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RESEARCH NOTES

Agricultural Development and Crop Diversification in Himachal Pradesh: Understanding the Patterns, Processes, Determinants and Lessons

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I

INTRODUCTION

Himachal Pradesh is a small mountainous state in the western Himalayas with an altitude ranging from 350 metres to 6,975 metres above the mean sea level. As is well known, agricultural development in the mountainous regions is circumscribed by the mountain specificities, namely, inaccessibility, marginality, fragility, niche and human adaptation mechanism created by unique vertical dimensions that distinguish them from the plains and other eco-systems. While the first three specificities contribute in varying degrees, among other things, to physical isolation, distance and high transportation costs, the latter two indicate positive features and the potential for agricultural development. A number of studies, both from Indian Himalayas and abroad, have shown that agriculture in the mountains faces serious problems of dwindling crop yields and resource degradation which may aggravate further if remedial measures are not undertaken immediately (Jodha, 1992; Dev, 1994). The sordid state of affairs has been attributed to, *inter alia*, (a) unrelenting demographic pressure; (b) insatiable demand for mountain produce from within mountain region and outside and (c) more importantly, the implementation of developmental strategies inappropriate for mountain regions. The net result has been the deepening ecological degradation and low level of income manifested in endemic poverty and impoverishment in most of the mountainous regions.

The diversification of agriculture towards selective high value cash crops including fruits and off-season vegetables, compatible with the comparative advantage of the region, is suggested as a viable solution to stabilise and raise farm income, increase employment opportunities, and conserve and enhance the natural resources, principally land and water (Vyas, 1996). The adoption of high value cash

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crops, particularly fruit crops, helps the mountainous regions in two ways. First, it promotes the productive use of abundant marginal lands available in these regions. Second, these crops help in maintaining and improving the ecology and environment by promoting soil conservation and improving soil fertility. In economic terms, it leads to significant improvement in the quality of life of the people.

Agricultural diversification towards fruit and vegetable crops in Himachal Pradesh, especially in some areas in the districts of Shimla, Kullu, Solan and Lahaul and Spiti, started in the late sixties, which gathered pace in the seventies and eighties. The process of crop diversification to high value crops has gained further momentum in the late nineties and is spreading to many new areas in the low and mid-hill districts. It has made a significant impact on the quality of life of the local people. The micro level experiences further show that diversification through high value crops is not only economically beneficial but ameliorates stress on natural resource base (Chand, 1996). At the macro level, the agricultural transformation led rural prosperity is manifested in a number of socio-economic indicators and poverty level that compare favourably both with mountainous states and other developed states like Haryana.[1] These accomplishments have attracted the attention of development economists and policy makers, and the state has come to be known as a model for other hilly/mountainous regions/states to follow. Against this background, the present study proposes to understand the patterns, processes and factors that facilitated the process of agricultural development and crop diversification. And more importantly the lessons that follow from the state's experience so that the strategy of agricultural diversification and development can be replicated and expanded to other areas both within and outside the state. More specifically, the study has the following objectives. First, to understand the pace and pattern of regional agricultural development since the early seventies. Second, to study the temporal changes in the process of agricultural diversification in terms of changing share of crop production, horticultural crops and livestock in the gross value of output originating in agriculture and changes in the cropping pattern including area under high value crops. Third, to estimate and compare the costs and returns of high value cash crops in different regions surrogating different levels of agricultural transformation. Fourth, to identify the etiological factors, both at the micro and macro level, which facilitated the whole process of change and draw important lessons.

The study is organised into six sections. The second section describes the data and methods used in conducting the study. Section III discusses the pace and patterns of agricultural development since 1972-73. The extent of crop diversification, at the state, district and household level, has been discussed in Section IV. Economics of high value enterprises based on inputs use, costs and returns is presented in Section V. The factors, both at the micro and macro level, facilitating the process of agricultural development and crop diversification have been analysed in Section VI. The major findings and important lessons that emerge from state's experience are given in Section VII.

II

DATA AND METHODS

The study is based both on secondary and primary data. The secondary data for the study have been collected from various publications and records from government departments, namely, Agriculture, Horticulture and Directorates of Economics and Statistics and Land Records. The primary data have been collected from 225 farm households, 75 each from three developmental blocks, namely, Theog in Shimla, Sangrah in Sirmaur and Seraj in Mandi district. These three blocks have been chosen purposively after wider consultations with the officials of the agricultural department, agricultural scientists and other informed persons to represent areas in the state, which are at different levels of agricultural transition. The selection of the farm households has been done following multistage simple random sampling procedure. The data from the sample households were collected using well-structured and pre-tested schedule through a personal interview method for the agricultural year 2001-02.

