

Vegetable Cultivation in North West Himalayan Region: A Study of Indian State

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ABSTRACT

Present study was undertaken to examine the growth and productivity of vegetable crops and to decompose the production changes into different components. Semi-log exponential model was used to estimate the growth. The study revealed that area, production and productivity of vegetable crops increased during the study period, however, the increase in production and productivity was higher than increase in the area. Among different vegetable, greatest increase in the area, production and productivity was found in tomato followed by cauliflower. Decomposition analysis of vegetable production revealed that overall increase in production of vegetable crops was due to area expansion. Crop-wise analysis showed that the increase in tomato production was due to interaction of area and yield, whereas, increase in potato production was solely because of increased productivity. The increase in cauliflower and pea was mainly because of area effects. It is concluded that both agro-ecological as well as economic factors favours the cultivation of vegetable crops.

Key Words: Vegetable crops; Growth; Decomposition analysis; Value-productivity; Himachal Pradesh

INTRODUCTION

Indian Himalayas is spread over 58 million hectares; support 51.07 million populations of Jammu and Kashmir, Himachal Pradesh and Uttranchal in the North West Region and Assam, Arunachal Pradesh, Manipur Meghalaya, Mizoram, Nagaland, Sikkim and Tripura in North East Region. Among all the North West Himalayan states, Himachal Pradesh has recorded highest growth rate of fruit and floriculture crops in area and production and second in vegetable production (Sharma *et al.*, 2003). The state economy is mainly agriculture based as about 69% of the workers depend on agriculture. Besides this, varied agro-ecological conditions of the state have an advantage over plains in growing a number of vegetable crops due to their growing season. This has led vegetable production highly profitable especially in mid and high hills of the state. The study was under taken to examine the growth performance both area-wise as well as crop-wise of major vegetable crops grown in the state. Decomposition analysis has been carried out to examine the causes of production variations during the period under study.

MATERIALS AND METHODS

Time series data used for the present study were collected from Directorate of Agriculture, Government of Himachal Pradesh, Statistical Outline of Himachal Pradesh and Annual Season and Crop Reports for the period 1991 to 2000. The data were processed and analyzed by using standard statistical techniques. Some of the techniques used for the analysis of data are as given below.

Growth trend. The growth rates of area; production and productivity were estimated using log linear function. The

equation fitted to analyze the growth rate trend was semi-log exponential form (Wasim, 2001).

$$\text{Log } Y = a + bt$$

Where,

Y = area/ production/ productivity

a = constant

b = expresses the rate of change and when multiplied by 100 gives the percentage growth rate
 t = time variable in years (1, 2,.....10)

Value productivity. Value productivity of different vegetable crops has been estimated as follow:

$AVP_{it} = Y_{it} * P_{it}$ at current prices

$AVP_{it} = Y_{it} * P_{ic}$ at constant prices

Where,

Y_{it} = yield of ith vegetable crop in period 't'

P_{it} = current price of the vegetable crop in period 't'

P_{ic} = constant price of ith vegetable crop in period 't'

Decomposition Analysis. In order to have a broad spectrum of the relative contribution of area and yield output growth of vegetable production decomposition technique was employed as under.

$$P = A * Y$$

$$(P + \Delta P) = (A + \Delta A) * (Y + \Delta Y)$$

$$\text{Change in production } \Delta P = \underbrace{\Delta A}_{\text{Area effect}} Y + \underbrace{\Delta Y}_{\text{Yield effect}} A + \underbrace{\Delta A \Delta Y}_{\text{Interaction effect}}$$

