



## PRODUCTION AND GROWTH OF HORTICULTURAL CROPS IN WEST BENGAL- A DISTRICT LEVEL ANALYSIS

**SRIJANA RAI**

Department of Economics Assistant Professor  
Kurseong College, Kurseong. Dist Darjeeling. West Bengal

**ABSTRACT:** *West Bengal witnessed impressive agricultural growth rates during the decade of the eighties, primarily due to the institutional and technological changes. The high growth rates could however, not be sustained in the following decade primarily due to area saturation and declining yield growth rates. Owing to this deceleration and the policy of globalization, the state has been following the policy of crop diversification in favour of high value cash crops since the mid nineties. In this context, horticultural crops occupy an important position in terms of providing livelihood options, mitigating to some extent the excess demand for cereals and contributing to food and nutritional security. However, the performance of the horticultural sector is not very satisfactory as productivity is low, even though area under them has increased. The present study taking the district as the smallest unit, would like to analyse the growth rates of two important horticultural crops i.e. fruits and vegetables in terms of area, production and yield, and also examine how much of the change in output is attributed to area change and yield change.*

**KEYWORDS:** Crop Diversification, Horticulture, Compound Annual Growth Rates, Area Effect, Yield Effect.

### INTRODUCTION:

The contribution of agricultural growth to economic development and poverty reduction is a well established fact. Agricultural growth in West Bengal has been the subject of research for several scholars. The studies indicate that during the decade of the eighties agricultural growth in the state increased tremendously from the previous decade. This was attributed primarily to the land reform measures introduced in the state during the early 1980s and the introduction of the HYV technology along with efficient local panchayats and better farming practices (op. cit. Ghosh, 2010). Ghosh, 2010, observes that the main factor contributing to the “massive increment in the output growth rate of most of the major crops” was improved yield growth rates. The high growth path could, however, not be sustained in the later periods as the growth rate of production of most of the major crops showed a declining trend in the decade of the nineties. This decline could be attributed to the fact that the area under cultivation of major crops reached a saturation level and the yield growth rates of major crops showed a declining trend in the decade of the nineties. This has been an issue of grave concern for the state especially in terms of the issue of food security. Alternative measures are thus required to counteract the deceleration in agricultural growth. Ghosh, 2010, has cited four factors to enhance growth of agriculture in the state. They are:

1. (i) Institutional change in the farming sector.
2. (ii) Increase in the cropping intensity of land.
3. (iii) Shift in the cropping pattern in favour of crops with higher productivity.
4. (iv) Improvements in the technique of cultivation.

Ghosh further mentions that “sustained agricultural growth” requires institutional changes coupled with improvements in the techniques of cultivation. However, an effective method for improving agricultural growth is shifting the cropping pattern in favour of crops with high productivity also known as crop diversification. A change in the cropping pattern of the state from low value crops to high value crops can have far reaching effects in offsetting the deceleration in agricultural growth. (Ghosh, 2010). De and Chattopadhyay’s, (2010) study reveal that crop diversification has been carrying on since 1970, though at a slow rate. Bhattacharya (2008) however, notes that crop diversification in West Bengal is a recent phenomenon and has taken place during the late nineties following the slowing down of the Green Revolution and the opening up of the Indian economy to the world economy.

The cropping pattern in the State is dominated by food crops which account for about 78 per cent of the area under principal crops. Among the food crops, rice is particularly important. West Bengal was the largest producers of paddy in the country with a production of 14719.50 MT in the year 2007-08 (State Agriculture Plan for West Bengal, 2007). Traditionally, West Bengal has been the highest producer of jute. The State also accounts for 25 per cent of tea production in the country, next only to Assam.

