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Horticulture in mountainous states with special emphasis on Himachal Pradesh

S. Sood • V. Kumar

Department of Agricultural Economics, Extension Education & Rural Sociology, CSK HPAU, Palampur, Himachal Pradesh

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ABSTRACT

Horticulture sector has come to be recognized as the key driver of growth in agriculture during the past three decades or so. It has sustained the growth momentum, though less vigorously, despite overall slowdown in agriculture. The policy support to horticulture has been more than encouraging. Owing to unique agro-climatic advantages, the north-western and north-eastern Indian hilly states have tremendous potential in making horticulture driven growth more broad-based. The present article attempts to examine the performance of eleven hilly states using secondary data for the period 2001-02 to 2017-18. Also, a separate analysis has been carried out for the state of Himachal Pradesh which is a model of hill development. The results revealed that the overall area and production under fruit as well as vegetable crops in the mountainous states increased during the study period. The overall productivity of fruits decreased and that of vegetable crops increased in the mountainous states. The share of all mountain states however declined marginally during the study period.

Himachal Pradesh has shown remarkable growth of horticulture in the recent past. Its share in the gross value added in agriculture increased considerably. The area under fruits witnessed a significant increase while production and productivity have also shown positive trends. As regards the infrastructural facilities available for the development of horticulture, it was observed that there are disparities with respect to the availability of these facilities across districts. In order to make horticulture a buoyant sector, efforts need to be in place to abridge these disparities with the provision of quality service delivery

1. Introduction

Horticulture sector has played a key role in the growth of agriculture in India during the past three decades or so. The diverse agro-climatic conditions and rich diversity in horticultural crops enable India to produce a wide range of these crops round the year. Out of the overall growth rate of 3.56 per cent in agriculture during 2000-2011, fruits and vegetables alone accounted for 19.20 per cent (Jha *et al.*, 2019). The production of horticultural crops was 311.71 million tonnes from an area of 25.43 million hectares with 33 per cent share in output in agriculture. (Government of India, 2018). Horticulture based diversification of

agriculture has been often suggested to augment incomes of the rural people in current agricultural scenario (Joshi *et al.*, 2004). In addition to this, wide spread cultivation of fruits and vegetables also helps in expanding the agro-industrial base. In view of these achievements and prospects, horticulture is increasingly recognised as a sunrise sector, owing to its potential to raise farm income, provide livelihood security and earn foreign exchange through export (Jha *et al.*, 2019).

Horticulture in the southern and western Indian states has achieved significant progress. These states have become a quintessence of horticultural based agricultural diversification.

*Corresponding author: shivalikasood123@gmail.com

Many states in the north-eastern and north-western parts hold immense potential to make this diversification more broad based. These states possess a medley of agro-climatic conditions that nurture a variety of horticultural crops. Realizing this, tremendous policy support has been given to these states through the National Horticulture Mission (NHM) as well as specially meant technology mission for the development of horticulture in these states in the recent past. Among these states, Himachal Pradesh has long been regarded as a 'model state' due to its magnificent achievements in the production of fruits, mainly apple. The Government of India has proposed to double farmers' income by the year 2022. It is being increasingly recognised that horticulture will remain an integral component for the strategy to achieve this goal. With this background, the present paper attempts to examine the changes in the contribution of horticulture in these mountainous states. Secondly, an attempt has been made to assess the performance of horticulture sector in the state of Himachal Pradesh.

2. Materials & Methods

The study is entirely based on secondary data on area, production and yield of fruits and vegetables in the mountainous states. The data for different years, 2001-02 to 2017-18 were collected from various published sources like Horticultural Statistics at Glance, Statistical Year Book of Himachal Pradesh and publications of Central Statistics Office, etc. Following formulae of compound growth rates were used to analyze the data and study the trends in fruits & vegetables:

1. Compound growth rate (r)=

$$\left\{ \left[\left(\frac{Y_f}{Y_i} \right)^{\frac{1}{\text{number of years}}} \right] - 1 \right\} * 100$$

where,

Y_f = area/ production/ productivity of fruits & vegetables in the final year

Y_i = area/ production/ productivity of fruits & vegetables in the initial year

2. $Y = a.b^t$

where, Y = Value of output; a = Constant & b = Regression coefficient

t = Time variable.

