



Research Article

Growth of Area and Production of Selected Horticulture crops in the States under the Scheme Horticulture Mission for North East and Himalayan States of India

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Abstract: Utilizing the secondary data the paper examines the growth rates of area and production of vegetables and fruits among the states under the scheme Horticulture Mission for North East and Himalayan States for the time periods 1991-92, 2001-02, 2010-11 and 2017-18. Our study reveals that growth rates of vegetables and fruits were fluctuating in the reference period. However, growth rate in fruits was less fluctuated compared to the growth rate of vegetables. Among the states under the scheme, Uttarakhand was found to be the most remarkable in terms of improvement in the productivity of fruit crops and Himachal Pradesh in terms of productivity of vegetables. It is found that among the states under study, the change in production of fruits and vegetables was the least in Arunachal Pradesh over the same period.

Keywords: Horticulture, Production, Productivity, Area, HMNEH

JEL: Q₁

I. Introduction

Technology mission for integrated development of horticulture was launched in the year 2001-02 to look into the issues pertaining to production and productivity of the horticulture crops in North Eastern states of India including Sikkim. The scheme also launched to address post-harvest handling, marketing and processing of horticultural crops related problems. During the year 2003-04, three more Himalayan states were also included under the same scheme namely Himachal Pradesh, Jammu & Kashmir and Uttarakhand. The scheme's main motive was all round development of horticulture crops in the states under the scheme. The scheme was renamed as Horticulture Mission for North Eastern and Himalayan States (HMNEH) in the year 2010.

The states those under the HMNEH scheme comprise of eleven states of India namely Arunachal Pradesh, Assam, Nagaland, Mizoram, Manipur, Meghalaya, Sikkim, Tripura, Jammu & Kashmir (undivided), Himachal



Pradesh and Uttarakhand. These states are engaged in cultivation and production of various horticulture crops which are highly rich in vitamins, protein and minerals. The Himalayan states of India are bestowed with wide range of climatic condition which provides the congenial climate for cultivation of various horticulture crops (Pandey and Joshi, 1997). These states has land share of about 18 per cent of the total area of the country and has around 6 per cent of population of the country. In terms of population engaged in agriculture, more than 50 per cent are dependent on it (Census 2011). Centre government has been allocating funds for the promotion and rejuvenation of horticulture crops in these states. Hence, in this backdrop, present study aims to find the growth trends of area as well as production of selected horticulture crops of various states under the Scheme HMNEH over the last four time periods. First part of the paper deals with the basic information about scheme and second section deals with literature review followed by objectives, methodology section and results and discussion of the study. Last section concludes the findings of the present study.

II. Literature Review

India has the advantage of agro-climatic condition that provides a good scope for production of various horticulture crops and due to this, horticulture is the fastest growing sector within the agriculture sector. This growth further induced by the changing consumer preference for high value horticulture crops (Ramapa et al., 2015). India is among the highest producer of fruits and vegetables and it stand second position in the world. Within India also, fruits and vegetables constitute the main crops among the horticulture crops (Kumari and Singh, 2019). According to them, this sector has a great potential in higher income generation along with the employment. Further, the sector has chances of eliminating poverty, reducing hunger and malnutrition. The share of fruits and vegetables was increasing since 1990s (BIRTHAL et al., 2007). It has been identified as a good source of nutritional security and has a great potential for generating further economic activities in terms of marketing, distribution, etc (Mousumi et al., 2020). It is observed that the diversification towards horticulture provides better alternative with higher return (Ramapa et al., 2015). Further, it has been found that diversification was higher towards horticulture crops and within that, fruits and vegetables occupied significant area. In terms of demand also, demand for fruits and vegetables is higher compared to other crops. Additionally, various schemes pertaining to horticulture also stimulate the growth rate of these crops (Ramapa et al., 2015). According to BIRTHAL et al., (2007), consumption pattern was more diversified towards high value commodities such as fruits, vegetables, fish, poultry, diary etc and the potential to increase in demand for staple crops has limited and stagnated. This change in food basket among the Indian consumer was spurred by the higher rate of growth of urban population. According to them, most of the states under their study allocated higher portion of land for the cultivation of fruits and vegetables during the period 1980 to 2003. However, as per BIRTHAL et al., (2007), despite of higher prospects, it is difficult for the poor farmers to completely adopt the horticulture sector as it need higher time period to reap the benefit of horticulture crops, especially fruits. Further, this sector needs

higher investment and most of the poor farmers do not have savings and credit facilities to invest in this sector. Thus in this area, government help in terms of financial incentives may encourage the farmers to take up the opportunity in this sector. Furthermore, productivity in horticulture was found low despite of increasing in area expansion and production thus this area may need to be focused (Mousumi et al., 2020).

North East region comprises of seven states and constitutes nearly 70 per cent hills with number of rivers and streams (Ganguly, J.B, 1998). The region has immense potential for development of horticulture and occupied cultivated area share of around 19 per cent with Sikkim being highest share followed by Manipur. (DE, L.C., 2017). It is identified that promoting organic farming as well as local resources based farming are sustainable and environment friendly as the existing food security leaving millions of poor hungry (Bharat Dogri, 2022). Thus, the region has great scope for promotion of this sector for its socio-economic development. However, according to Birthal et al., (2007), the region is considered as most backward in terms of agriculture despite of having favourable agro-climatic conditions for horticulture development. Lack of infrastructure and underdeveloped market has also been identified as a basic factor for backwardness. As per their study, about 15 per cent of household grows fruits at national level while 4.7 per cent of North east region household grow fruit and about 4.6 per cent grow vegetables at national level and North East 66.9 per cent vegetables.