Where,

ΔP = Change in production between 1990-91 and 1999-00

ΔA = Change in area between 1990-91 and 1999-00

ΔY = Change in yield between 1990-91 and 1999-00

RESULTS AND DISCUSSION

Growth Trends in Vegetable Cultivation in Himachal Pradesh. At present state has 30,000 hectares under vegetable cultivation with a total production of 520 thousand metric tonnes (Table I). The productivity of vegetable crops in the state is 17.33 metric tonnes per hectares (mt ha^{-1}). It can be seen from the table that highest vegetable productivity (22.41 mt ha^{-1}) was observed in the district of Solan, followed by Sirmour (19.77 mt ha^{-1}) and Kullu (19.71 mt ha^{-1}). The productivity of vegetable crops in the districts of Bilaspur, Chamba, Hamirpur, Kangra, Kinnaur, Lahul & Spiti, Mandi and Shimla was found lower than the state productivity. In order to study the growth performance of vegetable crops with respect to area, production and productivity during the last one decade growth rates were estimated (Table II). It was found that area, production and productivity of vegetable crops showed a significant growth; however, growth in production (7.51%) and productivity (4.65%) was higher as compared to area (2.85%). These results highlight the fact that the state has a comparative advantage of growing vegetable crops on account of its varied agro-climatic conditions as production and productivity has shown higher growth rate in comparison to growth in area. Data further show that highest increase in area was found in Una (8.56%) followed by Hamirpur (7.24%) signifying the fact that vegetable cultivation is picking up in the lower parts of the state where existing cropping pattern is dominated by cereal crops (Table II). Sharma *et al.* (2003) also reported that vegetable cultivation has increased under un-irrigated conditions of the mid and lower hill regions because of the higher returns than cereal crops. The highest growth in production was found in district Kullu (14.39%), followed by Bilaspur (13.14%) and Sirmour (12.47%). Analysis of growth in productivity showed that highest productivity was found in district Sirmour (7.65%) followed by Kullu (7.52%) and Bilaspur (6.62%). It was further evident that the districts of Bilaspur, Chamba, Kullu, Sirmour and Solan of the state have significant growth in area, production and productivity of vegetable crops. It can be concluded from the foregoing analysis that vegetable cultivation is not confined to the mid (651-1800m amsl) and high hill (1801-7000m amsl) conditions, but also picking up in the low hill zone (450-650m amsl) of the state.

Besides this, the trends in area, production and productivity of different vegetable crops grown in different districts of the state were also worked out (Table III). Among the selected vegetable crops tomato recorded the highest increase in area (10.56%) and production (15.12%) followed by cauliflower (10.37%) and (14.16%) in the state. The area under potato decreased but to a meager extent. The productivity of tomato, pea, cauliflower and ginger also increased significantly. Among different vegetable crops, tomato recorded highest growth in area in Kullu (28.76%), potato in Una (8.31%), pea in Kinnaur (6.04%), cauliflower

Table I. Status of Vegetable Cultivation in Himachal Pradesh

District	Area (000ha)	Production (000 mt)	Productivity (mt ha^{-1})
Bilaspur	1.595 (5.32)	25.82 (4.96)	16.19
Chamba	1.220 (4.07)	17.39 (3.34)	14.25
Hamirpur	0.785 (2.62)	11.39 (2.19)	14.51
Kangra	2.535 (8.45)	39.68 (7.63)	15.65
Kinnaur	0.853 (2.84)	10.39 (2.00)	12.18
Kullu	2.775 (9.25)	54.70 (10.52)	19.71
L & S	1.382 (4.61)	15.18 (2.92)	10.98
Mandi	3.250 (10.83)	46.95 (9.03)	14.45
Shimla	5.850 (19.50)	94.85 (18.24)	16.21
Sirmour	3.950 (13.17)	78.10 (15.02)	19.77
Solan	4.845 (16.15)	108.58 (20.88)	22.41
Una	0.960 (3.20)	17.00 (3.27)	17.70
H.P.	30.00 (100)	520.00 (100)	17.33

Source: Directorate of Agriculture, HP Govt. Shimla (1999-2000)
Figure in the parenthesis are the percentage to the total.

