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"An Empirical Study on Performance of Major Fruit Producing States of India: A Case Study of Post Reform Period"

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Abstract

Horticultural development was not a priority sector in India until recent years. It was in the post-1991 period that a focused attention was given to horticulture development through an enhancement of planed allocation and knowledge-based technology. The changing consumption pattern has resulted in decline in per capita household demand for food grains but has dramatically increased the consumption demand of horticultural products especially fruits. India has the advantage of diverse agro-climatic conditions which enables it to produce a wide range of horticultural crops round the year. Presently, India is the second largest producer of fruits and vegetables in the world after China. In this paper an attempt has been made to analyse the decadal growth in area and production of fruits and examine the percentage share of fruits to total horticulture output in major fruit producing states of India. It is found rom the study that the share of area under the fruit crop has increased from 24.17 percent in 2001-2002 to 29.82 percent in 2013-2014, but share of fruit production in total horticultural produce in 2001-2002 was 29.50 percent which has only increased up to 32.8 percent in 2013-2014, which means that the percentages area in total horticulture has increased by 6% but the production has increased by only 3.5 percent for the same period. Furthermore, it is found that the decadal growth rate (DGR) has witnessed large growth variations among majority of the fruit growing states over the two decades, states like Andhra Pradesh, Gujarat, Meghalaya and Goa registered negative growth during 1991-2001, however these states improved their performance during second decade and registered higher DGR. While states like Nagaland, Madhya Pradesh, Tripura witnessed positive growth rates during 1991-2001 but could not sustain their growth in the second decade and registered negative growth rates. Among all major fruit growing states Nagaland and Goa were exceptional cases in the study as Nagaland a small state by its area showed the highest DGR between 1991-2001 decade, similarly Goa again a small state by its population and size showed tremendous increase in DGR during 2001-2011.

Keywords: Area, Growth, Fruits, Horticulture, India, Production, Productivity.

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I. Introduction

It is a stated fact that the economic growth of most of the underdeveloped nations has been going through a process of economic reforms since the formation of World Trade Organization (WTO). They are gradually adopting trade liberalisation as a policy measure, which has posed new challenges and opportunities to the agriculture dominated countries. Horticultural development was not a priority sector in India until recent years. In the period 1948-80, the main focus in the agriculture sector was on cereals in Indian context. Much planned efforts had not been made for horticultural development after independence, except for some technical support and development efforts for specific commodities like spices, coconut and potato. During 1980-92 gradually there was consolidation of institutional support and a planned process for the development of horticulture sector in India.

It was in the post-1991 period that a focused attention was given to horticulture development through an enhancement of planed allocation and knowledge-based technology. Though, this decade being called a "golden revolution" in horticultural production the productivity of horticultural crops has increased marginally from 7.5 tonnes per hectare in 1991-92 to 8.4 tonnes per hectare in 2004-05 **(NHB, 2005).** National Horticulture Mission was launched in 2005-06 by the Government of India with a mandate to promote integrated development in horticulture, to help in coordinating, stimulating and sustaining the production and processing of fruits and vegetables and to establish a sound infrastructure in the field of production, processing and marketing with a focus on post-harvest management to reduce losses **(Mittal 2007).**

Horticulture is the fastest growing sector within agriculture on the basis of economic prosperity in India that has provoked marked changes in the life styles, tastes and preferences and the consumption habits from traditional food commodities to processed and high value commodities (Murthy, 2000, Meenakshi, 1996 and Rao, 2000). The changing consumption pattern has resulted in decline in per capita household demand for food grains but has dramatically increased the consumption demand of horticultural products especially fruits**(Radhakrishna and Ravi, 1992, Kumar and Mathur, 1996, Murthy, 2000, and Kumar and Kumar, 2003).**Horticulture plays an important role in country's nutritional security as well,including poverty alleviation and employment generation **(Anonymous, 2011).**

Presently, India is the second largest producer of fruits and vegetables in the worldafter

China**(Economic Times, 2016).**The green revolution of 1960s and 1970s ended chronic food deficits and while cereals still command the attention of policy makers, fruit production has surged impressively, making India the second largest global producer behind China.