III. Objectives

Present study is an attempt to evaluate the growth trends of area as well as production of horticulture crops of various states under the Scheme HMNEH over the four time periods 1991-92, 2001-02, 2010-11 and 2017-18.

IV. Data Sources and Methodology

For the purpose of analyzing the trend in area, production and productivity of fruits and vegetables, the states under the scheme HMNEH are selected. To fulfill the objective of the study, secondary data pertaining to area and production of fruits and vegetables of four periods, that is, 1991-92, 2001-02 and 2010-11 and 2017-18 are collected from Ministry of Agriculture and Farmer's Welfare. Further, resources from various articles and online sources are also used for the present study. Simple descriptive statistics such as percentages, diagrams, etc have been used to ascertain the objective of the study. As the data is of four time period, decadal Growth rate is calculated by using excel formula Decadal Growth rate= $\left(\frac{E_A}{B_A}\right)^{1/n} - 1$

Where,

E_A = Ending Value

B_A = Beginning value

n= number of years

V. Results and Discussion

Geographical Area

India has total geographical area of 3287469 Sq. Km of which the Himalayan states, as considered in the study, occupied around 12.98 per cent. Among them Arunachal Pradesh occupied highest (2.55 per cent) followed by Assam (2.39 per cent). Sikkim has the lowest area share among the Himalayan states under the HMNEH scheme as shown in Table 1.

**Table-1: Percentage Share of Geographical Area under different Himalayan States
area in Square km**

States	Geographical Area	Percentage Area of the country	Percentage Area among HMNEH States
Arunachal Pradesh	83743	2.55	19.62
Assam	78438	2.39	18.38
Manipur	22327	0.68	5.23
Meghalaya	22429	0.68	5.25
Mizoram	21081	0.64	4.94
Nagaland	16579	0.50	3.88
Sikkim	7096	0.22	1.66
Tripura	10486	0.32	2.46
Jammu & Kashmir	55538	1.69	13.01
Himachal Pradesh	55673	1.69	13.04
Uttarakhand	53483	1.63	12.53
HMNEH States	426873	12.98	100
India	3287469	100.00	

Source: geographical area of Indian states,
<https://statisticstimes.com/geography/india/indian-states-area.php>

Working Population

Table 2 shows the percentage of people engaged in agriculture (main cultivator+agriculture labour) and from the table it is clear that about 55 per cent of country's working population are engaged in agriculture and around 51 per cent of HMNEH states' population dependent on agriculture for their livelihood. Among the HMNEH states, states whose half percentage of population engaged in agriculture are Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Himachal Pradesh and Uttarakhand and rest have less than 50 per cent dependent on agriculture but above 40 per cent.

Table-2: Percentage of Working Population Engaged in Agriculture

States	Total working pop.	Rural	Urban	Agriculture Population	Agriculture Population /rural	Agriculture Population /urban
Arunachal	587657	470315	117342	338894 (57.67)	331695 (56.44)	7199 (1.23)

Pradesh						
Assam	11969690	10368283	1601407	5906973 (49.35)	5832982 (48.73)	73991 (0.62)
Manipur	1304610	959161	345449	688949 (52.81)	614181 (47.08)	74768 (5.73)
Meghalaya	1185619	973458	212161	693039 (58.45)	678543 (57.23)	14496 (1.22)
Mizoram	486705	252382	234323	271390 (55.76)	211279(43.41)	60111 (12.35)
Nagaland	974122	760360	213762	600664 (61.66)	572460 (58.77)	28204 (2.90)
Sikkim	308138	243785	64353	143387 (46.53)	141412 (45.89)	1975 (0.64)
Tripura	1469521	1116076	353445	649565 (44.20)	624651 (42.51)	24914 (1.70)
Jammu & Kashmir	4322713	3113081	1209632	1793021 (41.48)	1678915 (38.84)	114106 (2.64)
Himachal Pradesh	3559422	3289384	270038	2237100 (62.85)	2218861 (62.34)	18239 (0.51)
Uttarakhand	3872275	2885533	986742	1983724 (51.23)	1931471 (49.88)	52253 (1.35)
Total HMNEH	30040472	24431818	5608654	15306706 (50.95)	14836450 (49.39)	470256 (1.57)
India	481888868	348743092	133145776	263142470 (54.61)	252082946 (52.31)	11059524 (2.30)

Source: Census 2011, Government of India.

Fund Allocation

Table 3 shows plan wise allocation of fund in agriculture and allied sector. Among the four plans i.e IXth, Xth, XIth and XIIth plan, horticulture received highest in XIth plan (11.59 per cent) out of the total allocated in agriculture and allied sector.

Table-3: Plan wise Allocation of Fund (in crore)

Categories	IX Plan	X Plan	XI Plan	XII Plan
	1997 to 2002	2002 to 2007	2007 to 2012	2012 to 2017
Horticulture	1453	5025	15800	16840
Agriculture and allied Sector	37546	58933	136381	363273
Percent of horticulture	3.87	8.53	11.59	4.64

Source: Handbook on Horticulture Statistics-2014, Government of India.