The data have been analysed using appropriate statistical tools. The average and percentages have been computed to understand the changes in the relative contribution of different sectors including agriculture to state domestic product, the changes in the cropping pattern, and so on. The compound growth rates have been computed to understand the pace and pattern of agricultural development. The temporal changes in the process of crop diversification have been studied in three ways. First, by computing the changing share of area under non-foodgrain crops. Second, by constructing the Herfindhal index. The index has been computed using the following method.

$$\text{Herfindhal Index} = \sum_{i=1}^{n} p_i^2 \quad \text{where } p_i = \frac{A_i}{\sum_{i=1}^{n} A_i}$$

where p_i is the proportion of area under i-th crop and A_i is the actual area under i-th crop. The index is defined as a sum of squares of all 'n' proportions and is a measure of concentration. For increasing diversification, H is decreasing and vice-versa. It is bounded by '0' (complete diversification) and 1 (complete specialisation). Third, it has been argued that the most commonly used diversification measures such as Herfindhal index mainly capture distribution and diversity and are not appropriate to capture the changes in the enterprises mix over time. We, therefore constructed an index that measures changes in the area allocated to different crops between two time periods as suggested by Chand and Chauhan (2002). The index has been constructed using the following method: $DIV_{mk} = ½ \Sigma | (A_{im} - A_{ik}) | /TCA$ where DIV_{mk} refers to diversification in cropping pattern between year m and k; A_{im} refers to area under i-th crop in the m-th year; A_{ik} refers to area under i-th crop in the k-th year and TCA is

the total cropped area. These measures gives the extent of total cropped area where diversification took place and is the sum of absolute deviations in the area under 'i-th' crop between the two periods.

The net returns from different high value cash crops over different farm management cost concepts like A_1, A_2, B_1, B_2, C_1 and C_2 have been computed. The profitability of fruit crops like apple, which is a perennial crop, has been studied by following the most commonly used approach, i.e., by analysing the cross-sectional data on the value of inputs and outputs for different age groups of apple plantations. Standard project worth measures like net present value (NPV), benefit-cost ratio (BCR) and internal rate of return (IRR) have been computed to work out the financial viability of apple plantation (Gittinger, 1976, p. 98). The linear regression model of the following type has been used to quantify the contribution of different factors that triggered the process of diversification. $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + ----- + U$ where a is constant, b_i's are regression coefficients, Y is the per cent area under high value cash crops, X_i's are independent variables like size of landholdings, extent of inaccessibility, availability of family labour, irrigation facilities, non-farm income, etc. and U is a random term.

III

THE PACE AND PATTERN OF AGRICULTURAL DEVELOPMENT

Consistent with the overall pattern of structural changes associated with the process of economic development, the contribution of agriculture to the net state domestic product declined continuously; from around 35 per cent in 1980-81 to 19.52 per cent in 1999-2000 (Table 1). The contribution of primary sector as a whole during the period plummeted from around one-half to around one-fourth. Consequently, the contribution of secondary and tertiary sectors increased respectively from 20.10 per cent and 31.82 per cent in 1980-81 to 31.99 per cent and 42.52 per cent in 1999-2000.

TABLE 1. SECTORAL DISTRIBUTION OF NET STATE DOMESTIC PRODUCT (NSDP) IN HIMACHAL PRADESH: 1980-81 TO 2000-2001

Sr. No.	Sectors	1980-81	1985-86	1990-91	1995-96	2000-01
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Primary sector	48.08	43.54	40.24	32.14	25.49
	(i) Agriculture and animal husbandry	34.95	34.97	31.77	24.37	19.52
	(ii) Forestry	12.10	6.90	6.62	6.54	4.67
	(iii) Fishing	0.27	0.30	0.36	0.29	0.20
	(iv) Mining and quarrying	0.76	1.37	1.49	0.94	1.10
2.	Secondary sector	20.10	21.76	22.37	31.55	31.99
3.	Tertiary sector	31.82	34.70	37.39	36.31	42.52
4.	All sectors	100	100	100	100	100
5.	Net state domestic product (NSDP), at 1993-94 prices (Rs. in lakh)	251,720	287,526	391,891	492,052	667,155
6.	Per capita NSDP (Rs.)	5,933	6,160	7,632	8,801	10,942

Source: Directorate of Economics and Statistics, Government of Himachal Pradesh, Shimla.

Further, Table 2 shows that during the twenty-year period since 1980-81, the net state domestic product originating in agriculture and animal husbandry recorded a growth rate of 1.91 per cent per annum. The overall growth rate of the state economy was 5.25 per cent per annum. Between the two periods, the growth rates in agriculture and related activities were higher during the eighties compared to the nineties.

TABLE 2. COMPOUND GROWTH RATES OF NSDP IN HIMACHAL PRADESH: 1980-81 TO 2000-2001

Sr. No.	Sectors	1980-81 to 1990-91	1991-92 to 2000-01	1980-81 to 2000-01
(1)	(2)	(3)	(4)	(5)
1.	Primary sector	2.35	1.10	1.90*
(i)	Agriculture and animal husbandry	3.46	0.75	1.91*
(ii)	Forestry	-3.92	1.05	1.59
(iii)	Fishing	7.03*	-1.76	4.30*
(iv)	Mining and quarrying	16.79*	11.92*	5.22
2.	Secondary sector	5.85*	10.64*	8.51*
3.	Tertiary sector	6.84*	7.58*	6.37*
4.	All sectors	4.65*	6.33*	5.25*