II. Objectives

In the light of importance of the present study entitled *"An Empirical Study on Performance of Major Fruit Producing States of India: A Case Study of Post Reform Period"*researcher has set the following objectives:

1) To analyse the trend in productivity of horticulture fruit crops India
2) To know the share of area and production of fruits to horticulture outputin major fruit producing states of India.
3) To examine the decadal variations in area, production and productivity of fruits in major fruit producing states of India.

III. Methodology

To fulfil the above mentioned objectives of this study, we have used secondary data from various sources such as Directorate of Economics and Statistics, Ministry of Agriculture, National Horticulture Board (NHB), Indian Horticultural database, Department of Agriculture and Cooperation, Horticulture statistics at a glance 2014-15. In order to understand the changes in, the area, production, and productivity for fruit crops, secondary datawas taken for the period from 2001-02 to 2014-15 and regression analysis was used for understanding the trend analysis in productivity.

$$\textit{Production} = f(\textit{Time})$$

$$Y_t = \beta_0 + \beta_1\,(\textit{Time}) + U_t$$

The Researcher also tried to see the effect of area on production and analyze the changes therein

$$\textit{Production} = f(\textit{Area, Time})$$

$$Y_t = \beta_0 + \beta_1\,(\textit{Area}) + \beta_2\,(\textit{Time}) + U_t$$

The share of area and production of fruits in total horticulture output over the years was also analysed andapparent changes were observed during the same period. growth rate was

calculated by analysing the compound annual growth rate (CAGR) and Decadal growth rate (DGR) from the last ten years (2001-2011) which clearly frames out the shift of fruit production status of different fruit producing states in these three decadesvia, 1991-92, 2001-02 and 2011-12. A matrix was constructed to examine the shift in Indian states on the bases of average area and production of national statistic for these three decades.

IV. Data Analysis and Interpretation

Table 1.1: All India Area, Production and Productivity of Horticultural fruit crops over the years

Year	Fruits		
	A	P	Pdy
2001-02	4010	43001	10.72
2002-03	3788	45203	11.93
2003-04	4661	45942	9.85
2004-05	5049	50867	10.07
2005-06	5324	55356	10.40
2006-07	5554	59563	10.72
2007-08	5857	65587	11.20
2008-09	6101	68466	11.22
2009-10	6329	71516	11.30
2010-11	6383	74878	11.73
2011-12	6705	76424	11.40
2012-13	6982	81285	11.64
2013-14	7216	88977	12.33
2014-15	6358	88819	13.97

Source:2001-02: Indian Horticulture database, National Horticulture board (NHB); 2014-15: Horticultural Statistics at a Glance 2015. A= Area (Hectare), P= Production ('000 MT), Pdy = Productivity (MT/HA)

Dependent Variable: Production

	Coefficients	*Standard Error*	*t Stat*	*P-value*	R Square
Intercept	9.993407*	0.427713211	23.3647368	2.255E-11	0.508
Time	0.176879*	0.050232369	3.52121797	0.004214	

*Indicates statistical significance at 1 percent

The power of this model is 0.50 which is equal to 50%, it means that 50% of variation in productivity is explained by time period, it also means that there are other factors like area, land quality, fertilizer, usage, irrigation facility which affect production of fruits. The CAGRof the production of fruits over this period comes out to be 5.738. So the trend analysis suggests that there has been a steady growth rate over the years but not as much as it should be.The next