Fund Allocated for Horticulture promotion in HMNEH States

With the motive to improve the productivity along with the area expansion and higher production of horticulture crops in the Himalayan states of the country, government has been allocating central fund since the inception of the scheme.

Table-4: Fund Allocated to HMNEH States Scheme over the period of 2007 to 2018 (in crore)

Year	Fund Allocated	Growth Rate	Percentage Received	Grant Total
2007	321.76		16.58	1941.02
2008	291.39	-9.44	14.22	2048.496
2009	325.72	11.78	17.36	1876.0325
2010	399.98	22.80	14.81	2699.9281
2011	493.13	23.29	15.97	3088.05
2012	442.26	-10.32	23.78	1859.86

2013	532.99	20.52	18.66	2856.8
2014	402.02	-24.57	20.52	1958.73
2015	325.99	-18.91	19.19	1699.17
2016	313.84	-3.73	20.98	1495.72
2017	290.61	-7.40	14.28	2034.63

Source: Compiled and computed from Hand Book on Horticulture Statistics 2014 and Horticulture at a Glance-2018, Government of India.

Table 4 shows that in the year 2007, central government has allocated 321.76 crore to the HMNEH states but by 2017 it has declined to 290.61 cr. In terms of growth in the fund allocation, table depicts that the trend in fund allocation has been fluctuating over the period 2007 to 2017. Growth rate in fund allocation was positive in the year 2009, 2010, 2011 and 2013 while the growth rate of allocation for rest of the years was negative. However, in terms of percentage received out of the total fund released, HMNEH scheme received highest in the year 2012, even though its growth rate was negative, over the period 2007 to 2017.

Table 5 represents state-wise allocation of fund. Manipur was receiving highest during the period 2012-13 and 2013-14 but in the period 2014-15 to 2017-18 Jammu and Kashmir was receiving the highest per cent among the HMNEH states.

Table-5: State-Wise Fund Allocation

States	In (crore)					
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Arunachal Pradesh	47.42 (12.06)	46.61 (9.73)	23.77 (5.91)	35.5 (10.89)	00 (00.00)	00 (00.00)
Assam	37.49 (9.53)	48 (10.02)	29.09 (7.24)	20 (6.14)	22 (7.01)	22.9 (6.44)
Manipur	48.93 (12.44)	58 (12.10)	44.17 (10.99)	35.75 (10.97)	10 (3.19)	24 (6.75)
Meghalaya	29 (7.38)	40 (8.35)	27.6 (6.86)	18 (5.52)	18.75 (5.97)	15.36 (4.32)
Mizoram	43.1 (10.96)	48 (10.02)	41 (10.20)	34.5 (10.58)	31.5 (10.04)	41.5 (11.67)
Nagaland	43.55 (11.08)	47.45 (9.90)	34.76 (8.65)	17.25 (5.29)	15 (4.78)	36.34 (10.22)
Sikkim	42.89 (10.91)	49.36 (10.30)	44.5 (11.07)	33.25 (10.20)	25.25 (8.05)	30.5 (8.58)
Tripura	44.8 (11.39)	56.14 (11.72)	37 (9.20)	32.75 (10.05)	23.5 (7.49)	10 (2.81)
Jammu & Kashmir	18.25 (4.64)	29.43 (6.14)	45 (11.19)	52 (15.95)	96.09 (30.62)	116.5 (32.77)
Himachal Pradesh	27.55 (7.01)	26.19 (5.47)	42.42 (10.55)	24.49 (7.51)	24.25 (7.73)	28 (7.88)
Uttarakhand	10.23 (2.60)	30 (6.26)	32.73 (8.14)	22.5 (6.90)	47.5 (15.14)	30.37 (8.54)
Total	393.21	479.18	402.04	325.99	313.84	355.47

	(100)	(100)	(100)	(100)	(100)	(100)
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Source: Horticulture at a Glance-2018, Government of India.

Area under fruit crop among the HMNEH states are shown in Table 6 and the table shows that Himachal Pradesh has occupying the highest percent of area among the HMNEH states in the time period 1991-91, 2001-02, 2010-11 but during the year 2017-18 Uttarakhand has surpassed the percentage share of area. Nagaland has the lowest per cent share in area under fruit in the year 1991-92 but in 2001-02, 2010-11 and 2017-18 it was Sikkim that has lowest percentage share in area among HMNEH states. At the national level, HMNEH states occupied around 22 per cent in the year 1991-91, 2001-02 and in 2017-18 in the country's total fruit crop cultivated area while it was around 17 per cent during the year 2010-11. In Table 6, Assam has the highest percent area under vegetable among the HMNEH states in the year 1991-92, 2001-02, 2010-11 and 2017-18. On the other hand, Mizoram has the lowest per cent in 1991-92 and 2001-02 but in the year 2010-11 and 2017-18 it was Arunachal Pradesh that has lowest per cent of area share under vegetables.