Table 3 tells the story of changing levels of area, production and productivity of major crops since 1972-73. It may be seen from the Table that among cereal crops, there was an increase in the area under most of the crops except rice, barley and other cereals. The area under pulses nosedived from about 72 thousand hectares in the triennium ending 1974-75 to 34 thousand hectares in the triennium ending 1999-2000. Among the non-foodgrain crops, while the area under potato remained practically unchanged, that under sugarcane, ginger and oilseeds declined by varying degrees. The production of foodgrains increased from 9.99 lakh tonnes to 14.11 lakh

TABLE 3. AREA, PRODUCTION AND YIELD OF MAJOR CROPS, 1972-73 TO 1999-2000

Sr. No.	Crops	Area (ha) in triennium ending			Production (tonnes) in triennium ending			Yield (kg/ha) in triennium ending		
		1974-75	1986-87	1999-2000	1974-75	1986-87	1999-2000	1974-75	1986-87	1999-2000
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1.	Rice	96,058	93,823	82,841	101,657	82,726	119,269	1,058	882	1,440
2.	Maize	261,976	303,505	304,248	452,261	551,900	654,797	1,726	1,818	2,152
3.	Wheat	315,740	378,268	375,883	330,228	404,299	568,624	1,046	1,069	1,513
4.	Barley	41,594	33,275	26,782	48,783	33,306	33,862	1,173	1,001	1,264
5.	Other cereals*	53,047	27,683	16,251	32,121	45,954	10,118	606	456	623
6.	All cereals	768,414	836,554	806,005	965,069	1118,184	1386,669	1,256	1,337	1,720
7.	Pulses	72,926	44,916	34,112	27,778	10,439	24,601	398	232	721
8.	Foodgrains	838,289	881,470	840,117	999,717	1128,623	1411,271	1,193	1,280	1,680
9.	Sugarcane	3,643	2,932	3,267	6,116	3,394	15,394	1,679	1,157	4,712
10.	Potato	14,915	14,576	14,359	57,905	48,099	152,833	3,882	3,300	10,644
11.	Ginger	2,018	2,218	1,799	1,047	1,159	2,779	519	522	1,544
12.	Oilseeds	23,095	21,853	19,241	9,695	4,476	10,093	420	205	525

Source: Annual Season and Crop Reports, Directorate of Land Records, Government of Himachal Pradesh, Shimla.

*Includes *ragi* and other common millets.

tonnes. The production of non-foodgrain crops also increased by varying degrees; the maximum increase was witnessed in potato production, from about 57 thousand tonnes to 1.52 lakh tonnes. The yield levels of different crops also increased during the period. For example, the yield of rice increased from 10.58 qtl/ha in the triennium ending 1974-75 to 14.40 qtl/ha in the triennium ending 1999-2000, that of maize from 17.26 qtl/ha to 21.52 qtl/ha and wheat from 10.46 qtl/ha to 15.13 qtl/ha. The yield levels of non-foodgrain crops like sugarcane, potato, ginger and oilseeds too registered significant increases. In terms of compound growth rates, there was an overall decline in the growth rates of area under different crops except that under wheat and maize (Table 4). The maximum decline occurred in the case of pulses, other cereals and barley. There was no neat pattern in growth rates in the yield levels of different crops in two periods. The foodgrains production increased at the rate of 1.55 per cent per annum. Among different foodgrian crops, the production of wheat recorded the highest growth (2.56 per cent per annum), followed by maize (1.68 per cent). Among the non-foodgrain crops, the production of sugarcane and potato recorded higher growth rates, though these were statistically insignificant. Further, the growth rates of production in most of the crops were higher in the second period (1985-86 to 1999-2000) compared with the first period (1972-73 to 1984-85). The growth rate of yield was the highest in case of wheat (1.93 per cent) followed by maize (0.95 per cent) and rice (0.84 per cent). Among non-foodgrain crops, the yield of potato witnessed maximum growth rate. The growth rates of sugarcane and ginger were also higher *albeit* statistically insignificant. Further, the growth rates for all the crops were significantly higher in the second period compared with those in the first period.