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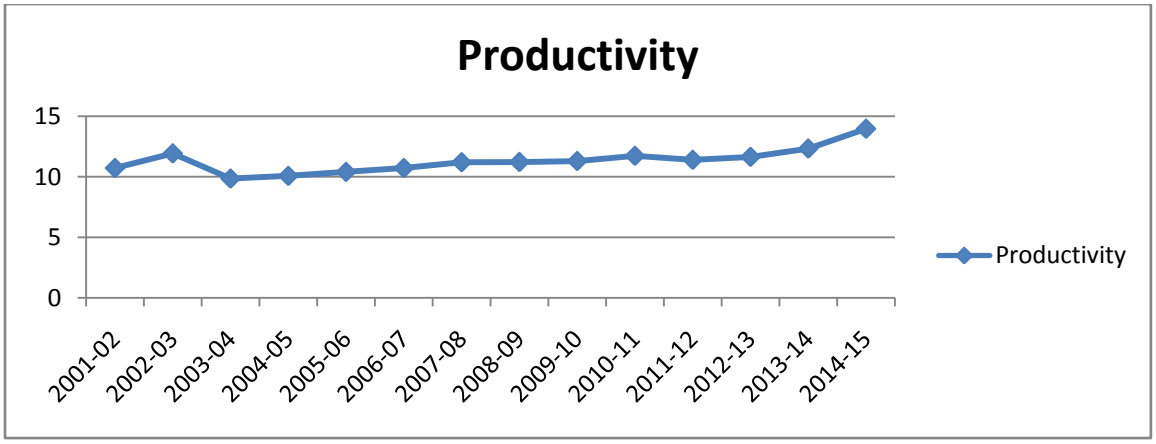
regression hence was carried with area also as the important determinant of production of fruits. The results for which are

Table 1.2: Dependent Variable: Production

	Coefficients	*Standard Error*	*t Stat*	*P-value*	R Square
Intercept	40558.64	9914.75	4.090738	0.002177	0.987
Area	-0.93741*	2.616059	-0.35833	0.727546	
Time	4056.402*	730.1034	5.555928	0.000242	

*Indicates statistical significance at 5 percent

These results explain that area is one of the important determinants to production hence the power of the model increased to 98.7 percent. At the same time the coefficient of area is negative as well as statistically insignificant. The reason behind it is obvious, as we lag in productivity in horticulture sector(China 10 tons per hectare, India 9.7 tons per hectare) so in production of fruits also we are not getting the desired results (China 154.634, India 82.631 million tons).



Productivity; MT/HA

The main cause for the drastic decline (fall) in the productivity of fruit crop in particular and agriculture in general for the year 2003-2004 was the adverse weather conditions in north eastern states and some central parts of India including the major fruit producing states (Economic Times 2004). Also the Global Recession of the same period had affected almost all segments of agriculture, some segments particularly fruits had been adversely hit by slowdown, in productivity, some segments by decline in prices and some by both (Chand et al 2008).

A more detailed discussion on causes of low productivity of horticulture in India over the years has been presented in the study

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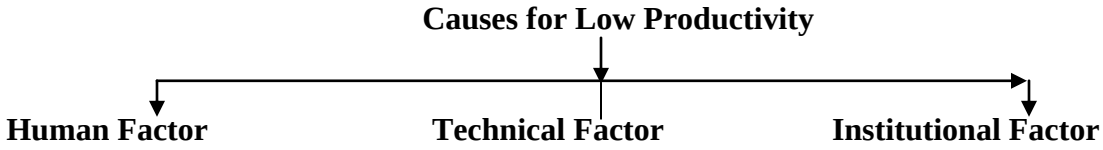

a) Human Factors

Human Factors include those which are related to training and efficiency of the farmers. Since Indian farmers are illiterate and have no knowledge for latest techniques of production they lack the scientific approach to horticulture production and most of them still use the traditional methods. There cost of production though low by using conventional methods but it affects productivity adversely. They are fatalist in nature and usually waste money on customs and traditions due to which the social climate is not suitable in Indian farming system.