Table-6: Share of area under Fruits and Vegetables in different HMNEH States

(Area in '000'ha)

States	1991-92		2001-02		2010-11		2017-18	
	Fruits	Vegetables	Fruits	Vegetables	Fruits	Vegetables	Fruits	Vegetables
Himachal Pradesh	157.2 (24.94)	38.7 (6.39)	223 (26.24)	34.6 (6.15)	214.8 (20.32)	80.4 (12.33)	230.9 (15.53)	89.3 (11.03)
Tripura	44.9 (7.12)	30.3 (5.00)	28.3 (3.33)	31.3 (5.57)	40.8 (3.86)	36 (5.52)	53.8 (3.62)	45.9 (5.67)
Manipur	19.8 (3.14)	11.8 (1.95)	26.1 (3.07)	10.6 (1.89)	68.9 (6.52)	22.2 (3.40)	47.6 (3.20)	45.3 (5.60)
Meghalaya	24.2 (3.84)	25.9 (4.28)	24 (2.82)	35.7 (6.35)	30.2 (2.86)	41.8 (6.41)	32.8 (2.21)	49.1 (6.07)
Nagaland	5.2 (0.82)	8.2 (1.35)	25 (2.92)	26.3 (4.68)	18.2 (1.72)	10.7 (1.64)	39.4 (2.65)	46.2 (5.71)
A.P.	20.2 (3.20)	17.1 (2.82)	41.6 (4.90)	20.8 (3.70)	72 (6.81)	4.2 (0.64)	48.1 (3.24)	2.6 (0.32)
Sikkim	7.7 (1.22)	7.6 (1.26)	12.3 (1.45)	14.2 (2.53)	17.5 (1.66)	23.9 (3.66)	19.4 (1.31)	38.1 (4.71)
Jammu & Kashmir	119.1 (18.89)	180.3 (29.78)	142.2 (16.73)	50.8 (9.03)	211.6 (20.01)	69.7 (10.69)	327.4 (22.02)	56.3 (6.96)
Uttarakhand	150.5 (23.87)	57.1 (9.43)	197.5 (23.24)	93.8 (16.68)	179.3 (16.96)	85.8 (13.15)	476.6 (32.06)	100.1 (12.37)
Assam	72.3 (11.47)	222.4 (36.74)	110.8 (13.04)	237.4 (42.22)	177 (16.74)	260.1 (39.87)	147.3 (9.91)	300.2 (37.09)
Mizoram	9.3 (1.48)	6 (0.99)	19 (2.24)	6.8 (1.21)	27 (2.55)	17.5 (2.68)	63.2 (4.25)	36.2 (4.47)
HMNEH	630.4 (21.93)	605.4 (11.79)	849.8 (21.19)	562.3 (11.21)	1057.3 (16.56)	652.3 (7.69)	1486.5 (22.85)	809.3 (7.89)

Source: Compiled and computed from Indian Horticulture Database 2011 and Horticulture at a Glance-2018

In Table 7, growth rate of area under fruits was around 30 per cent for Himachal Pradesh in the time period 1991-92 to 2001-02 while in time period 2001-02 to 2010-11, it was around minus four per cent (-4%). Again, it became positive at around 7 per cent growth rate in time period 2010-11 to 2017-18. Except for the time period 1991-92 to 2001-02, the growth rate of area under vegetables was positive for the state, albeit reducing in per cent.

On the other hand, growth rate of area under vegetables was positive over the time period 1991-92 to 2017-18 for Tripura. However, growth rate of area under fruit was negative in 1991-92 to 2001-02 but positive for the rest of the period. Area growth rate of fruits in Manipur was positive for the year 2010-11 to 2017-18. Vegetables growth area was negative in 1991-92 to 2001-02 and rest of the year was positive for the same. Negative growth rate in area under fruit was only in 1991-92 to 2001-02 for Meghalaya and rest of the period was positive for both fruits and vegetables even though its percentage was fluctuating over the same period. Growth rate in area under fruits and vegetables was positive for Arunachal Pradesh in 1991-92 to 2001-02 but it was negative in the time period 2010-11 to 2017-18. During the period 2001-02 to 2010-11, the growth rate in area under vegetable was also found negative.

For Sikkim, growth rate in area under vegetables and fruits was positive for whole study period. In case of Jammu and Kashmir, vegetables growth rate was found to be negative in the period 1991-92 to 2001-02 and 2010-11 to 2017-18. For Assam, growth rate in area under fruit was negative in 2010-11 to 2017-18. Overall, all the states of HMNEH has experienced both positive and negative growth rate of area under fruits and vegetables, except for the state Mizoram. In terms of the overall change in area from 1991-92 to 2017-18, the result reveals that the overall change from 1991-92 was positive for all the states except for Arunachal Pradesh and Jammu and Kashmir in area under vegetables.

As the present study aims to find the changes after the initiation of HMNEH scheme, change from 2001-02 has been analyzed and it showed the positive shift towards the higher area in both fruits and vegetables. Mizoram registered the highest percentage change of area under fruits from 2001-02 to 2017-18 followed by Uttarakhand and Jammu and Kashmir while on the other hand, lowest area change under fruit was for Himachal Pradesh and Arunachal Pradesh during the same period. Change of area under vegetables was highest for Mizoram followed by Manipur, Sikkim and Himachal Pradesh over the same period.