From the estimated function the compound growth rate was worked out by,

$$\text{CGR (r)} = [\text{Antilog (log b)} - 1] \times 100$$

where, r = Compound growth rate

A. Horticulture in Mountainous States

Horticulture is the major source of livelihood in the hilly states of Jammu and Kashmir (J&K), Himachal Pradesh (HP), Uttarakhand and the seven North-Eastern States. In order to know the changing contribution of horticulture in these states, the changes in the area, production and yields of these crops were examined. Thereafter, the growth in the value of output from these crops was estimated. The results have been summarized in the following paragraphs.

- **Area, production and yields of fruits in mountainous states**

The changes in the area, production and yields of various fruit crops during 2001-02 to 2017-18 in these mountainous states have been presented in Table 1. The total area under fruits in mountainous states more than doubled from 706.64 thousand hectares in 2001-02 to 1,486.53 thousand hectares during 2017-18, accounting for about 22.85 per cent of the total area under fruits in the country. The comparison across the different mountainous states revealed that as a proportion of total area in mountainous states Uttarakhand recorded highest area of about 32.06 per cent under fruits followed by J&K (22.03 %) and Himachal Pradesh (15.53 %) during 2017-18. The Table 1 further shows that the states of Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura and Assam collectively accounted for 31.38 per cent of the total mountainous states area during 2017-18.

The production of fruits in all mountainous states increased from 4,331.15 thousand tonnes in 2001-02 to 7,935.31 thousand tonnes in 2017-18. The share of these states in the total fruits production in the country however declined marginally between 2001-02 and 2017-18 but still these states collectively contributed 8.15 per cent towards total fruits production in the country. The comparison of the production across the states reveals that Jammu & Kashmir and Assam together contributed 56.44 per cent to total fruits production in the mountainous states during 2017-18. The overall production of fruits has increased considerably in the country as well as in the states but the increase in production was quite marked in a few states viz. Meghalaya, J&K, Manipur and Mizoram. This shows that fruit production is becoming more popular in other mountainous states.'

The productivity of total fruits in mountainous states was estimated at 5.34 tonnes per hectare which was about one third of the productivity of fruits at the national level (14.96 tonnes/ha). The per hectare yield of fruits in the mountainous states decreased marginally from 6.13 tonnes/ha during 2001-02 to 5.34 tonnes/ha in 2017-18. The productivity of fruits in

the country however increased by 40 per cent during this period. The comparison of productivity across the states reveals that in most of the states (except Arunachal Pradesh, Nagaland, Tripura, Himachal Pradesh & Uttarakhand) the

productivity has increased significantly over the period. The productivity level in the states like Manipur, Meghalaya and Mizoram was found to be higher, but in Assam it was found to be almost similar as the national average.

Table 1: Area, production and yields of fruits in mountainous states, 2001-02 to 2017-18 (Area in `000 ha; Production in `000 tonnes and Yield in tonnes per ha)

States	2001-02			2010-11			2017-18		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
Arunachal Pradesh	41.6 (5.89)	124.9 (2.88)	3.00	72 (6.36)	107.9 (1.46)	1.5	48.13 (3.24)	125.7 (1.58)	2.61
Assam	110.8 (15.69)	1335.1 (30.83)	12.05	137.5 (12.15)	1763.5 (23.82)	12.83	147.26 (9.91)	2123.62 (26.76)	14.42
HP	223.04 (31.59)	263.45 (6.08)	1.18	214.8 (18.98)	1031.1 (13.93)	4.8	230.85 (15.53)	565.31 (7.12)	2.45
J&K	140.9 (19.94)	1000.9 (23.11)	7.10	325.6 (28.77)	2220.5 (30.00)	6.82	327.43 (22.03)	2355.19 (29.68)	7.19
Manipur	26.1 (3.69)	134.00 (3.09)	5.13	68.7 (6.07)	286.3 (3.87)	4.17	47.61 (3.20)	455.59 (5.74)	9.57
Meghalaya	24.0 (3.40)	186.9 (4.32)	7.79	30.2 (2.67)	241.9 (3.27)	8.01	32.81 (2.21)	316.51 (3.99)	9.65
Mizoram	19.0 (2.69)	63.4 (1.46)	3.34	27 (2.39)	211.5 (2.86)	7.83	63.19 (4.25)	340.51 (4.29)	5.39
Nagaland	25.0 (3.54)	302.00 (6.97)	12.08	18.2 (1.61)	151.3 (2.04)	8.31	39.5 (2.66)	380.52 (4.80)	9.63
Sikkim	12.3 (1.74)	10.3 (0.24)	0.84	17.5 (1.55)	25.8 (0.35)	1.47	19.36 (1.30)	54.9 (0.69)	2.84
Tripura	28.3 (4.00)	452.1 (10.44)	15.98	40.8 (3.61)	643.9 (8.70)	15.78	53.75 (3.62)	547.52 (6.90)	10.19
Uttarakhand	55.6 (7.87)	458.1 (10.58)	8.24	179.3 (15.84)	718.9 (9.71)	4.01	476.64 (32.06)	669.94 (8.44)	1.41
All Mountainous States	706.64 (100.00) (17.62) [@]	4331.15 (100.00) (10.07) [@]	6.13	1131.6 (100.00) (17.73) [@]	7402.6 (100.00) (9.86) [@]	6.54	1486.53 (100.00) (22.85) [@]	7935.31 (100.00) (8.15) [@]	5.34
India	4010.2	43000.9	10.72	6382.6	74877.5	11.73	6506.23	97357.51	14.96