Population density and growth are obvious reasons in addition in Indian context. Also heavy pressure of the population is the main cause of low productivity of Indian agriculture. In 1990, 16.30 crore people were dependent on agriculture. The number has gone up to 58.80 crore, so per capita cultivable land has reduced from 0.43 hectare to 0.23 hectare. This also has lead to subdivision and fragmentation of land holdings.

b) Technical Factors:

The latest technologies in farming are rarely used instead the traditional equipments are commonly used in farm practices at a larger scale resulting in backwardness of horticulture which in turn hampers its productivity. Credit facilities are inadequate in rural areas; more specifically for horticulture marginally more investment is required as compared to other agricultural produce. Farmers cannot raise credit from rural banks easily. They have to depend on 'Mahajans' and 'Shahukars'. These money lenders charge heavy rate of interest. Farmers have to sell their produce at low price to these money lenders. So farmers have low Income and thus low productivity.One of the significant factors for low productivity is improper marketing. Farmers fail to get suitable price for their produce. Inadequate means of transport forces the farmers to sell their produce to local money lenders at low prices. Due to lack of warehousing facilities, farmers are not able to store their produce when prices are low. So these attribute a lot for low productivity.

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c) Institutional Factors:

Land holdings in India are of very small size. Average size of holding is 2.3 hectare and 70% of the holdings are even less than 2 hectares. These holdings are fragmented. Due to these small holdings, mechanised cultivation is difficult. Implements and irrigation facilities are not properly utilized. This in turn affects its productivity.The age old tradition of zamindari and tenancy still persist in India despite its abolition after independence, this is yet another reason for low productivity in horticulture. Over the years the productivity of horticulture has not increased at a pace as desired. If we compare it with China, per hectare, productivity of horticulture, which is 9.7 tons in India, is much less than China, which is more than 12 tons per hectare.

Table1.3: The share of area and production of fruits in total horticulture output (2001-2014).

	Fruits		Total			
	area(x)	**prod(Y)**	**total area**	**total prod**	**Area (%)**	**Production(%)**
2001-02	4010	43001	16592	145785	24.17	29.50
2002-03	3788	45203	16270	144380	23.28	31.31
2003-04	4661	45942	19208	153302	24.27	29.97
2004-05	5049	50867	18445	166939	27.37	30.47
2005-06	5324	55356	18707	182816	28.46	30.28
2006-07	5554	59563	19389	191813	28.65	31.05
2007-08	5857	65587	20207	211235	28.99	31.05
2008-09	6101	68466	20662	214716	29.53	31.89
2009-10	6329	71516	20876	223089	30.32	32.06
2010-11	6383	74878	21825	240531	29.25	31.13
2011-12	6705	76424	23242	257277	28.85	29.70
2012-13	6982	81285	23694	268847	29.47	30.23
2013-14	7216	88977	24198	277352	29.82	32.08

Source: Indian Horticulture database, National Horticulture board (NHB); 2014-15: Horticultural Statistics at a Glance 2014.

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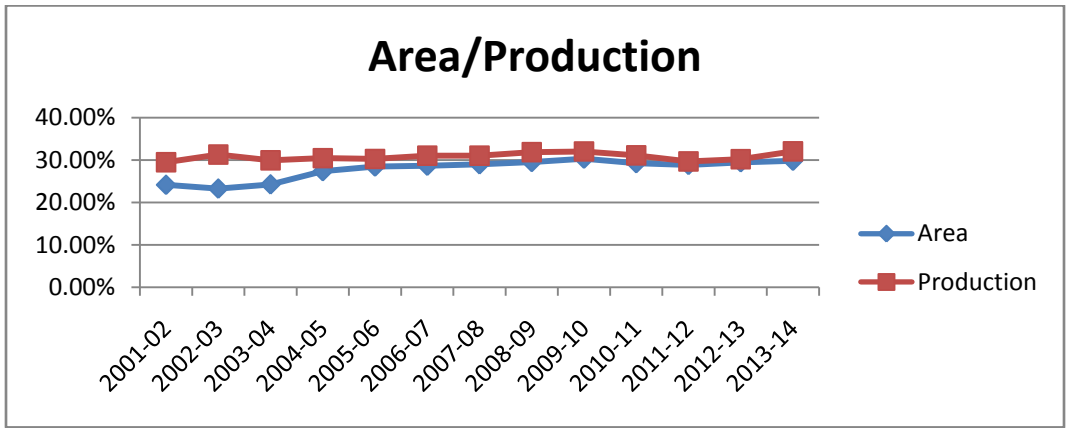

The above table depicts that although the share of area under the fruit crop has increased from 24.17 percent in 2001-2002 to 29.82 percent in 2013-2014, but the production has not increased in the same proportion.This result is also supported by the regression results of table 1. The share of fruit production in total horticultural produce in 2001-2002 was 29.50 percent which has only increased up to 32.8 percent in 2013-2014.