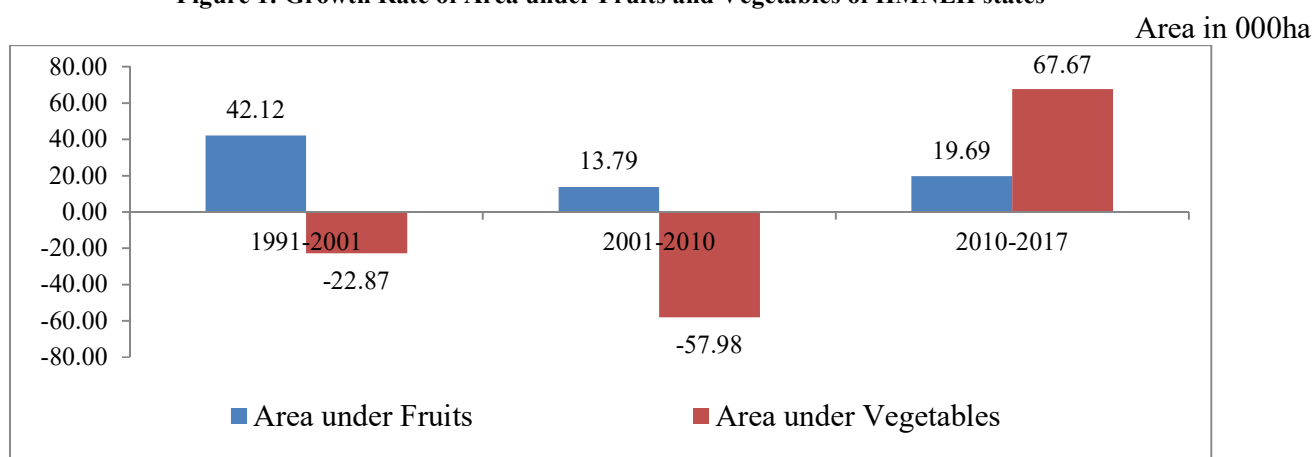
Table-7: Growth Rate of Area under Fruits and Vegetables

		(Area in '000'ha)											
		Himachal Pradesh	Tripura	Manipur	Meghalaya	Nagaland	A.P.	Sikkim	J & K	Uttara khand	Assam	Mizoram	HMNE States
1991-	Fruits	157.2	44.9	19.8	24.2	5.2	20.2	7.7	119.1	150.5	72.3	9.3	630.4

92	Veg.	38.7	30.3	11.8	25.9	8.2	17.1	7.6	180.3	57.1	222.4	6	605.4
	Fruits	223 (29.51)	28.3 (-58.66)	26.1 (24.14)	24 (-0.83)	25 (79.20)	41.6 (51.44)	12.3 (37.40)	142.2 (16.24)	197.5 (23.80)	110.8 (34.75)	19 (51.05)	1089.154 (42.12)
1991-2001	Veg.	34.6 (-11.85)	31.3 (3.19)	10.6 (-11.32)	35.7 (27.45)	26.3 (68.82)	20.8 (17.79)	14.2 (46.48)	50.8 (-254.92)	93.8 (39.13)	237.4 (6.32)	6.8 (11.76)	492.70 (-22.87)
	Fruits	214.8 (-3.82)	40.8 (30.64)	68.9 (62.12)	30.2 (20.53)	18.2 (-37.36)	72 (42.22)	17.5 (29.71)	211.6 (32.80)	179.3 (-10.15)	177 (37.40)	27 (29.63)	1263.432 (13.79)
2001-2010	Veg.	80.4 (56.97)	36 (13.06)	22.2 (52.25)	41.8 (14.59)	10.7 (-145.79)	4.2 (-395.24)	23.9 (40.59)	69.7 (27.12)	85.8 (-9.32)	260.1 (8.73)	17.5 (61.14)	311.87 (-57.98)
	Fruits	230.9 (6.97)	53.8 (24.16)	47.6 (-44.75)	32.8 (7.93)	39.4 (53.81)	48.1 (-49.69)	19.4 (9.79)	327.4 (35.37)	476.6 (62.38)	147.3 (-20.16)	63.2 (57.28)	1573.172 (19.69)
2010-2017	Veg.	89.3 (9.97)	45.9 (21.57)	45.3 (50.99)	49.1 (14.87)	46.2 (76.84)	2.6 (-61.54)	38.1 (37.27)	56.3 (-23.80)	100.1 (14.29)	300.2 (13.36)	36.2 (51.66)	964.65 (67.67)
Decadal Growth rate(in %)	Fruits	10.09	4.63	24.52	7.90	65.91	24.22	25.99	28.76	33.40	19.47	61.46	25.69
	Veg.	23.25	10.94	39.98	17.34	54.07	-37.56	49.63	-25.25	15.07	7.79	56.73	12.35
change over 1991-92	Fruits	46.88	19.82	140.40	35.54	657.69	138.12	151.95	174.90	216.68	103.73	579.57	149.55
	Veg.	130.75	51.49	283.89	89.58	463.42	-84.80	401.32	-68.77	75.31	34.98	503.33	59.34
change over 2000-01	Fruits	3.54	90.11	82.38	36.67	57.60	15.63	57.72	130.24	141.32	32.94	322.63	44.44
	Veg.	158.09	46.65	327.36	37.54	75.67	-87.50	168.31	10.83	6.72	26.45	432.35	95.79

Source: Compiled and computed from Indian Horticulture Database 2011 and Horticulture at a Glance-2018, Government of India.

