34830 | 43781 | 77529 | 86360 |
| | % change | 100 | 126 | 223 | 248 |
| | Productivity | 11.18 | 11.27 | 11.59 | 12.65 |
| | % change | 100 | 101 | 104 | 113 |
| Vegetables | Area | 5161 | 6166 | 8896 | 9381 |
| | % change | 100 | 119 | 172 | 182 |
| | Production | 63868 | 89096 | 155022 | 164461 |
| | % change | 100 | 139 | 243 | 258 |
| | Productivity | 12.46 | 14.44 | 17.42 | 17.53 |
| | % change | 100 | 116 | 140 | 141 |

| Table 1 Contd., | | | | | |
|---|---|---|---|---|---|
| Area: Area 000 ha, Production 000 Tons, Productivity tons / ha | | | | | |
| **Crop** | **Particulars/Year** | **1991-92** | **2001-02** | **2011-12** | **2014-15** |
| Flowers | Area | 57 | 91 | 580 | 785 |
| | % change | 100 | 162 | 1027 | 1389 |
| | Production | 247 | 609 | 1965 | 3024 |
| | % change | 100 | 246 | 796 | 1224 |
| | Productivity | 4.37 | 7.07 | 3.89 | 3.86 |
| | % change | 100 | 162 | 89 | 88 |
| Plantation Crops | Area | 2431 | 2943 | 3508 | 3618 |
| | % change | 100 | 121 | 144 | 149 |
| | Production | 8710 | 9617 | 15117 | 16806 |
| | % change | 100 | 110 | 174 | 193 |
| | Productivity | 3.57 | 3.27 | 4.29 | 4.65 |
| | % change | 100 | 91 | 120 | 130 |
| Spices | Area | 2231 | 2980 | 3076 | 3134 |
| | % change | 100 | 134 | 138 | 140 |
| | Production | 2297 | 3518 | 5682 | 5853 |
| | % change | 100 | 153 | 247 | 255 |
| | Productivity | 1.03 | 1.18 | 1.85 | 1.87 |
| | % change | 100 | 115 | 180 | 182 |
| Total Hort. crops | Area | 12961 | 16185 | 22921 | 23770 |
| | % change | 100 | 125 | 177 | 183 |
| | Production | 109872 | 146787 | 255552 | 276556 |
| | % change | 100 | 134 | 233 | 252 |
| | Productivity | 8.47 | 9.08 | 11.15 | 11.64 |
| | % change | 100 | 107 | 132 | 137 |

**Note:** The horticulture production is estimated as 283 million tonnes in year 2015- 16

The area of the Horticultural crops in the country has increased from 12961 thousand hectares to 23770 thousand hectares, i.e. net area increased by 183 per cent. The production also increased from 1098.72 lakh tons to 2765.56 lakh tons i.e. net increased by 253 per cent. The productivity of Horticultural crops in India has increased from 8.47 tons per hectare to 11.64 tons per hectare, i.e. net increased by 137 per cent. The more increase in area and production in seeing between year 2001-02 to 2011-12 which is increased by 177 and 233 per cent.

Amongst the crops, the area and production of flowers has grown spontaneously by 1027 and 796 per cent respectively over the period of 25 years. But the productivity of the spices and vegetables has shown good achievement of productivity, i.e. by 180 and 140 percent respectively over the selected period.

Overall, the good Horticultural crops production achieved in India in last 25 years.

## Growth in Horticultural Crops in India

The table no. 2 represents the compound growth rates of area, production and productivity of Horticultural crops in India for the decades 1995-96 to 2004-05 and for the decade 2005-06 to 2014-15 as well as for whole period of said two decades.

The growth rate of the Horticultural crops' area was 3.22 percent, significantly for the first decade. While it was 2.72 per cent significantly for second decade. For whole period it was 3.06 percent significantly. Which shows the growth in area of Horticultural crops was smoother and positive for the whole period.

The Horticultural crops' productivity was decreased by 0.48 percent in first decade non-significantly and by 2.05 percent per annum in the second decade, significantly. For the whole period, the growth rate of productivity in Horticultural crops was positive and significant and it was 1.56 percent per annum.

The production growth in Horticultural crops of India was 2.73 percent, 4.81 percent and 4.67 percent for first decade, second decade and for whole period respectively. It was positive and significant at 1 per cent.