Thus over the period of 2001-2014 percentages area in total horticulture has increased by 6% but the production has increased by only 3.5 percent for the same period. This indicates that despite increase in area the production was not realised in same proportion or nearing to it. This also reflects that we need to take up measures to improve productivity in horticulture sector also. To understand the decadal change state-wise we have compared states with highest productivity in India.

Table 1.4: State wise Area, Production, and productivity of main fruit growing states of India

1991-92				2001-02				2011-12			
states	**A**	**P**	**Pdy**	**States**	**A**	**P**	**Pdy**	**states**	**A**	**P**	**Pdy**
Gujarat	84.6	1828	21.6	**Madhya Pradesh**	46.6	1143	24.6	**Tamil Nadu**	332	8535.1	25.7
Madhya Pradesh	64.7	1245	19.2	**Tamil Nadu**	227	4342	19.1	**Gujarat**	353.7	7522.4	21.3
Tamil Nadu	136.2	2316	17	**Tripura**	28.3	452.1	16	**Madhya Pradesh**	159.6	3391.3	21.3
Karnataka	209.2	3191	15.2	**Gujarat**	149	2346	15.7	**Punjab**	71.5	1419.9	19.9
Maharashtra	256.1	3518	13.7	**Karnataka**	257.1	4028	15.7	**Karnataka**	371.8	6428.1	17.3
Andhra Pradesh	313.1	4008	12.8	**Maharashtra**	582.8	8840	15.2	**Uttar Pradesh**	337	5795.1	17.2
Bihar	266.9	2799	10.5	**Punjab**	37.5	531.7	14.2	**Andhra Pradesh**	671.7	9841.1	14.7
West Bengal	111.2	1132	10.2	**Chhattisgarh**	14.4	203.1	14.1	**West Bengal**	216.6	3055.4	14.1
Punjab	72.7	663.8	9.1	**West Bengal**	147	1985	13.5	**Goa**	11.1	154.7	13.9
Meghalaya	24.2	218	9	**Nagaland**	25	302	12.1	**Bihar**	299.2	3946.4	13.2

Source: All India 2013-14 (Final Estimates), Department of Agriculture and Cooperation. A= Area (Hectare), P= Production ('000 MT), Pdy = Productivity (MT/HA)

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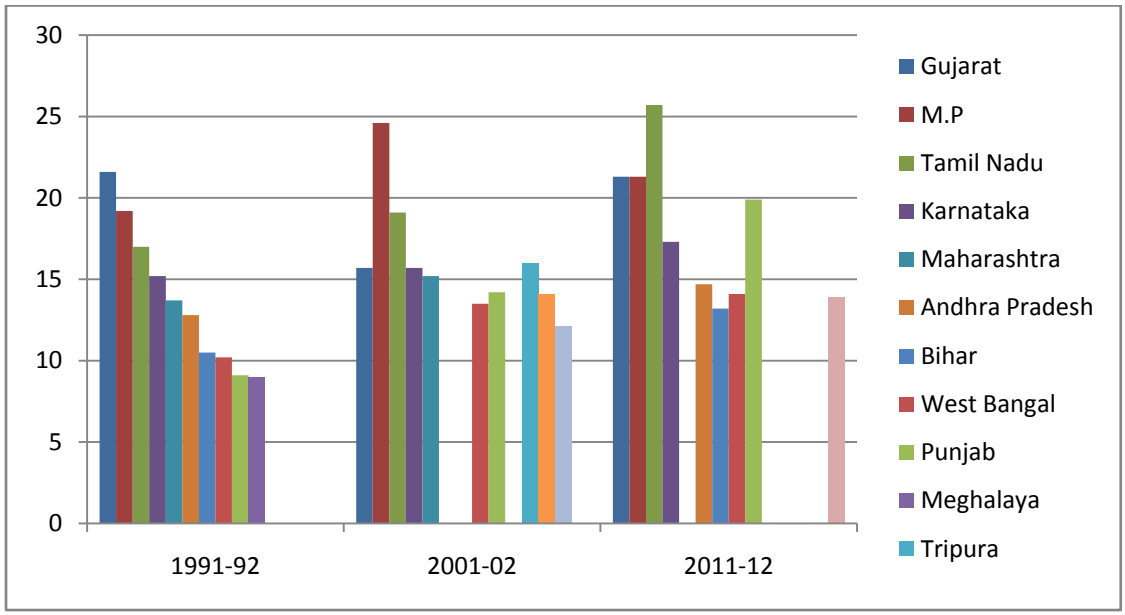