Figure 1: Growth Rate of Area under Fruits and Vegetables of HMNEH states



Source: Compiled and computed from Indian Horticulture Database 2011 and Horticulture at a Glance-2018, Government of India.

Figure 1 shows that growth rate in area under fruits in HMNEH states was positive but decreasing over the time period 1991-2001 to 2010-17. In case of Vegetables, it was negative and declining over the period 1991-2001 and 2001-2010 however it has increased to around 68 per cent over the period 2010-2017.

Table 8 depicts that Assam was producing highest per cent of vegetables among the HMNEH states in the whole study period. Apart from Assam, three more states were also producing more than 10 per cent among the states in consideration are Jammu and Kashmir, Uttarakhand and Himachal Pradesh.

Assam was also producing highest per cent of fruit during the year 1991-92 and 2001-02 but Jammu and Kashmir has surpassed Assam in the year 2010-11. Again in 2017-18, Uttarakhand surpassed Jammu and Kashmir and became the highest contributor of fruit production among the HMNEH states. Assam is still occupying the third position in terms of production of fruits with the production share of more than 10 per cent. Besides these three states, Himachal Pradesh and Tripura have leading share in the percentage of fruit production among the considered states.

Table-8: Percentage of Fruits and Vegetables Production in different HMNEH States

in 000mt

States	1991-92		2001-02		2010-11		2017-18	
	Fruits	Veg.	Fruits	Veg.	Fruits	Veg.	Fruits	Veg.
Himachal Pradesh	339.9 (11.16)	476 (9.98)	263.4 (6.20)	639.1 (10.31)	1031.1 (13.93)	1474 (17.40)	565.3 (3.17)	1811.8 (18.20)
Tripura	319.1 (10.48)	306.8 (6.43)	452.1 (10.64)	353.2 (5.70)	643.9 (8.70)	532.3 (6.29)	547.5 (3.07)	795.7 (7.99)
Manipur	43 (1.41)	50.3 (1.05)	134 (3.15)	66.1 (1.07)	286.3 (3.87)	236.5 (2.79)	455.6 (2.56)	342.1 (3.44)
Meghalaya	218.1 (7.16)	219.2 (4.59)	186.1 (4.38)	265.9 (4.29)	241.9 (3.27)	356.5 (4.21)	316.5 (1.78)	519.7 (5.22)
Nagaland	9.2 (0.30)	66.9 (1.40)	302 (7.11)	286 (4.61)	151.3 (2.04)	79.4 (0.94)	380.5 (2.14)	561.6 (5.64)
Arunachal Pradesh	47.3 (1.55)	79.9 (1.67)	124.9 (2.94)	83.9 (1.35)	107.9 (1.46)	38.5 (0.45)	125.7 (0.71)	16.6 (0.17)
Sikkim	18.8 (0.62)	46.1 (0.97)	10.3 (0.24)	60 (0.97)	25.8 (0.35)	120.9 (1.43)	54.9 (0.31)	229.1 (2.30)
Jammu & Kashmir	700.8 (23.01)	745 (15.61)	1000.9 (23.56)	728.9 (11.76)	2220.5 (30.00)	1559.1 (18.41)	2355.2 (13.23)	1226 (12.31)
Uttarakhand	428.7 (14.07)	617.6 (12.94)	376.1 (8.85)	737.3 (11.89)	718.9 (9.71)	1030.9 (12.17)	10539.8 (59.20)	989.4 (9.94)
Assam	886.4 (29.10)	2132.3 (44.68)	1335.1 (31.43)	2935.2 (47.34)	1763.5 (23.82)	2925.5 (34.54)	2123.6 (11.93)	3292.9 (33.07)
Mizoram	34.8 (1.14)	31.8 (0.67)	63.4 (1.49)	44.1 (0.71)	211.5 (2.86)	115.6 (1.36)	340.5 (1.91)	171 (1.72)
HMNEH states out of India's fruit crop production	3046.1 (10.64)	4771.9 (8.86)	4248.3 (9.88)	6199.7 (8.79)	7402.6 (9.89)	8469.2 (5.78)	17805.1 (18.29)	9955.9 (5.40)

Source: Compiled and computed from Indian Horticulture Database 2011 and Horticulture at a Glance-2018, Government of India.

In Table 9, State wise growth rate of production of fruits and vegetables shows that except for the states Mizoram and Manipur, all the other HMNEH states were experiencing fluctuation in the growth rate of fruits and vegetables, especially in the growth rate of fruits. Himachal Pradesh was experiencing both negative and positive growth rate of production of fruits from the period 1991-92 to 2017-18 while growth rate of vegetables

was positive during the same period. In case of Tripura, except for the period 2010-11 to 2017-18, growth rate of fruit production was positive. On the other hand, vegetable growth rate was positive for the whole study period for the State.

Growth rate of fruit was found negative during the period 1991-92 to 2010-11 for the State Meghalaya and rest of the year was positive for both fruits and vegetables. Growth rate of fruits and vegetables for the State Nagaland was negative in the period 2001-02 to 2010-11 and rest of the year was positive. Similarly, negative growth rate in fruit production was seen in 1991-92 to 2010-11 for the State Sikkim.