Note: 1. Figures in parentheses are percentages of total for all mountainous states.

2. @ represents the share of mountainous states in all India area and production.

Source: Horticulture Statistics at a Glance (Different Issues).

• **Area, production and yields of vegetable crops in mountainous states**

The area under vegetables in the mountainous states as well as over all area in the country has increased substantially

during the study period. In 2001-02 the area under vegetables in the country was 6,155.70 thousand hectares that increased to 10,259.12 thousand hectares in 2017-18. In the mountainous states, the area under vegetables, however,

increased from 562.30 thousand hectares (2001-02) to 809.65 thousand hectares (2017-18). Despite an overall increase in area in the country as well as these states, the per cent contribution of the area in these states to the total area under vegetables in the country has decreased from 9.13 per cent in 2001-02 to 7.89 per cent in 2017-18 indicating that area increase in these states could not match the expansion that occurred at the country level. It has decreased considerably in Arunachal Pradesh while in all states, there has been an increase in the area under vegetables.

The overall production of vegetables in the country more than doubled from 88,622 thousand tonnes in 2001-02 to

1,84,394.28 thousand tonnes in 2017-18. In the mountainous states also, the production of vegetables increased to 9,955.85 thousand tonnes in 2017-18 as compared to 2001-02 level of 5,462.4 thousand tonnes. Despite, an overall increase in production in the country as well as in these states, the per cent contribution of the production in these states to the total production of vegetables in the country has decreased from 6.16 per cent in 2001-02 to 5.39 per cent in 2017-18. It shows an increase in the overall production of vegetables in the country but the production in the mountainous states has not increased at the same pace.

Table 2: Area, production and yields of vegetables in mountainous states, 2001-02 to 2017-18

(Area in `000 ha; Production in `000 tonnes and Yield in tonnes per ha)

States	2001-02			2010-11			2017-18		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
Arunachal Pradesh	20.8 (3.70)	83.9 (1.41)	4.03	4.2 (0.64)	38.5 (0.45)	9.17	2.58 (0.32)	16.58 (0.17)	6.43
Assam	237.4 (42.22)	2935.2 (53.73)	12.36	260.1 (39.87)	2925.5 (34.54)	11.25	300.17 (37.07)	3292.88 (33.07)	10.97
HP	34.6 (6.15)	639.1 (49.17)	18.47	80.4 (12.33)	1559.1 (17.41)	18.34	89.32 (11.03)	1811.78 (18.20)	20.28
J&K	50.8 (9.03)	728.9 (10.71)	14.35	69.7 (10.69)	1559.1 (18.41)	22.37	56.29 (6.95)	1226.024 (12.31)	21.78
Manipur	10.60 (1.88)	66.1 (12.21)	6.24	22.2 (3.40)	236.5 (2.79)	10.65	45.3 (5.60)	342.11 (3.44)	7.55
Meghalaya	35.7 (6.35)	265.9 (1.11)	7.45	41.8 (6.41)	356.5 (4.21)	8.53	49.11 (6.07)	519.67 (5.22)	10.58
Mizoram	6.80 (1.21)	44.1 (4.45)	6.49	17.5 (2.68)	115.6 (1.36)	6.61	36.25 (4.48)	171.01 (1.72)	4.72
Nagaland	26.30 (4.68)	286 (0.74)	10.87	10.7 (1.64)	79.4 (0.94)	7.42	46.21 (5.71)	561.61 (5.64)	12.15
Sikkim	14.2 (2.40)	60 (4.79)	4.44	23.9 (3.66)	120.9 (1.43)	5.06	38.42 (4.75)	229.1 (2.30)	5.96
Tripura	31.30 (5.57)	353.2 (1.01)	11.28	36.00 (5.25)	532.3 (6.28)	14.79	45.94 (5.67)	795.68 (7.99)	17.32
Uttarakhand	93.8 (12.55)	507.50 (5.92)	7.19	85.8 (13.15)	1030.9 (12.17)	12.02	100.06 (12.36)	989.41 (9.94)	9.89
All Mountainous States	562.30 (100.00) (9.13) [@]	5462.4 (100.00) (6.16) [@]	11.68	652.3 (100.00) (7.68) [@]	8470.1 (100.00) (5.78) [@]	12.98	809.65 (100.00) (7.89) [@]	9955.85 (100.00) (5.39) [@]	12.30
India	6155.7	88622	14.40	8494.5	146554.5	17.25	10259.12	184394.28	17.97