Looking at the statistic we see that by and large 1991-92 and 2001-02 we have the same states in the list with little change in the order of their productivity, except Chhattisgarh (which was a newly created state by then) a part of Madhya Pradesh. We also observe that Andhra Pradesh, Bihar; major states have been dropped out in the list in 2001-02. Amongst the north eastern states Meghalaya has been replaced by Nagaland. While observing the statistic for 2011-12 we find that Andhra Pradesh and Bihar have restored in the list, Uttar Pradesh (the state with highest population) has emerged in the list as well as Goa (a small state) has shown a drastic rise in productivity of fruits. To understand the exact changes in productivity of major fruit growing Indian states we have calculated the decadal growth for all the states which have been in the list in the three decades.

Table 1.5: Decadal growth rate of major fruit growing states

	1991-92	2001-02		2011-12	
	Pdy	Pdy	DGR	Pdy	DGR
Andhra Pradesh	12.80	10.69	-16.47	14.65	37.02
Bihar	10.49	10.57	0.75	13.19	24.84
Gujarat	21.61	15.74	-27.13	21.27	35.08
Karnataka	15.25	15.67	2.71	17.29	10.35
Kerala	4.66	7.56	62.18	8.20	8.58
Madhya Pradesh	19.24	24.53	27.47	21.25	-13.37
Maharashtra	13.74	15.17	10.42	6.76	-55.47

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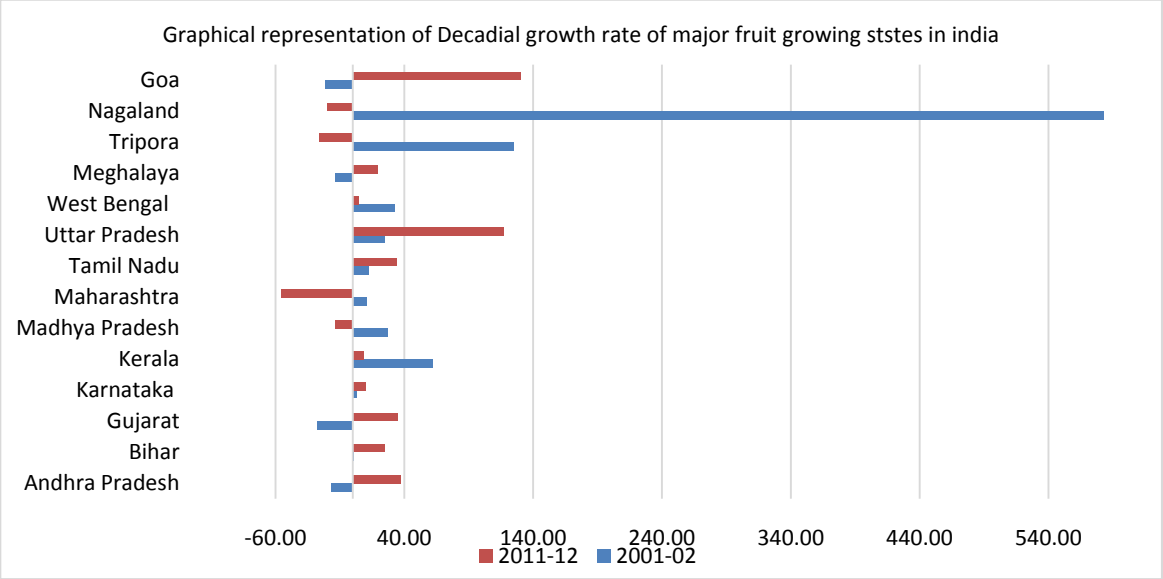
Tamil Nadu	17.00	19.13	12.49	25.71	34.40
Uttar Pradesh	6.34	7.92	24.91	17.20	117.02
West Bengal	10.18	13.50	32.68	14.11	4.46
Meghalaya	9.01	7.79	-13.55	9.29	19.27
Tripora	7.11	15.98	124.79	11.82	-25.99
Nagaland	1.77	12.08	582.78	9.72	-19.50
Goa	7.65	6.05	-21.00	13.94	130.49