On the other hand, growth rate in fruit production was positive for whole study period for Jammu and Kashmir but for vegetables, the state was experiencing negative growth rate in production during the year 1991-92 to 2001-02 and 2010-11 to 2017-18. For the State Uttarakhand, negative growth rate was found in 1991-92 to 2000-01 in fruits and in 2010-11 to 2017-18 in vegetables. Among the states in consideration, Assam was found to be the most constant in the growth rate in both the crops. The State also experienced negative growth rate only in the year 2001-02 to 2010-11 in vegetable growth rate but that was also a small per cent (i.e -0.33) and rest of the year was found positive.

In case of Arunachal Pradesh, negative growth rate in fruits was found in the year 2001-02 and for vegetables in 2010-11 to 2017-18. Decadal growth rate for the period 1991-92 to 2017-18 was found to be positive for all the states, except for Arunachal Pradesh. Changes in the production from 1991-92 to 2017-18 also found to be negative for Arunachal Pradesh while rest of the HMNEH states was positive.

Change from 2001-02 also computed and presented in Table 9 which reveals that production was increased from 2001-02 to 2017-18 and Uttarakhand was highest in terms of production of fruits followed by Mizoram and Sikkim. Arunachal Pradesh has lowest change over the same period. In terms of production of vegetables also, Manipur has the highest per cent followed by Mizoram, Sikkim and Himachal Pradesh. To be precise, the result reveals that Mizoram and Sikkim have developed both in terms of area as well as production of fruits and vegetables. Uttarakhand has progressed highest in terms of area expansion as well as in production of fruits. Manipur and Himachal Pradesh excelled in expanding area under vegetables and production of vegetables.

Table-9: Growth Rate of Fruits and Vegetables Production

		In 000mt											
		Himachal Pradesh	Tripura	Manipur	Meghalaya	Nagaland	A.P.	Sikkim	Jammu & Kashmir	Uttarakhand	Assam	Mizoram	HMNEH states
1991-92	Fruits	339.9	319.1	43	218.1	9.2	47.3	18.8	700.8	428.7	886.4	34.8	3046.1
	Veg.	476	306.8	50.3	219.2	66.9	79.9	46.1	745	617.6	2132.3	31.8	4771.9

1991-2001	Fruits	263.4 (-22.51)	452.1 (41.68)	134 (211.63)	186.1 (-14.67)	302 (3182.61)	124.9 (164.06)	10.3 (-45.21)	1000.9 (42.82)	376.1 (-12.27)	1335.1 (50.62)	63.4 (82.18)	7883.045 (158.79)
	Veg.	639.1 (34.26)	353.2 (15.12)	66.1 (31.41)	265.9 (21.30)	286 (327.50)	83.9 (5.01)	60 (30.15)	728.9 (-2.16)	737.3 (19.38)	2935.2 (37.65)	44.1 (38.68)	6724.538 (40.92)
2001-2010	Fruits	1031.1 (291.46)	643.9 (42.42)	286.3 (113.66)	241.9 (29.98)	151.3 (-49.90)	107.9 (-13.61)	25.8 (150.49)	2220.5 (121.85)	718.9 (91.15)	1763.5 (32.09)	211.5 (233.60)	8220.276 (4.28)
	Veg.	1474 (130.64)	532.3 (50.71)	236.5 (257.79)	356.5 (34.07)	79.4 (-72.24)	38.5 (-54.11)	120.9 (101.50)	1559.1 (113.90)	1030.9 (39.82)	2925.5 (-0.33)	115.6 (162.13)	9076.965 (34.98)
2010-2017	Fruits	565.3 (-45.18)	547.5 (-14.97)	455.6 (59.13)	316.5 (30.84)	380.5 (151.49)	125.7 (16.50)	54.9 (112.79)	2355.2 (6.07)	10539.8 (1366.10)	2123.6 (20.42)	340.5 (60.99)	19525.32 (137.53)
	Veg.	1811.8 (22.92)	795.7 (49.48)	342.1 (44.65)	519.7 (45.79)	561.6 (607.30)	16.6 (-56.88)	229.1 (89.50)	1226 (-21.36)	989.4 (-4.03)	3292.9 (12.56)	171 (47.92)	10707.94 (17.97)
Decadal Growth rate	Fruits	13.56	14.45	80.42	9.76	153.60	27.68	30.72	35.40	122.67	24.41	76.86	59.12
	Veg.	39.68	26.90	61.49	24.09	70.22	-32.49	49.31	13.26	12.50	11.48	52.28	22.39
change over 1991-92	Fruits	66.31	71.58	959.53	45.12	4035.87	165.75	192.02	236.07	2358.55	139.58	878.45	540.99
	Veg.	280.63	159.35	580.12	137.09	739.46	-79.22	396.96	64.56	60.20	54.43	437.74	124.40
change over 2001-02	Fruits	114.62	21.10	240.00	70.07	25.99	0.64	433.01	135.31	2702.39	59.06	437.67	147.69
	Veg.	183.49	125.28	417.55	95.45	96.36	-80.21	281.83	68.20	34.19	12.19	287.76	59.92

Source: Compiled and computed from Indian Horticulture Database 2011 and Horticulture at a Glance-2018, Government of India.