Note: 1. Figures in parentheses are percentages of total for all mountainous states.

2. @ represents the share of mountainous states in all India area and production.

Source: Horticulture Statistics at a Glance (Different Issues).

The change in the productivity trends during the study period indicated that the national level productivity of the vegetables has increased. Also the productivity in the mountainous states has increased but this increase in productivity has been less as compared to increase in the national average yield. The productivity in all states has increased except Mizoram and Assam. At present, the productivity levels in some states like Himachal Pradesh and J&K are higher than the national average yield.

- ***Growth rates for area, production and yield of fruits and vegetables***

The overall growth rates for the study period (2001-02 to 2017-18) have been worked out for the area, production and yield of fruits and vegetables separately in the Table 3. These depict that overall annual growth rate of area in the country was higher in case of vegetable crops *viz.* 3.05 per cent, as compared to fruits where growth rate was 2.89 per cent. But the growth rate of production was higher for fruits (4.92%) as compared to vegetables (4.40%). Also the growth rate of productivity of fruits was higher at 1.98 per cent as compared to that of vegetable crops which has the growth rate of 1.31 per cent during the study period. Also, during the entire study period the annual growth rates for area, production and yield were found to be positive for all the mountainous states together.

The changing level of state-wise shares of value of output from total fruits and vegetables of mountainous states has been given in Table 4. As may be seen, at the country level total value of output from fruits and vegetables increased from Rs 2,66,22,955 lakh in 2011-12 (at current prices) to Rs 4,51,69,344 lakh for 2015-16. For the mountainous states, this value of output increased from Rs 26,75,895 lakh to Rs 40,17,277 lakh during the same period. Put together, these mountainous states contributed 10.05 per cent to value of output from total fruits and vegetables in the year 2011-12. The two states of Assam and Jammu & Kashmir contributed 47.50 per cent to the value of output from total fruits and vegetables in the mountainous states in 2011-12. This was followed by the states of Himachal Pradesh and Uttarakhand whose contribution was 15.13 per cent and 13.42 per cent, respectively. In 5 states, namely, Manipur, Meghalaya, Mizoram, Nagaland and Sikkim the per cent share to value of output was found to be less than or equal to 5.0 per cent. For all mountainous states, the value of output increased significantly at a rate of 9.94 per cent whereas the value of output from the fruit and vegetables increased at a growth rate of 15.20 per cent at the national level (Table 4). Across states, except for Uttarakhand, all these witnessed positive and significant growth rates in the value of output during this period.

Table 3: Growth rates for area, production and yields of fruits and vegetables in mountainous states, 2001-02 to 2017-18 % pa)

Sr. No.	States	Fruits			Vegetables		
		Area	Production	Yield	Area	Production	Yield
1	Arunachal Pradesh	0.86	0.04	-0.82	-11.55	-9.10	2.78
2	Assam	1.69	2.77	1.06	1.39	0.68	-0.70
3	HP	0.20	4.59	4.38	5.74	6.32	0.55
4	J&K	5.09	5.16	0.07	0.61	3.11	2.49
5	Manipur	3.60	7.46	3.73	8.92	10.15	1.13
6	Meghalaya	1.86	3.15	1.27	1.89	4.02	2.09
7	Mizoram	7.32	10.39	2.86	10.35	8.30	-1.85
8	Nagaland	2.73	1.37	-1.32	3.37	4.05	0.66
9	Sikkim	2.70	10.34	7.44	6.03	8.20	1.74
10	Tripura	3.85	1.13	-2.61	2.28	4.89	2.55
11	Uttarakhand	13.47	2.26	-9.88	0.38	4.01	1.89
All Mountainous States		4.47	3.63	-0.81	2.17	3.05	0.61
India		2.89	4.92	1.98	3.05	4.40	1.31