However in the last two decades i.e. since the beginning of the nineties, there has been a gradual change in the cropping pattern in favour of high value crops like boro paddy, potatoes, mustard etc. (De and Chattopadhyay 2010, Ghosh, 2010) against pulses, coarse cereals and sugarcane. The state ranked second after Uttar Pradesh in the production of potatoes with 9900.80 MT in 2007-08. An important diversification that has been taking place during the last two decades is in favour of horticultural crops especially fruits and vegetables, and flowers (Bhattacharya, 2008). The state is a major producer of fruits, vegetables, flowers, tea and spices; and with a vegetable production of 125.56 lakh MT in 2007-08, the state is also one of the highest producers of vegetable in the country. Horticultural crops cover 21% of net cultivable area in the state. (National Horticulture Mission, Action Plan for WB, 2005). The area under all the major horticulture crops in the state has increased over the period (2004 to 2007) at varying levels owing to more cultivable waste lands being brought under perennial horticulture crops and also due to adoption of crop diversification to more remunerative vegetables and flower crops. The potential for cultivation of horticulture crops such as banana, mango, pineapple, etc, tea plantations and floriculture amongst other crops is estimated at Rs.385.89 crore. (State Agriculture Plan for West Bengal, 2007).

The present study would like to analyse the growth rate of fruits and vegetables in the different districts of West Bengal during the period 2000-01 to 2010-11. The study attempts to do this by calculating the Compound Annual Growth rates of area, production and yield of total fruits and vegetables in the said period for the different districts and also decompose the output growth into area and yield effect to see which of the two has contributed to change in their output.

#### **OBJECTIVES :**

1. To evaluate and analyse the Compound Annual Growth Rates of Area, Production and Yield for two important horticultural crops viz. fruits and vegetables for the period 2000-01 to 2010-11.
2. To decompose the output change into area and yield effect to observe which of the two is stronger in bringing about a change in output.

#### **SIGNIFICANCE OF THE STUDY:**

An analysis of growth of fruits and vegetables is significant for several reasons. Firstly, in view of the deceleration in the production of major agricultural crops since the nineties in the state, crop diversification in favour of high value cash crop farming which includes fruits and vegetables becomes an important source of augmenting farm incomes for a large number of rural households in the state. Secondly, the high pressure created on the food grains, due to the predominantly cereal based food consumption habits in the country and in the state of West Bengal, may be mitigated to some extent by supplementing with fruits and vegetables. It is worth mentioning in this context that the per capita consumption of fruits and vegetables in the country including in the State of West Bengal, is less than 200 gms/day against the recommended norm of 350 gm/day, the key reasons for which include low production, transport and distribution bottlenecks etc. However, consumer demand is increasing due to improvement in the quality of lives of the people in urban and semi urban areas. Increasing the production of fruits and vegetables also assumes meaning for providing nutritional security and addressing the problem of mal nutrition.

#### **DATA BASE AND METHODOLOGY:**

The period under the study is from 2000-01 to 2010-11 to examine the growth rate of fruits and vegetables in the decade of 2000. The study is based entirely on secondary data. The data sources are:

1. District Statistical Handbook, 2004 for the different districts.
2. Directorate of Horticulture, Government of West Bengal.

The following formula has been used for calculating the Compound Annual Growth Rates.

$$CAGR = \left( \frac{V(t_n)}{V(t_0)} \right)^{\frac{1}{t_n - t_0}} - 1$$

$V(t_0)$  is the value in the initial period

$V(t_n)$  is the value in the final period

$\frac{1}{t_n - t_0}$  is the number of years.

In the second section, the change in output is decomposed into area effect and yield effect using the following formula used by K. K. Kaushik in his analysis of farm growth rates in Himachal Pradesh. (Kaushik, 1999).

The following symbols have been used in the formula

$g$  –increase in output

$g_1$ -increase in output due to increase in area i.e. area effect

$g_2$  – increase in output due to improvement in productivity i.e. yield effect

$P_0$  – output in base period  $P_t$  output in terminal period

$a_0$  – output in base period  $a_t$ -area in terminal period

$y_0$  –yield in base period  $y_t$ -yield in terminal period

The formulae for increase in output may be written as

$$g = P_t - P_0$$

$$g = g_1 + g_2$$

The formulae for area and yield effect may be written as

$$g_1 = (a_t - a_0)y_0$$

$$= a_t y_0 - a_0 y_0$$

$$= a_t y_0 - P_0$$

$$\therefore g_1 = a_t y_0 - P_0 \text{----- (1)}$$

$$g_2 = g - g_1$$

$$= (P_t - P_0) - (a_t y_0 - P_0)$$

$$= P_t - a_t y_0$$

$$\therefore g_2 = P_t - a_t y_0 \text{----- (2)}$$

$g_1/g$  represents the share of area increase in total output and  $g_2/g$  the share of improvement in yield in total output.