TABLE 4. COMPOUND GROWTH RATES OF AREA, PRODUCTION AND YIELD OF MAJOR CROPS IN HIMACHAL PRADESH, 1972-73 TO 1992-2000

Sr.		Area			Production			Yield		
No.	Crops	I	II	III	I	II	III	I	II	III
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1.	Rice	-0.39	-1.00*	-0.72*	-2.51	3.45*	0.12	-2.12	4.50*	0.84
2.	Maize	1.30*	-0.04*	0.73	1.36	2.08	1.68	0.06	2.12*	0.95*
3.	Wheat	1.68*	-0.03	0.61*	1.47	1.78	2.56*	-0.20	1.82	1.93*
4.	Barley	-1.65*	-1.66*	-1.98*	-3.06*	-0.46	-1.44*	-1.43*	1.21	0.55
5.	Other cereals*	-2.82*	-4.46*	-4.41*	-7.25*	-0.12	-5.17*	-2.55*	4.55	-0.79
6.	All cereals	0.82*	-0.32*	0.21	0.85	1.87	1.63*	0.03	2.19*	1.42*
7.	Pulses	-4.83*	-2.28	-3.16*	-10.01*	10.17*	-2.40	-5.44*	12.73*	0.78
8.	Foodgrains	0.44*	-0.41*	-0.001	0.60	1.96	1.55*	0.16	2.38*	1.54*
9.	Sugarcane	-1.78	2.03	-1.15	-6.14*	20.44*	1.95	-4.44	18.05*	3.13
10.	Potato	-0.51	-1.16	-0.30	-3.95	6.52	4.31	-3.46	7.78	4.63*
11.	Ginger	-0.81	-2.04	-1.98*	-0.84	12.72	0.13	-0.03	15.06*	2.15
12.	Oilseeds	-0.13	-0.99	-0.33	-6.57*	7.69*	-0.02	-6.45*	8.78*	0.32

Note: (1) * denotes significance at 0.05 level of probability.
(2) I - 1972-73 to 1984-85; II - 1985-86 to 1999-2000 and III - 1972-73 to 1999-2000.

The state has also made significant strides in horticultural development; in 1999-2000, the horticultural sector contributed around 16 per cent of the gross value of output originating in agriculture. Table 5 shows that while area under fruit crops increased from 26,307 hectares in the triennium ending 1967-68 to around 2 lakh hectares in the triennium ending 1999-2000, fruit production increased from 48 thousand tonnes to 2.72 lakh tonnes. The yield levels, however, fluctuated and had declined in recent years, mainly because of erratic weather and increasing incidence of diseases and insect pests. Further, among the horticultural crops, apple continued to be the most important fruit crop accounting for around two-fifths of the total area and more than four-fifths of total fruit production.

TABLE 5. TRENDS IN AREA, PRODUCTION AND YIELD OF FRUITS IN HIMACHAL PRADESH, 1965-66 TO 1999-2000

Triennium ending	Area (ha)			Production (tonnes)			Yield (tonnes/ha)		
	Apple	Others	Total	Apple	Others	Total	Apple	Others	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1967-68	15,148	11,159	26,307	307,482	17,744	48,492	2.03	1.59	1.84
	(57.48)	(42.42)	(100)	(63.41)	(35.59)	(100)			
1977-78	36,895	32,085	68,980	150,282	26,800	177,082	4.07	0.83	2.57
	(53.49)	(46.51)	(100)	(84.87)	(15.31)	(100)			
1987-88	52,805	82,464	135,269	264,405	41,242	305,647	5.01	0.50	2.26
	(39.03)	(60.97)	(100)	(86.51)	(13.49)	(100)			
1999-2000	84,772	120,841	205,613	225,679	46,585	272,264	2.66	0.38	1.32
	(41.23)	(58.77)	(100)	(82.89)	(17.11)	(100)			

Source: Horticultural Development in Himachal Pradesh: Facts and Figures at a Glance, Directorate of Horticulture, Government of Himachal Pradesh, Shimla.

Note: Figures in parentheses are percentages.

Table 6 shows that during the period 1965-66 to 1999-2000, while the area under all fruits registered a growth rate of 6.46 per cent per annum, the fruit production increased at a rate of 4.94 per cent per annum. The growth rate of yield of all fruits during the same period was, however, negative. Nevertheless, the yield of apple registered a growth rate as high as 11.89 per cent per annum. Between the two time periods, the yield levels of apple and other fruits registered negative growth rates during the second period, i.e., from 1981-82 to 1999-2000. It may be mentioned that

TABLE 6. COMPOUND GROWTH RATES IN AREA, PRODUCTION AND YIELD OF FRUITS IN HIMACHAL PRADESH, 1965-66 TO 1999-2000

	Area			Production			Yield		
Crops	I	II	III	I	II	III	I	II	III
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Apple	7.59*	4.06*	4.73*	10.45*	3.11	7.47*	2.76	-2.99*	11.89*
Other fruits	10.89*	4.27*	8.13*	-2.05*	0.93	1.17	-11.50*	-3.27*	-5.91*
Total fruits	9.07*	4.12*	6.46*	7.36*	0.95	4.94*	-1.43*	-3.13*	-1.41*

Note: 1. *Denotes significance at 0.05 level of probability.