Table 4: State-wise shares of value of output from total fruits and vegetables in mountainous states (at current prices)

States	2011-12		2015-16		CGR (% pa)
	Value (Rs Lakh)	% share	Value (Rs Lakh)	% share	
Arunachal Pradesh	151746	5.67	188345	4.69	6.56 (5.22)
Assam	687239	25.68	950456	23.66	8.34* (1.34)
HP	404830	15.13	662419	16.49	11.35 (5.92)
J&K	583831	21.82	882657	21.97	8.01 (5.06)
Manipur	115027	4.30	196880	4.90	13.49* (2.95)
Meghalaya	76257	2.85	132459	3.30	15.96* (2.24)
Mizoram	58132	2.17	89677	2.23	11.70* (0.43)
Nagaland	77562	2.90	181289	4.51	28.42* (8.62)
Sikkim	26525	0.99	33090	0.82	6.36 (4.04)
Tripura	135603	5.07	370439	9.22	28.78* (2.51)
Uttarakhand	359143	13.42	329566	8.20	-2.37 (2.18)
All Mountainous States	2675895	100.00 (10.05) [@]	4017277	100.00 (8.89) [@]	9.94* (2.82)
India	26622955		45169344		15.20* (2.55)

Note: 1. Figures in parentheses are standard errors. 2. * Indicates significance at 5 % probability level.

3. @ represents the share of mountainous states in all India value of output.

Source: Derived from CSO data.

B. Horticulture in Himachal Pradesh

Himachal Pradesh has long been regarded as a horticultural state due to magnificent achievements in the production of fruits, mainly apple. The other fruit crops grown in the state include temperate fruits such as peach, pear, plum, apricot and the subtropical fruit crops such as mango, citrus, litchi, etc. In addition to fruit production, the state has earned its niche in the commercial vegetable cultivation in the past three decades or so. These include crops such as peas, tomato, cabbage, cauliflower, capsicum, beans and garlic and their cultivation was initially restricted to mid to high hill pockets. However, realizing the importance of off-season vegetable growing, even the farmers in low-mid hill locations started growing vegetables in recent times.

Contribution of horticulture

The increasing contribution of horticulture in the state can be fathomed from the fact that the gross value added (GVA) in this sub-sector increased from Rs.4,048.30 crore in 2011-12 to Rs. 6,624.19 crore in 2015-16 (Table 5). The GVA in agriculture grew from Rs. 7,887.17 crore to Rs.10,323.98 crore during the same period. In contrast, the performance of crop sector was very poor. Also, horticulture sub-sector reflected an increasing trend of its share in GVA unlike the crop sub-sector whose share dwindled continuously. It is worth mentioning that the share of horticulture peaked to 69.18 per cent in 2013-14.

Table 5: Gross value added in various sub-sectors of Agriculture, 2011-12 to 2015-16 in Himachal Pradesh (at constant prices)

Year	Gross Value Added (in Rs Lakh)			
	Crops	Horticulture	Livestock	Total Agriculture
2011-12	268572 (34.05)	404830 (51.33)	115315 (14.62)	788717 (100.00)
2012-13	251453 (27.02)	563456 (60.94)	109697 (11.86)	924606 (100.00)
2013-14	214035(20.45)	723984 (69.18)	108442 (10.36)	1046461 (100.00)
2014-15	236846 (24.57)	616912 (63.99)	110304 (11.44)	964062 (100.00)
2015-16	251126 (24.32)	662419 (64.16)	118853 (11.51)	1032398 (100.00)

Source: Gross State Domestic Product of Himachal Pradesh, Department of Economics and Statistics, Government of Himachal Pradesh.

Vegetable and fruit production

The area under vegetable crops has witnessed substantial increase in recent years. It could be seen from Table 6 that area under vegetable crops increased from 44,601 hectares in the 2001-02 to 94,555 hectares in the 2017-18 and registered a significant and positive compound growth rate of around 4.53 per cent per annum. The production during the same period increased from 7.70 lakh tonnes to around 18.90 lakh tonnes and recorded a significant growth rate of 5.94 per cent. The yield level, however, increased from around 17.27 tonnes/ha to 19.99 tonnes per hectare and recorded a significant compound growth rate of 1.35 per cent per annum. Thus, there is a need to bring about increase in productivity of vegetable crops. Also, identification of suitable new pockets with congenial climate for vegetable growing can go a long way in increasing the vegetable production in the state provided appropriate back up support alongwith apposite marketing environment.