The area and yield effect have been calculated using equations (1) and (2).

### STUDY AREA:

The study area chosen is the state of West Bengal located in eastern India and lying between 21° 25' 24" and 27°13' 15" north latitudes and 85°48' 20" and 89°53' 04" east longitudes. West Bengal is surrounded by Nepal, Bhutan and the state of Sikkim on the north, Assam on the north east, Bangladesh on the east, Bihar and Jharkhand on the west, Orissa on the south west and the Bay of Bengal on the south. West Bengal comprising of nineteen districts has diverse physical features ranging from the mighty Himalayas in the north to the Bay of Bengal in the south. In the present study the district of Kolkata has been excluded due to its urban nature.

West Bengal is predominantly an agricultural state with almost 65% of its population dependent on agriculture and allied activities. Of the total rural workers, 19.53% and 19.30% are cultivators and agricultural labourers, respectively, while 4.72 % are engaged in household industries. Agriculture in the State is small farmer centric with 90 per cent of the cultivators being small and marginal farmers. Small and marginal farming communities hold 84% of the State's agricultural lands. The contribution of agriculture to State Domestic Product, measured by its percentage share was 20.58% and 22.08% at current and constant prices respectively in the year 2005-06. Though the contribution of agriculture to State Domestic Product has been decreasing over the years, it is nonetheless an important sector as it is a source of livelihood to a majority of the rural population. Besides, it is an important source of food, fodder, raw materials etc. Hence, growth of the agricultural sector is positively correlated with the prosperity of the rural as well as the urban economy.

The State of West Bengal divided into six diverse agro-climatic zones with abundant natural resources is favourable for growing an extensive range of horticultural crops. The state has immense potential for development of horticulture sector both through horizontal (area expansion) and vertical integration (productivity improvement). However, the scope for area expansion being limited, stress should be placed on productivity improvement to increase output. The major fruit growing districts in the state are Malda, Murshidabad, North 24 Parganas, Nadia and Darjeeling. The important fruits grown are mango, pineapple, litchi, guava, banana, sapota, mandarin, jackfruit etc. West Bengal is the largest producer of vegetables in the country. Major vegetable growing districts include Murshidabad, Nadia, North & South 24 Parganas, Burdwan, Hooghly and Bankura producing traditional vegetables like brinjal, tomato, cabbage, cauliflower, cucurbits and lady's finger and nontraditional vegetables like broccoli, gherkin, baby corn, brussel sprout, celery etc.

### FINDINGS AND DISCUSSION:

**Compound Annual Growth Rates of Area, Production and Yield:** Using the formula given above, the Compound Annual Growth Rates of Area, Production and Yield for fruits and vegetables for the period 2000-01 to 2010-11 have been calculated in Table 1 and Table 2 respectively. The data for Dakshin Dinajpur in the case of fruits for the year 2000-01 being incomplete, data for 2001-02 has been taken and the CAGR has been accordingly calculated for 9 years. The data for fruits and vegetables for the year 2010-11 being unavailable for Burdwan and Purba Medinipur, the data for 2007-08 has been used and the CAGRs have been accordingly calculated for 7 years.

An area of 2,11,640 hectares was brought under the cultivation of fruit crops during 2010-2011 which indicates 57.4% increase in area over 2000-01. Production also increased by 56.47% during the same period. However, yield growth rate was negative at -0.57%.

Table 1 reveals that with the exception of Howrah and Dakshin Dinajpur, the compound annual growth rate of area is positive for all the districts. The highest growth rate at 15.69% is recorded in Paschim Medinipur followed by Bankura(15.29%) and Nadia(12.81%). The state average is 4.64%. The positive growth rates for 16 districts indicates trend towards diversification in favour of fruits.