I = 1965-66 to 1980-81; II = 1981-82 to 1999-2000; III = 1965-66 to 1999-2000.

post-1980 period has not been so good for apple production. The major setback came in the early eighties when the scab disease took a heavy toll. And subsequently, the apple production has fluctuated due to the frequent outbreak of diseases and erratic weather conditions, especially at the time of fruit setting.[2]

IV

THE PROCESS OF AGRICUTLURAL DIVERSIFICATION

An idea of the extent of agricultural diversification at the state level can be had by looking into the changing contribution of crop production, horticulture and livestock towards the gross value of output originating in agriculture. The data given in Table 7 show that during 1993-94 and 2000-01 despite fluctuations, crop production contributed nearly half of the total value of output originating in agriculture. Further, while the contribution of livestock sector remained stagnant around 35-36 per cent, that of horticultural crops fluctuated sharply, ranging from as high as 17.35 per cent to as low as 4.62 per cent. Yet another way to understand the temporal changes in the process of agricultural diversification is to study the temporal

TABLE 7. SHARE OF CROP PRODUCTION, HORTICULTURE AND LIVESTOCK IN THE GROSS VALUE OF OUTPUT ORIGINATING IN AGRICULTURE, 1993-94 TO 2000-2001 AT 1993-94 PRICES

Year	Crop production	Horticulture	Livestock	Total	Gross value of output originating in agriculture (Rs. in lakh)
(1)	(2)	(3)	(4)	(5)	(6)
1993-94	47.80	14.51	37.69	100	155,407
1994-95	54.35	8.27	37.38	100	157,031
1995-96	50.74	13.28	35.98	100	166,409
1996-97	49.36	14.71	35.93	100	171,372
1997-98	52.39	11.44	36.17	100	175,474
1998-99	47.48	17.35	35.17	100	180,856
1999-2000	57.05	4.62	38.33	100	167,735
2000-2001	48.30	15.99	35.71	100	184,314

Source: Directorate of Economics and Statistics, Government of Himachal Pradesh, Shimla.

changes in the cropping pattern. In this context, Table 8 shows that among foodgrain crops the share of area under rice declined steadily while that under maize and wheat registered a small but persistent increase. Among the non-foodgrains, the area under apple, other fruits, potato and other vegetables increased over the period by varying degrees. It, however, needs to be mentioned that state level averages, especially in the context of Himachal Pradesh, where there are marked variations in the climatic conditions among different districts and even among different areas in the same district, do not reveal much about the extent of crop diversification. For example, two tribal districts (Lahaul and Spiti and Kinnaur) and most of the areas of Shimla, Kullu and Chamba and some areas of Sirmaur, Solan and Mandi that fall in the temperate region have potential to grow temperate fruits and vegetables. It is, therefore, essential to examine the changes in the area under different crops at a much more

TABLE 8. TEMORAL CHANGES IN CROPPING PATTERN IN HIMACHAL PRADESH, 1972-73 TO 1999-2000

(per cent to total cropped area)

Sr. No.	Crops	1972-73	1977-78	1982-83	1987-88	1992-93	1999-2000
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	Rice	10.54	10.90	9.45	9.25	8.42	8.38
2.	Maize	28.16	29.11	30.10	30.78	31.91	31.35
3.	Wheat	34.27	34.30	39.24	38.50	38.93	38.73
4.	Barley	4.55	4.04	3.94	3.23	2.79	2.71
5.	Other cereals*	5.90	4.13	3.40	2.85	2.08	1.60
6.	Pulses	7.76	8.66	4.48	4.52	4.22	3.40
7.	Sugarcane	0.39	0.45	0.35	0.31	0.24	0.32
8.	Apple	1.27	1.57	2.08	2.62	3.56	4.25
9.	Other fruits	0.52	0.60	0.92	1.06	1.22	1.78
10.	Potato	1.56	1.56	1.39	1.53	1.46	1.50
11.	Other vegetables	0.54	0.61	0.83	1.32	1.15	2.12
12.	Ginger	0.24	0.27	0.20	0.21	0.17	0.21
13.	Oilseeds	2.58	2.33	2.43	2.38	2.25	1.97
14.	Others	1.72	1.47	1.19	1.44	1.60	1.68

Source: Annual Season and Crop Reports, Directorate of Land Records, Government of Himachal Pradesh, Shimla.

*Includes *ragi* and other common millets.

disaggregated level, preferably at a block level. However, due to data constraints, we look at the temporal changes in per cent share of area under foodgrain and non-foodgrain crops at the district level. The requisite information has been brought out in Table 9. The Table shows that while there has been a significant increase in the extent of crop diversification in terms of per cent share of area under non-foodgrain crops in four districts, namely, Kullu, Shimla, Kinnaur and Lahaul and Spiti, the increase was less pronounced in three others (Solan, Sirmaur and Chamba). Further, in all these districts, the process of crop diversification had gathered momentum in recent periods, especially after 1987-88. In the remaining four districts (Kangra, Bilaspur, Hamirpur and Una), which mostly fall in the sub-tropical region, the per cent share of area under foodgrain and non-foodgrain crops remained practically

TABLE 9. TEMPORAL CHANGES IN THE ARA UNDER NON-FOODGRAIN CROPS ACROSS DISTRICTS IN HIMACHAL PRADESH: 1972-73 TO 199-2000

(per cent to total cropped area)