Table II. Growth in Area, Production and Productivity of Vegetable Crops in Himachal Pradesh

District	Area	Production	Productivity
Bilaspur	6.51* (0.663)	13.14* (0.965)	6.62* (0.895)
Chamba	2.26* (0.464)	7.35* (1.710)	5.08* (2.010)
Hamirpur	7.24* (1.177)	7.61* (1.072)	0.375 (0.474)
Kangra	3.92* (0.444)	8.06* (3.380)	4.13 (3.290)
Kinnaur	2.31* (0.7257)	3.60* (1.472)	1.29 (1.310)
Kullu	6.86* (1.556)	14.39* (2.454)	7.52* (1.610)
L & S	7.28 (4.268)	2.54 (2.960)	-4.73 (2.810)
Mandi	1.10 (1.262)	6.54* (2.580)	5.44* (1.980)
Shimla	-0.210 (0.465)	3.35 (2.110)	3.57 (2.260)
Sirmour	4.81* (0.313)	12.47* (0.782)	7.65* (0.702)
Solan	5.24* (0.484)	10.37* (1.087)	5.13* (0.867)
Una	8.56* (2.22)	11.02* (2.810)	2.45 (1.230)
H.P.	2.85* (0.544)	7.51* (0.861)	4.65* (0.928)

* Significant at 5% level

Figure in the parenthesis are the percentage to the total.

in Bilaspur (13.97%) and ginger in Mandi (19.81%). Production growth of different vegetable crops varied

Table III. Growth of Area, Production and Productivity of different Vegetable Crops in different districts of Himachal Pradesh