The CAG for production also reveals that the growth rates are positive for fifteen out of eighteen districts which again shows the trend towards diversification in favour of horticultural crops. The highest growth rate has been observed in Nadia with 20.65% followed by Paschim Medinipur with 8.73% and Murshidabad with 7.43%. The state average is 4.58% and the highest negative growth rate has been observed in Dakshin Dinajpur with -6.73%.

The CAG of yield rate is however not very impressive. The state has recorded a negative growth rate of -0.06%. Eight districts have recorded a negative growth rate, the highest being in Bankura (-7.04%) followed by Purulia (-6.7%) and Paschim Medinipur (-6.01%). The reason for this could be attributed to the fact that in these districts though expansion in area and production has taken place, the production has not increased in proportion to the increase in area. The highest yield growth rate has been observed in Nadia(6.95%). The growth rate in the other districts is also not very high. Though problems regarding low yield are crop specific, factors such as lack of high yielding varieties, lack of latest agricultural technical know-how, lack of irrigation facilities, limited access to institutional credit due to low economic status of the farmers, climate change due to global warming, inadequate infrastructure for research and development etc. may help to explain the low yield growth rates in general.

**Table 1: Area, Production and Yield and Compound Annual Growth Rates of Area, Production and Yield of Fruits (2000-01 and 2010-11)**

Districts	Area in '000 hectares		Production in '000 tonnes		Yield in tonnes/ hectare		CAG in %		
	2000-01	2010-11	2000-01	2010-11	2000-01	2010-11	Area	Production	Yield
Burdwan	5.3	7.64#	57.99	72.5#	10.94	9.49#	5.36	3.24	-2.01
Birbhum	2.29	5.53	35.71	66.47	15.59	12.02	9.22	6.41	-2.57
Bankura	1.76	7.3	26.12	52.2	14.84	7.15	15.29	7.17	-7.04
Purba Medinipur	6.7	8.64#	95.6	133.12#	14.27	15.41#	3.7	4.84	1.1
Paschim Medinipur	2.84	12.2	43.94	101.5	15.47	8.32	15.69	8.73	-6.01
Howrah	2.58	2.18	38.81	20.81	15.04	9.55	-1.67	-6.04	-4.44
Hoogly	10.6	12.33	133.61	173.46	12.6	14.07	1.52	2.64	1.11
N.24 Pgs	13.56	20.36	173.86	343.09	12.82	16.85	4.15	7.03	2.77
S. 24 Pgs	6.84	9.99	96.72	162	14.14	16.22	3.86	5.29	1.38
Nadia	6.36	21.23	80.26	524.67	12.62	24.72	12.81	20.65	6.95
Murshidabad	17.01	27.33	141.35	289.53	8.31	10.6	4.86	7.43	2.46
U. Dinajpur	8.68	8.9	156.25	146.5	18	16.46	0.25	-0.64	-0.89

D. Dinajpur	5.65*	4.32	95.5*	51.01	16.9*	11.81	-2.94	-6.73	-3.9
Maldah	25.62	30.94	173.81	245.19	6.78	7.92	1.9	3.5	1.57
Jalpaiguri	9.33	9.68	161.68	208.81	17.33	21.57	0.37	2.59	2.12
Darjeeling	9.38	11.37	155.97	214.12	16.63	18.83	1.94	3.22	1.25
Coochbehar	3.47	6.04	51.78	101.74	14.92	16.84	5.7	6.99	1.22
Purulia	2.03	5.16	32.1	40.77	15.81	7.9	9.78	2.42	-6.7
W. Bengal	134.46	211.64	1656.9	2592.82	12.32	12.25	4.64	4.58	-0.06

Source: *Data for Area and Production- District Statistical Handbooks, 2004 for various districts, and Directorate of Horticulture, Government of West Bengal. Data for Yield and CAGR- calculated by author.*

(Note: \*Data is for 2001-02 due to incomplete data for 2000-01. #- Data is for 2007-08 due to unavailability of data for 2010-11. CAG for Burdwan and Purba Medinipur is calculated for 7 years and for Dakshin Dinajpur for 9 years.)