District	1972-73	1977-78	1982-83	1987-88	1992-93	1999-2000
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bilaspur	3.01	3.11	3.30	3.15	3.24	3.33
Chamba	6.36	6.87	7.49	8.02	7.46	9.75
Hamirpur	1.38	1.42	1.28	1.19	1.15	1.21
Kangra	11.21	9.57	9.34	9.53	11.04	9.91
Kinnaur	8.09	10.08	14.45	22.00	25.77	37.43
Kullu	6.83	9.08	11.90	12.20	16.96	21.33
Lahaul and Spiti	24.70	39.13	46.97	59.31	63.73	72.43
Mandi	5.89	6.69	6.80	7.90	7.10	9.11
Shimla	17.16	17.62	20.76	26.74	33.14	43.73
Sirmaur	9.99	12.52	10.75	13.13	12.72	15.46
Solan	9.73	8.30	8.25	10.93	10.19	12.52
Una	7.79	7.77	7.83	8.55	8.83	8.87
Himachal Pradesh	8.81	8.86	9.38	10.87	11.65	13.82

unchanged. These results have been corroborated by the temporal changes in the Herfindhal indices. As may be seen from Table 10, the values of the indices declined successively in Kinnaur, Lahaul and Spiti and Shimla implying increasing level of diversification. In Kullu, the process of crop diversification was more pronounced

TABLE 10. CHANGING LEVELS OF CROP DIVERSIFICATION INDICES (HERFINDHAL) ACROSS DISTRICTS IN HIMACHAL PRADESH: 1972-73 TO 1999-2000

District	1972-73	1977-78	1982-83	1987-88	1992-93	1999-2000
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bilaspur	0.3051	0.2782	0.3718	0.3773	0.3867	0.4315
Chamba	0.2538	0.2591	0.2659	0.2818	0.2743	0.2729
Hamirpur	0.2561	0.3148	0.3924	0.4218	0.4366	0.4510
Kangra	0.2485	0.2593	0.2838	0.2817	0.2783	0.2850
Kinnaur	0.3222	0.3062	0.2613	0.2093	0.1856	0.1629
Kullu	0.2018	0.2034	0.2120	0.2197	0.2453	0.2276
Lahaul and Spiti	0.2604	0.2428	0.2653	0.2342	0.2311	0.1869
Mandi	0.2020	0.2487	0.2627	0.2495	0.2830	0.2877
Shimla	0.1778	0.1775	0.1753	0.1719	0.1630	0.1654
Sirmaur	0.2512	0.2440	0.2658	0.2554	0.2584	0.2395
Solan	0.2476	0.2440	0.2789	0.2758	0.2916	0.2847
Una	0.2815	0.2808	0.3567	0.3683	0.3791	0.3754
Himachal Pradesh	0.5677	0.5456	0.6452	0.6662	0.6676	0.7114

between 1992-93 and 1999-2000, as was evident from a significant decline in the value of Herfindhal Index during the period. Similar trends were discernible in districts like Solan, Sirmaur and Chamba. Likewise, increase in the values of these indices in Bilaspur, Hamirpur, Kangra and Una reveal trends towards increasing specialisation. Table 11 shows the extent of crop diversification during different time periods. It shows that maximum crop diversification in low hill districts (Bilaspur, Hamirpur and Una) took place towards the late seventies and early eighties; the process of crop diversification was, however, among the cereal crops only; in these

TABLE 11. CHANGING EXTENT OF CROP DIVERSIFICATION ACROSS DISTRICTS IN HIMACHAL PRADESH: 1972-73 TO 1999-2000

(DIVmk as per cent to total cropped area)

District	1972-73 to 1977-78	1977-78 to 1982-83	1982-83 to 1987-88	1987-88 to 1992-93	1992-93 to 1999-2000
(1)	(2)	(3)	(4)	(5)	(6)
Bilaspur	4.43	17.78	1.64	2.22	4.13
Chamba	2.74	3.62	4.49	10.53	7.07
Hamirpur	11.52	15.24	4.06	1.77	2.05
Kangra	6.34	5.73	5.01	3.61	1.76
Kinnaur	4.37	11.18	13.45	12.33	12.44
Kullu	5.54	7.01	6.11	8.30	10.91
Lahaul and Spiti	13.07	9.51	13.75	14.39	11.54
Mandi	4.03	4.69	3.54	9.19	5.27
Shimla	2.01	5.20	11.79	10.82	12.17
Sirmaur	5.12	5.60	3.51	2.68	4.94
Solan	10.74	17.68	8.33	5.54	5.78
Una	6.50	11.22	3.08	1.80	2.47
Himachal Pradesh	2.55	7.52	2.19	2.48	3.12

three districts, there has been a significant shift of area from paddy to maize. In Solan, where the process of crop diversification was more pronounced during the same period, the diversification occurred in favour of fruits and vegetables. In five districts (Chamba, Kinnaur, Kullu, Lahaul and Spiti, and Shimla) whose large area falls under temperate agro-climatic conditions, the process of crop diversification towards high value fruits and vegetable crops started in the early seventies and has continued till the late nineties. It may be mentioned that these districts along with Solan have, over the period, emerged as the leading producers of high value fruit and off-season vegetable crops.