Source: All India 2013-14 (Final Estimates), Department of Agriculture and Cooperation. Pdy = Productivity (MT/HA), DGR= Decadal growth rate.



From the above table it is clear that decadal growth rate (DGR) has witnessed large growth variations among majority of the fruit growing states over the two decades, states like Andhra Pradesh, Gujarat, Meghalaya and Goa registered negative growth during 1991-2001, however these states improved their performance during second decade and registered higher DGR. While states like Nagaland, Madhya Pradesh, Tripura witnessed positive growth rates during 1991-2001 but could not sustain their growth in the second decade and registered negative growth rates.Among all majorfruit growing states Nagaland and Goa were exceptional cases in the study as Nagaland a small state by its area showed the highest DGR between 1991-2001 decade, similarly Goa again a small state by its population and size showed tremendous increase in DGR during 2001-2011.

V. Conclusion

Horticultural development was not a priority sector in India until recent years. It was in the post-1991 period that a focused attention was given to horticulture development through an enhancement of planed allocation and knowledge-based technology. The changing consumption pattern has resulted in decline in per capita household demand for food grains but has dramatically increased the consumption demand of horticultural products especially fruits. India has the advantage of diverse agro-climatic conditions which enables it to produce a wide range of horticultural crops round the year. Presently, India is the second largest producer of fruits and vegetables in the world after China. It is found from the study that theland holdings in India are of very small size. Average size of holding is 2.3 hectare and 70% of the holdings are even less than 2 hectares. These holdings are fragmented. Due to these small holdings, mechanised cultivation is difficult. Implements and irrigation facilities are not properly utilized. This in turn affects its productivity. Over the years the productivity of horticulture has not increased at a pace as desired. If we compare it with China, per hectare, productivity of horticulture, which is 9.7 tons in India, is much less than China, which is more than 12 tons per hectare.

The share of area under the fruit crop has increased from 24.17 percent in 2001-2002 to 29.82 percent in 2013-2014, but share of fruit production in total horticultural produce in 2001-2002 was 29.50 percent which has only increased up to 32.8 percent in 2013-2014, which means that the percentages area in total horticulture has increased by 6% but the production has increased by only 3.5 percent for the same period. Furthermore, it is found that the decadal growth rate (DGR) has witnessed large growth variations among majority of the fruit growing states over the two decades, states like Andhra Pradesh, Gujarat, Meghalaya and Goa registered negative growth during 1991-2001, however these states improved their performance during second decade and registered higher DGR. While states like Nagaland, Madhya Pradesh, Tripura witnessed positive growth rates during 1991-2001 but could not sustain their growth in the second decade and registered negative growth rates. Among all major fruit growing states Nagaland and Goa were exceptional cases in the study as Nagaland a small state by its area showed the highest DGR between 1991-2001 decade, similarly Goa again a small state by its population and size showed tremendous increase in DGR during 2001-2011.

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