Area under all fruits in the state increased from 223.04

thousand hectares in 2001-02 to 230.85 thousand hectares by 2017-18 (Table 7). The corresponding production has gone up from 428.03 thousand tonnes to 565.31 thousand tonnes during the same period. The productivity increased from 1.18 tonnes per hectare in 2001-02 to 2.45 tonnes in 2017-18. The share of apple in the total area under fruits and consequent production was 41.62 and 42.18 per cent, respectively in 2001-02. Its share in total area increased to 48.79 per cent in 2017-18. Consequently, the area share of other fruits has come down from 58.38 per cent to 51.21 per cent during the same period. The share of apple in total fruit production went up to 79 per cent and for 'other fruits' went down to 21 per cent by 2017-18. The computation of compound growth rates in area, production and yields of these crops revealed that the area under all fruits crops registered growth rate of 1.32 per cent per annum between 2001-02 and 2017-18. Area under apple grew at a rate of 1.99 per cent per annum whereas that for other fruit crops increased by 0.75 per cent per annum. As regards the production and yields, these growth trends were positive but non- significant.

Table 6: Changes in area, production and productivity of vegetable crops in Himachal Pradesh, 2001-02 to 2017-18

Year	Area (hectares)	Production (tonnes)	Yield (tonnes/ha)
2001-02	44,601	7,70,480	17.27
2005-06	66,059	10,92,526	16.54
2009-10	79,884	13,90,671	17.41
2013-14	91,200	16,71,247	18.33
2017-18	94,555	18,90,224	19.99
Growth Rate (Per cent per annum)	4.53* (0.359)	5.94* (0.299)	1.35* (0.180)

Note: *Significant at 5 per cent level.

Source: Statistical Year Book of Himachal Pradesh (Different issues).

Table 7: Area, production and yield of fruits in Himachal Pradesh, 2001-02 to 2017-18

Year	Area (000' ha.)			Production (000' tonnes)			Yield (tonnes/ha)		
	Apple	Others	Total	Apple	Others	Total	Apple	Others	Total
2001-02	92.82 (41.62)	130.22 (58.38)	223.04 (100.00)	180.53 (42.18)	247.50 (57.82)	428.03 (100.00)	1.94	0.64	1.18
2005-06	88.56 (46.20)	103.11 (53.80)	191.67 (100.00)	540.36 (77.69)	155.16 (22.31)	695.52 (100.00)	6.10	1.50	3.63
2009-10	99.56 (47.83)	108.59 (52.17)	208.15 (100.00)	280.11 (73.28)	102.13 (26.72)	382.24 (100.00)	2.81	0.94	1.84
2013-14	107.69 (49.01)	112.02 (50.99)	219.71 (100.00)	738.72 (85.27)	127.62 (14.73)	866.34 (100.00)	6.86	1.13	3.93
2017-18	112.63 (48.79)	118.22 (51.21)	230.85 (100.00)	446.57 (79.00)	118.74 (21.00)	565.31 (100.00)	3.96	1.00	2.45
CGR (% per annum)	1.99* (0.172)	0.75* (0.345)	1.32* (0.265)	3.71 (2.042)	1.44 (0.910)	3.20 (1.741)	1.69 (2.075)	0.69 (1.096)	1.85 (1.853)

Note: 1. Figures in parentheses indicate shares of apple and other fruits in total area and production.

2. *Significant at 5 per cent level.

Source: Statistical Year Book of Himachal Pradesh (Different issues).

C. Infrastructure support to horticulture

The availability of required physical infrastructure is of great importance for the growth in agriculture. Horticultural commodities, especially fruits and vegetables, are highly perishable. Among several constraints related to productions, processing and trade, the awfully inadequate supply chain infrastructure is perhaps the biggest impediment in boosting the performance of Indian horticulture, more so in hilly states. Efforts made to boost agricultural exports in general and fruits and vegetable exports in particular in recent past have not yielded desired results.

As regards the infrastructural and institutional support for the development of fruit and vegetable production in the state, there exist 94 progeny-cum demonstration orchards (PCDOs) for different fruits under the direct control of the State Horticulture Department. These PCDOs/Nurseries were established to serve as growth centres for the development of horticulture in their impact zone of 10 km radius. These units act as stocking of fruit trees of outstanding quality, pedigree multiplication centres, and demonstration orchards besides extension and training units for the farmers. Additionally, there are 632 private registered nurseries and about 2 million fruit plants are propagated in these nurseries per annum. Another crucial back up support to fruit growing in the state is in the form of plant protection centres (PPCs). These centres provide various plant protection chemicals and equipment's to the fruit growers along with the necessary technical know-how. There are 337 such centres at present in the state.