District	Vegetable Crops														
	Area					Production					Productivity				
	Potato	Tomato	Pea	Cauliflower	Ginger	Potato	Tomato	Pea	Cauliflower	Ginger	Potato	Tomato	Pea	Cauliflower	Ginger
Bilaspur	-8.67 [*] (1.60)	9.60 [*] (1.62)	1.10 (1.30)	13.97 [*] (1.69)	7.77 [*] (1.21)	-13.46 (12.23)	19.12 [*] (2.62)	2.27 (1.19)	16.61 [*] (1.93)	12.29 (6.66)	-4.79 (11.25)	9.52 [*] (1.47)	1.17 [*] (0.40)	2.64 [*] (0.63)	4.51 (6.90)
Chamba	1.16 [*] (0.49)	11.71 [*] (3.47)	3.97 [*] (0.63)	0.21 (2.33)	-	6.84 [*] (2.59)	13.39 [*] (3.44)	4.72 [*] (0.84)	3.78 (2.24)	-	5.67 (2.91)	1.68 [*] (0.98)	0.75 (0.78)	3.57 [*] (0.84)	-
Hamirpur	7.84 (4.25)	12.79 [*] (1.03)	5.98 [*] (1.64)	0.03 (1.93)	18.46 [*] (3.34)	12.26 (6.99)	11.28 [*] (1.02)	7.04 [*] (1.83)	0.01 (1.96)	23.84 [*] (3.78)	4.43 (6.13)	-1.52 (0.90)	1.06 [*] (0.59)	-0.02 (0.21)	5.38 (3.72)
Kangra	2.97 [*] (0.44)	7.97 [*] (0.80)	4.47 [*] (0.73)	9.20 [*] (1.09)	7.29 [*] (2.38)	8.92 (5.43)	5.55 [*] (1.68)	6.48 [*] (1.34)	10.98 [*] (0.96)	23.48 [*] (9.35)	5.96 (5.40)	-2.42 (1.10)	2.01 [*] (0.77)	1.78 [*] (0.65)	16.19 [*] (8.07)
Kinnaur	-2.32 (1.32)	9.47 [*] (2.42)	6.04 [*] (1.09)	4.50 [*] (2.16)	-	-5.91 [*] (2.68)	14.50 [*] (2.32)	8.27 [*] (1.23)	9.82 [*] (2.60)	-	-3.59 (3.18)	5.03 [*] (1.18)	2.23 [*] (0.66)	5.32 [*] (1.27)	-
Kullu	2.06 (2.01)	28.76 [*] (3.16)	4.85 [*] (0.59)	10.86 [*] (0.89)	-	5.31 (3.84)	32.57 [*] (3.50)	4.93 [*] (0.89)	16.81 [*] (1.57)	-	3.24 (2.94)	3.83 [*] (0.52)	0.08 (0.45)	5.95 [*] (0.78)	-
Lahul & Spiti	-0.98 (0.71)	16.51 [*] (4.51)	1.67 [*] (0.46)	-	-	-3.08 (1.83)	18.86 [*] (4.31)	3.03 [*] (0.65)	-	-	-2.10 (1.48)	2.37 [*] (0.37)	1.36 [*] (0.31)	-	-
Mandi	-0.84 (1.79)	2.12 (2.00)	4.84 [*] (0.42)	9.35 [*] (0.97)	19.81 (1.59)	5.90 (3.65)	4.26 (2.61)	5.99 [*] (0.79)	14.95 [*] (1.74)	23.59 [*] (2.35)	6.73 (2.81)	2.15 [*] (1.09)	1.15 [*] (0.67)	5.61 [*] (0.98)	3.78 [*] (1.08)
Shimla	-2.95 [*] (0.60)	19.90 [*] (2.82)	4.87 [*] (0.74)	14.59 [*] (1.93)	2.96 (1.47)	-0.03 (3.16)	24.13 [*] (3.25)	5.98 [*] (0.75)	17.86 [*] (2.06)	18.19 [*] (5.55)	2.92 (3.30)	4.25 [*] (0.88)	1.11 [*] (0.27)	3.27 (0.92)	15.23 [*] (5.98)
Sirmour	1.60 (0.80)	14.19 [*] (1.41)	5.21 [*] (0.28)	10.19 [*] (1.01)	0.46 (0.67)	4.89 [*] (2.12)	19.85 [*] (1.39)	5.57 [*] (0.60)	13.73 [*] (1.14)	2.55 (1.80)	3.30 (1.72)	4.61 [*] (0.63)	0.36 (0.34)	3.54 [*] (0.39)	2.10 (1.42)
Solan	0.09 (2.12)	6.31 [*] (0.83)	3.94 [*] (0.30)	1.74 (1.40)	6.08 [*] (1.77)	1.08 (3.44)	11.70 (1.33)	5.23 [*] (0.30)	4.23 [*] (1.90)	18.92 [*] (4.98)	0.99 (3.03)	5.38 [*] (0.89)	1.29 [*] (0.12)	2.49 [*] (0.64)	12.84 [*] (4.84)
Una	8.31 [*] (2.97)	1.97 (3.74)	5.50 [*] (2.18)	5.69 [*] (1.13)	-	11.72 [*] (4.45)	4.77 (3.85)	5.52 [*] (2.00)	7.89 [*] (1.07)	-	3.41 (2.24)	2.82 [*] (0.61)	0.03 (0.44)	2.20 [*] (0.46)	-
H.P.	-0.69 (0.57)	10.56 [*] (1.01)	4.29 [*] (0.32)	10.37 [*] (0.51)	2.49 [*] (0.55)	2.08 (1.66)	15.12 [*] (1.09)	5.39 [*] (0.45)	14.16 [*] (0.67)	10.30 [*] (1.84)	2.77 (1.82)	4.56 [*] (0.48)	1.10 [*] (0.26)	3.80 [*] (0.42)	7.81 [*] (1.80)

* Significant at 5% level

Figures in the parentheses are the standard errors

Table IV. Value Productivity of Different Crops at Current and Constant Prices in Himachal Pradesh (1999-2000)