**Table 2: Compound Growth Rate of Area, Productivity and Production of Horticultural Crops in India**

| Crop | Particulars | 1995-96 to 2004-05 (First Decade) | 2005-06 to 2014-15 (Second Decade) | 1995-96 to 2014-15 (Whole Period) |
|---|---|---|---|---|
| Fruits | Area | 3.33*** | 2.57*** | 4.30*** |
| | Productivity | -1.62** | 2.20*** | 0.33 |
| | Production | 1.66*** | 4.82*** | 4.65*** |
| Vegetables | Area | 2.08*** | 2.97*** | 3.23*** |
| | Productivity | 1.14* | 1.60*** | 1.53*** |
| | Production | 3.25*** | 4.61*** | 4.81*** |
| Flowers | Area | 4.56** | 26.96*** | 13.95*** |
| | Productivity | 3.50 | -5.76** | -1.79* |
| | Production | 8.26*** | 19.65*** | 11.91*** |
| Plantation Crops | Area | 1.25*** | 1.70*** | 1.47*** |
| | Productivity | 0.02 | 3.75*** | 1.58*** |
| | Production | 1.27 | 5.51*** | 3.08*** |
| Spices | Area | 6.20*** | 3.44*** | 0.99 |
| | Productivity | -0.01 | 2.15*** | 3.31*** |
| | Production | 6.19*** | 5.65*** | 4.33*** |
| Total Horticultural Crops | Area | 3.22*** | 2.72*** | 3.06*** |
| | Productivity | -0.48 | 2.05*** | 1.56*** |
| | Production | 2.73*** | 4.81*** | 4.67*** |

**Note:** * = Significant at 10 percent (table T value is 1.833 for decades and 1.729 for the whole period)

** = Significant at 5 percent (table T value is 2.262 for decades and 2.093 for the whole period)

*** = Significant at 1 percent (table T value is 3.250 for decades and 2.861 for the whole period)

Amongst, different selected crops, the growth in the area of flowers is overwhelming i.e. 13.95 percent, is followed by fruits i.e. 4.30 per cent. The productivity of the of all crops shown good growth except flowers. The productivity of the flowers is declining over the period of time. The good growth is, productivity is seen in spices (3.31 per cent), it is followed by vegetables. The production of the flowers achieved at the rate 11.91 per cent per annum, which is followed by vegetables (1.53 per cent).

The second decade has shown good growth as compared to first decade. Overall, the growth in the area (3.06 %), productivity (1.56%) and production (4.67 %) of the Horticultural crops in India is positive and significant.

## Instability in Horticultural Crops of India

The table no.3 displayed the Instability in Area, Productivity and Production of Horticultural crops in India for the decades 1995-96 to 2004-05, for the decade 2005-06 to 2014-15 and for the whole period of said two decades. Coefficient of Variation and Cuddy- Della Index are showing instability in Area, Productivity and Production.

The instability indicates the variation in the selected indicator over the period of the study. The Cuddy Della Index indicates instability at a controlled level.

The Coefficient of Variation in area of Horticultural crops was 10.80, 8.42 and 17.98 per cent in the first decade, second decade and for whole period, respectively, while the CD index for the area in Horticultural crops was 4.54, 2.33 and 3.30 per cent in the first decade, second decade and for whole period respectively.

In case of Productivity of Horticultural crops in India, the Coefficient of Variation was 5.61, 6.34 and 11.03 per cent in first decade, second decade and for whole period respectively, while the CD index for productivity in Horticultural crops was 5.44, 1.46 and 5.81 per cent in the first decade, second decade and for whole period respectively.

The Horticultural crop production was also varying over the selected period. The Coefficient of Variation was 9.05, 14.35 and 28.11 per cent in the first decade, second decade and for whole period, respectively, while the CD index for productivity in Horticultural crops was 4.00, 2.26 and 6.83 per cent in the first decade, second decade and for whole period respectively.

**Table 3: Instability in Area, Productivity and Production of Horticultural Crops in India**

| Crops | Indices | Area | | | Productivity | | | Production | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1995-2004 | 2005-14 | 1995-2014 | 1995-2004 | 2005-14 | 1995-2014 | 1995-2004 | 2005-14 | 1995-2014 |
| Fruits | CV | 12.44 | 8.83 | 25.32 | 7.08 | 8.13 | 7.83 | 6.42 | 14.39 | 28.67 |
| | Cuddy-Della index | 6.81 | 4.49 | 6.64 | 5.25 | 4.44 | 7.54 | 3.92 | 2.33 | 8.43 |
| Vegetables | CV | 6.61 | 9.09 | 19.29 | 5.57 | 5.17 | 9.57 | 11.24 | 13.83 | 28.51 |
| | Cuddy-Della index | 2.16 | 1.89 | 3.80 | 4.43 | 2.00 | 3.38 | 5.96 | 2.77 | 6.66 |
| Flowers | CV | 19.57 | 77.10 | 110.54 | 28.36 | 23.11 | 27.84 | 25.76 | 60.33 | 85.58 |
| | Cuddy-Della index | 13.53 | 36.95 | 69.19 | 25.80 | 15.50 | 26.18 | 10.82 | 24.58 | 47.23 |
| Plantation Crops | CV | 4.30 | 5.86 | 9.09 | 9.64 | 13.37 | 14.13 | 11.71 | 19.08 | 22.74 |
| | Cuddy-Della index | 2.02 | 2.83 | 2.72 | 9.63 | 6.97 | 10.15 | 10.91 | 9.33 | 12.56 |
| Spices | CV | 28.72 | 11.40 | 21.96 | 6.58 | 7.30 | 21.36 | 22.28 | 18.36 | 27.29 |
| | Cuddy-Della index | 20.71 | 5.05 | 21.32 | 6.58 | 3.40 | 8.82 | 11.91 | 7.95 | 11.32 |
| Total Horticultural Crops | CV | 10.80 | 8.42 | 17.98 | 5.61 | 6.34 | 11.03 | 9.05 | 14.35 | 28.11 |
| | Cuddy-Della index | 4.54 | 2.33 | 3.30 | 5.44 | 1.46 | 5.81 | 4.00 | 2.26 | 6.83 |