V

CROP DIVERSIFICATION: COST AND RETURNS

The household level data from the sample households in three blocks that represent different levels of crop diversification, on per cent of gross cultivated area under different crops have been presented in Table 12. The Table shows that in Theog block where the process of crop diversification began in the early eighties, the

TABLE 12. AREA UNDER HIGH VALUE CASH CROPS

(per cent)

Sr. No.	Crops	Theog		Sangrah		Seraj	
		Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	*Kharif* crops-I-Vegetable crops						
(i)	Tomato	-	0.67	-	-	1.61	1.11
(ii)	Colocasia	-	-	0.27	0.57	-	-
(iii)	Ginger	-	-	7.18	0.29	-	-
(iv)	Beans	6.76	3.36	-	-	-	-
(v)	Capsicum	6.76	6.73	-	-	-	-
(vi)	Cabbage	13.51	30.3	-	-	16.13	3.32
(vii)	Cauliflower	27.02	6.73	-	-	1.61	0.44
(viii)	Garlic	-	-	17.95	5.73	-	-
	Sub-total	54.06	47.79	25.4	6.59	19.35	4.87
II.	Cereal crops	3.38	23.57	13.83	40.11	16.13	22.12
2.	*Rabi* crops-I-Vegetable crops						
(i)	Peas	33.78	11.78	25.13	22.93	-	16.59
(ii)	Potato	6.74	6.73	27.92	22.92	32.26	24.34
	Sub-total	40.54	18.52	53.05	45.85	32.26	40.93
III.	Cereal crops	2.02	10.12	7.72	7.45	32.26	32.08
3.	All vegetable crops	94.60	66.31	78.45	52.44	51.61	45.80
4.	All cereal crops	5.40	33.69	21.55	47.56	48.39	54.20
5.	All crops	100	100	100	100	100	100
6.	Gross cropped area (ha)	0.296	0.594	1.114		0.062	0.904
7.	Net cropped area (ha)				0.174		
8.	Cropping intensity	0.23	0.56	0.67	0.16	0.04	0.56
	(per cent)	130.43	103.50	165.70	106.30	150.00	160.70
9.	Area under apple orchards (ha)	-	0.69	-	-	-	0.20

Source: Field survey, 2001-02.
Note: The percentages have been calculated on the basis of the gross cropped area.

per cent of gross cropped irrigated and unirrigated area under off-season vegetables was as high as 95 per cent and 66 per cent, respectively. In Sangrah block, which was in the middle stages of transition, these crops accounted for about 78 per cent of the gross cropped irrigated area and 52 per cent of the total unirrigated area. Likewise, in Seraj block where the process of diversification had recently started, the off-season vegetable crops including potato accounted for about half of the irrigated and 45 per cent of the total unirrigated area. Further, among different crops, cauliflower and cabbage in the *kharif* season and peas in the *rabi* season were important crops in Theog while in Sangrah, garlic, potato and peas were relatively more important. In recent years, garlic has emerged as the most important high value crop that accounted for about 18 per cent of the gross cropped irrigated area. In Seraj, potato and capsicum were important crops, respectively accounting for about 32 per cent and 16 per cent of the total irrigated area; peas was yet another important crop grown on about 24 per cent of the gross cropped unirrigated area.

The details on inputs use, costs and net returns from different crops in there blocks are presented in Table 13. The Table shows that in Theog block, surrogating areas in advanced stages of agricultural transformation, the use of fertilisers was highly imbalanced; the farmers were using higher doses of nitrogenous fertilisers but very low doses of phosphorus and potassium fertilisers in almost all the crops except tomato where the application of nitrogenous fertilisers was very low. However, the use of farmyard manure was quite reasonable. The expenditure on plant protection measures was also very high, especially in cauliflower and capsicum, due to very high incidence of diseases. Further, since the vegetable crops are highly labour intensive, the human labour days per hectare in different crops varied from 128 days in tomato to 339 days in capsicum. The net returns over cost C2 were higher for cabbage (Rs. 1,02,100) and cauliflower (Rs. 63,151) followed by those from potato (Rs. 51,407), peas (Rs. 42,257), capsicum (Rs. 40,810) and tomato (Rs. 34,621). The returns from cereal crops were negative; and in case of wheat, these did not cover even cost A_1. In Sangrah block, representing areas in the middle of agricultural transition, use of inputs, especially that of fertilisers in nutrients terms, though on a lower side, was comparatively more balanced. The use of farmyard manure was also lower than recommended. The expenditure on plant protection measures on different crops was, however, significantly lower in comparison to that in Theog block. The returns from garlic were very high (Rs. 1,73,262), and those from other crops like ginger, peas and potato were Rs. 53,772, Rs. 46,274 and Rs. 41,359, respectively. The cereals crops yielded very low returns, and in case of wheat the returns on cost C2 were - Rs. 2,116. Coming to Seraj block, where the process of transformation was in the initial stages, the use of fertilisers though on a lower side, was more balanced in most of the crops except tomato. The use of farmyard manure also did not differ much from the recommended levels. The maximum returns per hectare over cost C_2 were obtained from cabbage (Rs. 1,04,968) followed by tomato (Rs. 71,506), cauliflower (Rs. 62,680) and peas (Rs. 42,313). The returns from cereal