**Table 2: Area, Production and Yield and Compound Annual Growth Rates of Area, Production and Yield of Vegetables (2000-01 and 2010-11)**

Districts	Area in '000 hectares		Production in'000 tonnes		Yield in tonnes/hectare		CAG in %		
	2000-01	2010-11	2000-01	2010-11	2000-01	2010-11	Area	Production	Yield
Burdwan	45.36	57.11*	511.89	672.46*	11.29	11.77*	3.35	3.97	0.6
Birbhum	40.28	52.69	453.34	609.3	11.25	11.56	2.72	3	0.27
Bankura	58.28	52	727.38	858.07	12.48	16.5	-1.13	1.67	2.83
Purba Medinipur	44.9	45.28*	495	455.4*	11.02	10.06*	0.12	-1.18	-1.29
Paschim Medinipur	50.39	58.17	597.34	867.33	11.85	14.91	1.45	3.8	2.32
Howrah	15.57	13.11	183.86	159.61	11.81	12.17	-1.71	-1.4	0.3
Hoogly	47.44	53.36	562.34	655.03	11.85	12.28	1.18	1.54	0.36
N.24 Pgs	63.12	69.52	761.44	937	12.06	13.48	0.97	2.1	1.12
S. 24 Pgs	56.99	71.72	720.98	972.75	12.65	13.56	2.33	3.04	0.7
Nadia	75.35	83.43	979.93	1279.34	13	15.33	1.02	2.7	1.66
Murshidabad	58.88	85.82	990.83	1417.61	16.83	16.52	3.84	3.65	-0.19
U. Dinajpur	27.77	34.11	294.36	464.94	10.6	13.63	2.08	4.68	2.55
D. Dinajpur	43.27	46.43	521.11	572.35	12.04	12.33	0.71	0.94	0.24
Maldah	47	57.29	597.96	726.45	12.72	12.68	2	1.97	-0.03
Jalpaiguri	45.06	53.25	522.67	863.32	11.6	16.21	1.68	5.15	3.4
Darjeeling	18.55	22	161.63	239.97	8.71	10.91	1.72	4.03	2.28
Coochbehar	40.32	53.92	597.39	946.31	14.82	17.55	2.95	4.71	1.71
Purulia	36.86	35.27	433.92	535.54	11.77	15.18	-0.44	2.13	2.58
W. Bengal	815.39	943.32	10113.37	13334.28	12.4	14.14	1.47	2.8	1.32

Source: *Data for Area and Production- District Statistical Handbooks, 2004 for various districts, and Directorate of Horticulture, Government of West Bengal. Data for Yield and CAGR- calculated by author.*

(Note: \* Data is for 2007-08 due to unavailability of data for 2010-11. CAG for Burdwan and Purba Medinipur is calculated for 7 years.)

From the table it is clear that area under vegetables in the state increased from 815.39 thousand hectares to 943.32 thousand hectares indicating an increase of 15.69% area under vegetables during the period under study. Production has also increased from 10113.37 thousand tones to 13334.28 thousand tones indicating an increase of 31.85%. Yield has also increased from 12.4 tonnes per hectare to 14.14 tonnes per hectare indicating an increase of 14.03%.

The table also reveals that the area growth rate for vegetables is positive for most of the districts except Bankura, Howrah and Purulia. The highest growth rate has been recorded in Murshidabad (3.84%) followed by

Burdwan (3.35%). Coochbehar (2.95%) and Birbhun(2.72%). For the state it is 1.47%. Since growth rate is positive in most of the districts, this is again an indication that more area is being brought under cultivation of vegetables.

The Compound Annual Growth Rate of production for the state as a whole is also positive at 2.8%. With the exception of Purba Medinipur and Howrah all the districts have shown a positive growth rate in production of vegetables indicating diversification in favour of high value cash crop farming.