District	Value Productivity (Rs)									
	Current prices					Constant prices				
	Potato	Tomato	Pea	Cauliflower	Ginger	Potato	Tomato	Pea	Cauliflower	Ginger
Bilaspur	65000	175500	95455	136000	115020	31715	85631	46574	66358	56120
Chamba	71462	154271	107143	133167	-	34868	75272	52277	64975	-
Hamirpur	70000	104490	104385	148750	49832	34155	50983	50932	72576	24356
Kangra	59743	181440	99407	157500	92464	29150	88529	48503	76848	45116
Kinnaur	44293	191880	122400	180435	-	21612	93623	59722	88038	-
Kullu	35677	171818	111032	92424	-	17408	83834	54175	45096	-
L & S	186433	189540	125568	-	-	90965	92481	61268	-	-
Mandi	81107	129600	85587	102850	126228	39574	63235	41760	50183	61588
Shimla	66254	194040	115079	167324	133080	32327	94677	56150	81641	64932
Sirmour	85778	173571	100058	106364	33104	41853	84689	48820	51897	16944
Solan	65198	171315	131990	112667	79532	31812	83588	64401	54973	38808
Una	65571	187920	121500	121550	-	31994	91690	59283	59307	-
H.P.	72498	189566	113473	136321	64500	35374	92493	55366	66514	31472

Table V. Decomposition Analysis of the Vegetable Production changes in during 1990-91 to 1999-00 in Himachal Pradesh

Particulars	Vegetable Crops					
	Tomato	Potato	Cauliflower	Pea	Ginger	Total
Area effect	0.017132	-12.8952	77.25613	77.40106	22.88823	100.0297
Yield effect	0.006161	124.528	-0.16631	12.53242	54.80701	-0.01068
Interaction effect	99.97671	-11.6328	22.91018	10.06652	22.30476	-0.01899

among different districts and potato recorded highest growth in production in Una (11.72%), tomato in Kullu (32.57%), Pea in Hamirpur (7.04%), cauliflower in Shimla (17.86%) and ginger in Hamirpur (23.48%). Similarly the productivity of different vegetable crops varied among different districts. The highest productivity of potato was recorded in Shimla

(6.73%), tomato in Bilaspur (9.52%), pea in Kinnaur (2.23%), cauliflower in Kullu (5.95%) and ginger in Shimla (15.23%). The foregoing analysis indicated that growth in area, production and productivity of different vegetable crops varied among different districts. Sani *et al.* (1991) also found the relative importance of different vegetable crops in

the state. It can be concluded from this analysis that with respect to growth in area in different vegetable crops, tomato ranks first followed by cauliflower, pea and ginger.

Value Productivity of Vegetable Crops. Productivity value of different vegetable crops grown in different districts of the state was examined to know the profitability of these crops (Table IV). This parameter of different vegetable crops varied across the different districts due to price and yield variations. Tomato had the highest value productivity both at current as well as constant prices followed by cauliflower and pea. Data further showed that potato had highest value productivity in Lahul & Spiti, tomato, cauliflower and ginger in Shimla and pea in Solan at current prices, whereas at constant prices Kinnaur had highest value productivity in cauliflower. Mehta *et al.* (2001) revealed the highest productivity of tomato in Solan. Value productivity analysis revealed that tomato had the highest value followed by cauliflower, pea, potato and ginger in Himachal Pradesh.

Decomposition of Production Variations. To examine the causes of production variations, decomposition analysis of different vegetable crops was carried out (Table V). Overall increase in production of vegetable crops was due to acreage expansion. Crop-wise analysis revealed that increase in tomato production was due to interaction between area and yield, whereas in potato it was solely due to yield. Increase in cauliflower and pea production was mainly due to area (77%). Ginger production has increased mainly due to yield (54.81%), area and their interaction, which contributed 22% towards yield increase. This clearly showed that increased vegetable production in Himachal Pradesh was the cumulative effect of acreage expansion, increase in productivity and interaction between the area and yield.

CONCLUSIONS

There is great potential for the cultivation of vegetable crops in the state. The area, production and productivity of vegetable crops recorded a significant growth, however, growth in production (7.51%) and productivity (4.65%) was found higher as compared to area (2.85%). These results highlight the fact that the state has a comparative advantage of growing vegetable crops on account of its varied agro-climatic conditions. Tomato crop has the highest value productivity both at current as well as constant prices followed by cauliflower and pea. The decomposition analysis revealed that overall increase in vegetable production was mainly due to acreage expansion; however, increase in potato was solely because of productivity enhancement. An increase in tomato production was the cumulative effect of area and yield.

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