Growth rate of fruit crop production of HMNEH states was more than 100 per cent during the year 1991- 2000 and 2010-2017 but it was only 4.28 per cent during the year 2001-2010. However, growth rate in vegetables was ranging from around 18 per cent to around 42 per cent over the period 1991 to 2017.

Table 10 represents the yield of fruits and vegetables and it shows that productivity of HMNEH states was lower than the country's productivity. if we compare the productivity of fruits after the implementation of the scheme i.e from 2001-02 to 2010-11, it is found that the states that improved their productivity of fruits were Himachal Pradesh, Meghalaya, Sikkim, Jammu and Kashmir, Uttarakhand and Mizoram. On the other hand, few states whose productivity has been declined over the same period were Manipur, Nagaland, Arunachal Pradesh, Assam and Tripura.

As far as the vegetables productivity is concerned, it is clear from the table that the productivity per hectare of the HMNEH states has been improved. Except for the states Assam and Mizoram, productivity of vegetables has declined compared to the year 2001-02 to 2017-18. Remarkable growth in productivity of fruits has been found in case of Uttarakhand i.e 1.90 to 22.11 mt per ha from 2001-02 to 2017-18. Similar evidence is seen in case of vegetables productivity of Jammu and Kashmir i.e from 4.13 during the year 2001-02 to 21.78 during the year 2017-18.

Table - 10:Productivity of Fruits and Vegetables

States	1991-92		2001-02		2010-11		2017-18	
	Fruits	Veg.	Fruits	Veg.	Fruits	Veg.	Fruit	Veg.
Himachal Pradesh	2.16	12.30	1.18	18.47	4.80	18.33	2.45	20.29
Tripura	7.11	10.13	15.98	11.28	15.78	14.79	10.18	17.34

Manipur	2.17	4.26	5.13	6.24	4.16	10.65	9.57	7.55
Meghalaya	9.01	8.46	7.75	7.45	8.01	8.53	9.65	10.58
Nagaland	1.77	8.16	12.08	10.87	8.31	7.42	9.66	12.16
A.P.	2.34	4.67	3.00	4.03	1.50	9.17	2.61	6.38
Sikkim	2.44	6.07	0.84	4.23	1.47	5.06	2.83	6.01
Jammu & Kashmir	5.88	4.13	7.04	14.35	10.49	22.37	7.19	21.78
Uttarakhand	2.85	10.82	1.90	7.86	4.01	12.02	22.11	9.88
Assam	12.26	9.59	12.05	12.36	9.96	11.25	14.42	10.97
Mizoram	3.74	5.30	3.34	6.49	7.83	6.61	5.39	4.72
HMNEH	4.83	7.88	5.00	11.03	7.00	12.98	11.98	12.30
India	9.96	10.48	10.72	14.06	11.73	17.25	14.96	17.97

Compiled and computed from Indian Horticulture Database 2011 and Horticulture at a Glance-2018, Government of India.

VI. Conclusion

Study reveal that the growth rate in area under vegetables was negative in 1991-2001 and in 2001-2010 but in terms of production, it was positive over the study period. Growth rate of fruits was positive over the same period both in terms of growth rate in area as well as in terms of production. Compared to vegetable growth rate, growth rate of fruits was more stable, though fluctuation found, this may be because of the perennial nature of fruits crops. State level analysis result also demonstrates that Meghalaya was constant i.e. during 1991-2001, in the sense that the growth rate of production was negative when there was a negative growth rate in area and positive when there was a positive growth rate in area expansion. Growth rate of fruits was higher than vegetables and growth rate in production was higher than the growth rate in area (except in 2001-2010 both in terms of area and production). Area growth rate for Manipur was negative for fruits but positive for production growth rate in 2010-2017 which shows the improvement in productivity. For Arunachal Pradesh also, negative in growth rate in area under fruits in 2010-2017 but in terms of growth rate in production, it was positive which implies improvement in productivity. In Sikkim, area growth rate was positive over the study period but negative in terms of production growth rate in 1991-2001 but with the passage of time, its productivity improved which is visible from positive and higher growth rate in production. Growth rate of fruits was better than vegetables for Jammu and Kashmir and Uttarakhand over the study period. As the scheme launched in 2000s a comparison has been made to examine whether the area as well as production of crops has been improved over the years and from the analysis it has been found that in 2001-2010 area has been increased for the states Tripura, Manipur, Meghalaya, Arunachal Pradesh, Sikkim, Jammu and Kashmir, Assam and Mizoram compared to 1991-2001. While on the other hand, area has been declined in the period 2001-2010 was for Himachal Pradesh, Nagaland and Uttarakhand. However, productivity of fruits and vegetables was found improving for the state Himachal Pradesh in 2010-11 and for Tripura, it was improving for vegetables and slightly declined for fruits. In 2017-18, the states whose productivity of fruits and vegetables has been found

improving were Manipur, Meghalaya, Mizoram, Sikkim, Jammu and Kashmir and Uttarakhand. Most remarkable improvement was improvement in productivity of fruits was for Uttarakhand i.e 1.90 mt per hectare in 2017-18. The basic aim of the scheme was to improve productivity of horticulture crops but the study reveals that except for few states, most of the states are still at very low level of yield. Hence, more emphasis needs to be given on productivity improvement technique, especially those states under very low level of yield.

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