Amongst the crop groups, the instability was seen more in area, productivity, production of flowers, followed by fruits and vegetables (ranges from 25 to 110 per cent). Overall, Instability Index shows that the Production of Horticultural crops in India was more unstable as compared to an Area and Productivity of Horticultural crops during the selected period.

The Coefficient of Variation shows that variations of the almost all parameters is higher than the variation showed by Cuddy Della Index.

## Effect of Area and Productivity on Production of Horticultural Crops in India

The table.4 depicts the effect of previous years' Area and Productivity of selected crops on the value of next years' Horticultural crops Production in India for the both decades as well as for whole period of the two decades.

The results show that the lagged value of the area has given positive effect on next years' production significantly. The regression coefficient of area was 7.76 percent, 10.35 per cent and 11.41 per cent, significantly for the first decade, second decade and whole period. While the lagged productivity of Horticultural crops has contributed on production significantly in overall period.

**Table 4: Crop Acreage Response Model of Horticultural Crops in India**

| Crops | Particulars | 1995-2004 | 2004-14 | 1995-2014 |
|---|---|---|---|---|
| Fruits | Productivity | 934.04 | -2244.96 | 2678.17*** |
| | Area | 9.22** | 18.42*** | 12.73*** |
| | Intercept | -1571.93 | -15450.34 | -35044.04*** |
| Vegetables | Productivity | 434.27 | 7480.48 | 1620.17 |
| | Area | 21.22* | 17.03** | 22.24*** |
| | Intercept | -44244.90 | -121719.83** | -66719.72** |
| Flowers | Productivity | 37.38** | 181.36 | 34.48 |
| | Area | 8.12*** | 3.78** | 3.71*** |
| | Intercept | -380.67* | -488.21 | 131.44 |
| Plantation Crops | Productivity | -2598.30 | -3593.03 | -161.80 |
| | Area | 7.97 | 19.74* | 8.71*** |
| | Intercept | -3908.21 | -38432.78** | -14716.94*** |
| Spices | Productivity | 6980.44 | 9415.55** | 3158.06*** |
| | Area | 0.89* | -1.28 | 0.69*** |
| | Intercept | -7185.38 | -7620.26** | -2260.74** |
| Total Horticultural Crops | Productivity | 7788.85 | 23534.95 | 17261.93*** |
| | Area | 7.76*** | 10.35 | 11.41*** |
| | Intercept | -46236.23 | -233528.92** | -188365.22*** |

**Note:** * = Significant at 10 percent (table T value is 1.833 for decades and 1.729 for whole period)

** = Significant at 5 percent (table T value is 2.262 for decades and 2.093 for whole period)

*** = Significant at 1 percent (table T value is 3.250 for decades and 2.861 for whole period)

Amongst the crops, the effect of area on production is the highest in vegetables (22.24 thousand tons per thousand hectare of area), followed by fruits (12. Thousand tons per thousand hectare of area). The productivity of all crops except plantation crops has shown positive contribution in production.

The effect of past productivity was significant. The previous years' area made a positive effect on next years' production of Horticultural crops in overall period.

## 5. CONCLUSIONS

It is concluded from the results that the good Horticultural crops production has been achieved in India in last 25 years. The second decade has shown good growth as compared to first decade. The growth in the area (3.06 %), productivity (1.56%) and production(4.67 %) of the Horticultural crops in India is positive and significant. The production of the flowers is achieved at the rate 11.91 per cent per annum, which is followed by vegetables (1.53 per cent). Instability Index shows that the Production of Horticultural crops in India was more unstable as compared to Area and Productivity of Horticultural crops during the period from 1995-96 to 2014-15. Amongst the crop groups, the instability was seen more in area, productivity, production of flowers, followed by fruits and vegetables (ranges from 25 to 110 per cent). The previous years' area and productivity made a positive effect on next years' production of Horticultural crops in overall period. The effect of area in production is highest in vegetables (22.24 thousand tons per thousand hectare of area), followed by fruits(12.73 thousand tons per thousand hectare of area). The productivity of all crops except plantation crops has shown positive contribution in production.

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