As regards the post harvest facilities such as packing and grading houses and cold storage facilities, total packing and grading (combined) houses capacity in the state stood at 25,000 metric tonnes. In addition to this, the state has grading houses with capacity of 6,000 metric tonnes. Another crucial infrastructure support for the production of fruits and vegetables is the existence of cold storage facilities. The state has at present cold storage capacity of 16,250 tonnes of which fifty per cent lies outside the state in distant places such as Delhi, Chennai and Mumbai. As regards the fruit processing facilities, the state has 82 processing units with a capacity of 83,160 tonnes of which nearly 64.0 per cent is in the Cooperative/ Joint/ Private Sector. Finally, at present 10 market committees are functioning and 58 markets have been made functional in various districts of the state out of which 19 *mandies* have been enrolled under e-markets which provide space to the vegetable and fruit growers to sell their produce (Economic Survey, 2017-18).

In order to capture the disparities in the availability of these facilities across districts, disaggregated shares of area and

production at the district level were computed and juxtaposed with the availability of these facilities (Table 8). A district-wise distribution of area under different fruits revealed that Shimla, the most important district from horticulture perspective, accounted for the largest share (20.66%) of total area under fruits in the state followed by Kangra (17.57%). The production scenario was also dominated by Shimla (45.20%) alone, followed by Kullu (17.03%) and Kinnaur (9.35%). The four districts of Kangra, Shimla, Mandi and Kullu accounted for more than two-thirds of entire area under fruits. On the production side, Shimla, Kullu, Kinnaur, Mandi and Kangra accounted for 86.70 per cent of total fruit production. In addition to this lopsided distribution of area and production of fruits across districts, the most revealing point is that districts like Chamba and Sirmour which have large area under fruits and also the infrastructure support, contributed less to the overall fruit production in the state.

In order to further probe the disparities across districts for these facilities, average fruit area served by one progeny-cum demonstration orchard and private nursery was computed (Table 8). Though at the state level one such PCDO catered to an area of 2456 hectares, there were glaring disparities across districts. For instance, while in Kullu, Una and Kangra one such PCDO covered 6130, 6020 and 5071 hectares, respectively; in others like Solan, Lahaul & Spiti and Sirmour, it was below 1000 hectare per PCDO. The case of private nurseries was, though, different wherein the disparities were not as glaring. However, the average area under fruits covered by private nursery is more than 1000 hectares in the district of Kangra (1560 hectares) and Una (1204 hectares). These findings bring home the point that only existence of such facilities does not automatically translate into higher output. These need to be effective service providers. For instance, these facilities abound in the districts of Hamirpur and Bilaspur which have sufficient area under horticulture. However, the share in production of fruits in these districts was just 0.51 and 0.31 per cent, respectively. This calls for in depth analysis of the reasons for low production in these otherwise potential districts. As regards the plant protection centres (PPCs), juxtaposing such centres against the area under fruits across districts revealed that their distribution was also quite skewed. For example, one such PPC in Kangra had to attend more than thrice the area under fruits as against the state average of 685 hectares. Similar was the case for Sirmour wherein one PPC attended to the plant protection needs of 1161 hectares. Some districts like Solan, Chamba and Lahaul & Spiti were, however, better equipped to fight against the diseases and insect pests as these have lower fruit area to serve per PPC. But this did not translate into increased fruit output which needs further scrutiny.

Table 8: District-wise infrastructure support to fruit production in HP, 2018-19

District	Share in Area under Fruits (%)	Share in Fruit Production (%)	Average Area (ha) under fruits served by one		
			Plant Protection Centre (PPC)	Progeny cum Demonstration Orchard (PCDO)	Private Nursery (PN)
Bilaspur	3.53	0.31	509	1358	340
Chamba	7.35	3.77	361	1415	250
Hamirpur	3.33	0.51	480	1920	512
Kangra	17.57	6.38	2536	5071	1560
Kinnaur	5.60	9.35	647	1617	370
Kullu	13.28	17.03	730	6130	243
Lahaul & Spiti	0.77	0.06	295	886	590
Mandi	16.13	8.74	792	3384	324
Shimla	20.66	45.20	612	3669	289
Sirmaur	6.54	3.25	1161	944	387
Solan	2.63	1.48	264	760	552
Una	2.61	3.92	463	6020	1204
H.P.	100	100	685	2456	365

Source: Derived from the data on site, <http://hpagrisnet.gov.in> and Sharma HC, 2018.