An analysis of yield growth rate reveals that the yield growth rate is better than that for fruits. The state average is 1.32% and is positive for most of the districts except for Purba Medinipur (-1.29%), Murshidabad (-0.19%) and Maldah (-0.03%). Highest yield growth rate has been observed in Bankura (2.83%) followed by Purulia (2.58%) and Uttar Dinajpur (2.55%). Bankura and Purulia show a positive yield growth rate in spite of negative growth rate in area indicating an increase in productivity. Howrah also shows a positive yield growth rate in spite of a negative growth rate for area and production. Murshidabad and Maldah show a slight negative growth rate in yield indicating declining productivity. Low productivity of vegetables may be attributed to lack of good seedlings, pesticides, lack of post harvest handling and infrastructure etc.

**Area and Yield Effect:** Having calculated the Compound Annual Growth Rates of area, production and yield for the two major horticultural crops viz. fruits and vegetables and having observed that production of both have increased during the period under consideration, the next part of the paper would like to examine how much of the increase in production is due to increase in area and how much due to increase in productivity.

From Table 3 it is clear that area effect is stronger than yield effect for most of the districts in case of fruits, with the exception of Howrah, Nadia, Uttar Dinajpur and Jalpaiguri, indicating that additional area has been brought under cultivation of fruits. In Howrah, the decline in production is contributed both by decline in area and yield, as both have shown negative CAG rates (Table 1), but more so by yield effect than area effect. For Uttar Dinajpur, decline in production is contributed by declining productivity as CAG rate for area is positive. In Dakshin Dinajpur, area effect is slightly stronger than yield effect for decreased production. For West Bengal as a whole, the area effect is stronger than yield effect.

In case of vegetables, area effect is stronger than yield effect for nine out of eighteen districts and yield effect is stronger than area effect in the remaining nine districts. For the state as a whole yield effect is stronger than area effect. This indicates that, for vegetables more area being brought under cultivation along with improvements in productivity have both contributed to increase in production. However, yield effect is not the sole contributor to increased production.

**Table 3: Area and Yield Effects for Fruits and Vegetables from 2000-01 to 2010-11(in percent)**

Districts	Fruits			Vegetables		
	Change in Production	Area Effect	Yield Effect	Change in production	Area Effect	Yield Effect
Burdwan	14.51	176.3722	-76.3722	160.57	82.75637	17.24363
Birbhun	30.76	164.183	-64.183	155.96	89.39632	10.60368
Bankura	26.08	315.2301	-215.23	130.69	-60.0046	160.0046
Purba Medinipur	37.52	73.8081	26.1919	-39.6	-10.0646	110.0646
Paschim medinipur	57.56	251.5532	-151.553	269.99	34.06589	65.93411
Howrah	-18	33.46	66.54	-24.25	119.7151	-19.7151
Hoogly	39.85	54.57465	45.42535	92.69	75.49466	24.50534
N.24 Pgs	169.23	51.50103	48.49897	175.56	43.84324	56.15676
S. 24 Pgs	65.28	68.22702	31.77298	251.77	73.98737	26.01263
Nadia	444.41	42.22736	57.77264	299.41	34.95541	65.04459
Murshidabad	148.18	57.87711	42.12289	426.78	106.2657	-6.26566
U. Dinajpur	-9.75	-40.5128	140.5128	170.58	39.39852	60.60148
D. Dinajpur	-44.49	50.55518	49.44482	51.24	73.9797	26.0203
Maldah	71.38	50.38274	49.61726	128.49	101.7735	-1.7735

Jalpaiguri	47.13	12.88861	87.11139	340.65	27.89667	72.10333
Darjeeling	58.15	56.94428	43.05572	78.34	38.28185	61.71815
Coochbehar	49.96	76.73499	23.26501	348.92	57.80821	42.19179
Purulia	8.67	570.699	-470.699	101.62	-18.4925	118.4925
W. Bengal	935.88	101.5584	-1.5584	3220.91	49.17238	50.82762

*Source: Calculated by author (Note: For Burdwan and Purba Medinipur the area and yield effects are from 2000-01 to 2007-08.)*