As regards the post-harvest facilities such as packing and grading houses and cold storage facilities, these appear to be not only awfully short but highly skewed as well. For example, total packing and grading (combined) houses capacity in the state stood at 25,000 metric tonnes. Of this, while 80 per cent capacity was found in Shimla district, main production area, another 20 per cent was located in Kullu district (Table 9). Here it is worth mentioning that though Shimla is the major apple producing district, this fruit crop is grown in eight other districts of the state. In addition to this, grading houses with capacity of 6,000 metric tonnes with more equitable spread across apple producing areas also existed in the state. Another crucial component of infrastructural support for the production of fruits and vegetables is the existence of cold storage facilities. Of the total cold storage capacity of 16,250 tonnes, 50 per cent lies outside the state in distant places such as Delhi, Chennai and

Mumbai. If one excludes the exit point cold storage facility (18.46%) at Parwanoo in Solan district, then only about thirty per cent of the total cold storage is within the state. Further, whatever is within the state 80 per cent of that lies in Shimla district only while nearly one-fifth lies in Kullu district. Thus the fact that cold storage facilities are not only short to a large extent but also non existing in areas other than Shimla bring home the point of lacking infrastructure. As regards the fruit processing facilities, the state has 82 processing units with a capacity of 83,160 tonnes of which nearly 64.0 per cent is in the Cooperative/ Joint/ Private Sector (Table 10). This is spread throughout the state and as such is desirable from the perspective of broad based processing facilities. Of the remaining capacity, 35.0 per cent is under the control of HP Horticultural Produce Marketing and Processing Corporation Limited (HPMC) which have three units of which two are in Solan district (at Parwanoo and Jabli) and one at Jarol in Mandi district.

Table 9: Distribution of post harvest facilities in HP, 2018-19

Particulars	Total Capacity (metric tonnes)	Capacity Distribution (per cent)						
		Shimla	Kullu	Sirmaur	Mandi	Kinnaur	Exit Points	Outside State
1. Packing and Grading Houses	25,000	80.00	20.00	-	-	-	-	-
2. Grading Houses	6,000	16.67	16.67	16.67	33.33	16.67	-	-
3. Cold Storages	16,250	24.62	6.15	-	-	-	18.46	50.77

Source: Derived from the data on site, <http://hpagrisnet.gov.in>

Table 10: Fruit processing facilities in HP, 2018-19

Particulars	No. of Units	Capacity (tonnes)
1. HPMC units	3	29,000 (34.87)
2. Departmental Fruit Processing Units	9	1,300 (1.56)
3. Cooperative/ Joint/ Private Sector Units	70	52,860 (63.57)
All	82	83,160 (100.00)

Source: Derived from the data on site; <http://hpagrisnet.gov.in>

3. Conclusion

The present study shows that the area under fruits in these mountainous states increased during the study period. But, despite all the state support to boost horticulture in these states, the productivity declined marginally in the last decade or so. The productivity of total fruits in mountainous states was about one third of the productivity of fruits at the national level. The area under vegetables in the mountainous states as well as over all area in the country has increased substantially during the study period. However, the yield levels in these states were still lower as compared to national average yields except Himachal Pradesh and J&K. Hence, efforts are needed to augment the productivity levels both of fruits and vegetables because area expansion cannot continue *ad infinitum*. Similarly, no major change in the contribution towards the total value added through horticulture by these states (other than Assam, J&K, HP and Uttarakhand) calls for more thrust on horticulture in these states.

Horticulture sector in Himachal Pradesh exhibited magnificent growth in the past. Resultantly, its share in the gross value added in agriculture increased considerably. Within horticulture, though the area under other fruit crops witnessed decline, yet the productivity and production registered a stupendous growth which is a welcome development as it helps widen the fruit basket of the state. The broadening of vegetable production base to low and mid hills is another hallmark of the expanding horticulture sector

in the state. As far as the infrastructural support to the horticulture sector is concerned, noticeable disparities were observed with respect to the availability of these facilities across districts. In the new dispensations of trade and economic environment, these disparities need to be bridged so that balanced and broad based growth leads to a vibrant horticulture sector. Finally, the back-up support with quality service delivery should be the focus of horticulture development policy in the state.

4. References

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