In view of the findings mentioned above it may be inferred that

1. Area under fruits and vegetables has increased in most of the districts in the period under study.
2. Production of fruits and vegetables has also increased for most of the districts in the period under study.
3. Productivity improvement in case of fruits is however not very satisfactory. The highest positive compound annual growth rate has been observed in Nadia (6.95%). In other nine districts it ranges between 1.11% (Hoogly and Purba Medinipur) and 2.77% (Hoogly). The growth rate of yield is negative for eight out of eighteen districts and for the state as a whole.
4. The compound annual growth rate of yield in case of vegetables is slightly better than that for fruits as negative yield growth rates have been observed only for three out of eighteen districts. The state average is also positive. The positive growth rate ranges between 3.4% (Jalpaiguri) and ) 0.24% in Dakshin Dinajpur.
5. In case of fruits, area effect is stronger than yield effect and in the case of vegetables, area effect is stronger in nine districts and yield effect is stronger in remaining nine districts.

#### **SUGGESTIONS:**

With favourable agro climatic conditions and diverse and rich natural resources, the state possesses ample scope for the cultivation of horticultural crops especially fruits and vegetables. Though production and area under fruits and vegetables have increased, productivity is not very high and productivity growth rates especially for fruits are not very impressive, which is a constraint to development of horticultural crops cultivation. The low levels of productivity may be attributed to the following factors:

1. Inadequate availability of high yielding varieties and superior quality seeds within the state. For certain crops like potato the state has to depend on other states for supply of seeds.
2. Lack of awareness among farmers on latest technical knowledge regarding horticultural crop cultivation, including post harvest handling of horticultural crops, viz. preservation, storage, grading etc. and other extension services due to poor infrastructure.
3. Indiscriminate use of fungicides and pesticides.
4. Poor information and infrastructure regarding marketing of horticultural produce
5. Climate change leading to unseasonal rains and floods and environmental degradation adversely affecting production, transport and marketing of horticultural crops.
6. Inadequate supply of institutional credit due to farmers' poor economic status.
7. Insufficient irrigation facilities.
8. Outdated and old orchards and nurseries, and lack of interest and initiative to revamp them.
9. Agriculture in the state being small farmer centric, introduction of advanced scientific technologies become difficult due to high cost.
10. Inadequate research and development.

In view of the constraints mentioned above the following suggestions can be put forward for the development of horticulture cultivation:

1. High yielding varieties and superior quality planting material required.
2. Identification of new area and districts through waste land management, which can be brought under cultivation of specific fruits and vegetables and formation of crop clusters.

3. Development of extension services for capacity building and dissemination of information to farmers regarding latest agricultural technical knowhow, post harvest handling, crop suitability according to the prevailing agro-climatic conditions in the different regions, organic farming etc.
4. Usage of fertilizers, especially organic manure to enhance productivity, and pesticides and insecticides to control crop diseases.
5. Formation of agri export zones to promote export of horticultural crops. There are six agri export zones in the state at present. However, they are in their nascent stage and possess ample scope for increasing exports.
6. Formation of food parks to provide opportunity for agro processing and value addition capabilities within the state.
7. Improvement of micro irrigation facilities.
8. Improvement of post harvest infrastructure viz. storage and preservation, transport, marketing etc. to prevent wastage.
9. Establishment of model nurseries to provide quality planting material within the state and revamp existing outdated nurseries.
10. More need based research and development essential for procurement of high quality saplings within the state.

#### **CONCLUSION:**

The state of West Bengal which witnessed impressive agricultural growth rates during the decade of the eighties has shown a declining trend during the nineties. However, since the mid nineties and the beginning of the 21<sup>st</sup> century, an important diversification towards high value cash crop farming especially fruits and vegetables has been observed. The state being richly endowed with diverse agro climatic conditions and soil diversity has immense scope and potential for cultivation of horticultural crops. Development of the horticultural sector assumes significance in view of its capacity to provide livelihood sources to a large number of farmers and also help in ensuring food and nutritional security in view of the deceleration of the agricultural growth rates that the state has been witnessing. Though area under and production of horticultural crops has increased in the previous decade, it is far from satisfactory as productivity levels are low especially for fruits, and horticulture development has not received the thrust it deserves. It is thus important for the government to recognize and tap the enormous potential of the horticultural sector through infrastructure development, need based research and development, and training and capacity building of farmers.

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