TABLE 13. INPUTS USE, COSTS AND RETURNS FROM MAJOR CROPS

(*per hectare)*

Sr. No.	Particulars	Potato	Peas	Cabbage	Cauli-flower	Tomato	Beans	Capsicum	Wheat	Maize
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Theog						
1.	Seed cost (Rs.)	9,944	3,556	9,420	13,665	5,875	1,162	5,945	873	259.5
2.	FYM quantity (qtl.)	116.37	87.73	78.49	109.7	69	109.89	151.76	90.5	108.25
3.	Nutrient quantity (kg.) (a) N	116.56	81.87	131.79	165.38	27.34	97.76	224.73	43	74.16
	(b) P	46.79	18.16	16.58	20.71	-	4.47	12.76	8.92	1.80
	(c) K	33.94	8.09	6.65	6.93	-	2.31	3.87	4.46	-
4.	Plant protection (Rs.)	2,473	4,009	8,060	12,547	3,133	3,189	11,664	-	-
5.	Human labour (days)	179.48	196.53	271.64	274.35	128.47	224.67	339.19	79.8	124.55
6.	Bullock labour (days)	13.75	14.47	9.28	12.48	4.4	11.51	11.49	14.64	14.48
7.	Packing/Mkg./tpt cost (Rs.)	3,865	2,204	4,905	5,001	2,068	3,155	4,499	-	-
8.	Cost A_1 (Rs.)	24,358	19,361	31,204	41,945	22,340	13,348	32,851	9,436	10,736
9.	Cost A_2 (Rs.)	24,358	19,361	31,204	41,945	22,340	13,348	32,851	9,436	10,736
10.	Cost B_1 (Rs.)	25,098	21,138	32,893	43,229	22,345	13,570	33,693	10,047	11,395
11.	Cost B_2 (Rs.)	27,535	23,077	36,048	47,427	24,579	14,906	36,981	11,142	12,472
12.	Cost C_1 (Rs.)	35,160	31,190	46,800	57,628	34,645	26,974	53,649	14,842	18,448
13.	Cost C_2 (Rs.)	37,698	33,129	49,924	61,826	36,879	28,310	56,310	15,936	19,525
14.	Yield levels (qtl./ha)	147	75.6	227	132	90	53	75	10.5	22
15.	Prices (Rs./qtl)	607	998	667	944	500	889	1,293	600	450
	Net returns over									
16.	Cost A_1 (Rs.)	64,646	56,028	120,821	83,032	49,160	33,759	64,269	-3,140	264
17.	Cost A_2 (Rs.)	64,646	56,028	120,821	83,032	49,160	33,759	64,269	-3,140	264
18.	Cost B_1 (Rs.)	63,907	54,248	119,131	81,749	49,155	33,537	63,427	-3,751	-395
19.	Cost B_2 (Rs.)	61,469	52,309	116,007	77,237	46,921	32,202	60,139	-4,846	-1,472
20.	Cost C_1 (Rs.)	53,845	42,862	105,225	67,327	36,855	28,133	43,471	-8,546	-7,748
21.	Cost C_2 (Rs.)	51,407	42,257	102,100	63,151	34,621	18,797	40,810	-9,640	-8,525
22.	Net returns per quintal over cost C_2 (Rs.)	350	559	450	478	385	355	544	-102	-22

(Contd.)

TABLE 13. (*Contd.*)

Sr. No. (1)	Particulars (2)	Potato (3)	Peas (4)	Garlic (5)	Ginger (6)	Colocasia (7)	Wheat (8)	Maize (9)	Barley (10)
				Sangrah					
1.	Seed cost (Rs.)	17,691	4,030	19,874	1,630	3,925	800	488	617
2.	FYM quantity (qtl.)	210.8	74.66	271.63	65.79	105.24	26.5	52.59	51.95
3.	Nutrient quantity (kg.) (a) N	45.34	42.58	76.40	46.61	33.30	4.50	74.77	19.70
	(b) P	70.56	15.29	52.14	53	52	2.50	2.66	-
	(c) K	35.28	7.68	26.04	26.50	26	1.25	1.39	-
4.	Plant protection (Rs.)	511	1,659.5	1,041.5	2,066	243.88	-	-	-
5.	Human labour (days)	212.84	204	368.8	161.52	137.96	78	130.72	95.96
6.	Bullock labour (days)	16.44	9	19.64	8.32	8.04	19	12.92	19.75
7.	Packing/Mkg./tpt cost (Rs.)	14,254	9,924	-	9,675	1,655	-	109	-
8.	Cost A_1 (Rs.)	37,583	14,395	44,007	9,858	11,603	6,152	8,894	7,205
9.	Cost A_2 (Rs.)	37,583	14,395	44,007	9,858	11,603	6,152	8,894	7,205
10.	Cost B_1 (Rs.)	38,798	15,443	44,668	10,026	11,624	6,601	9,824	7,385
11.	Cost B_2 (Rs.)	42,556	16,883	49,069	11,012	12,784	7,216	10,713	8,105
12.	Cost C_1 (Rs.)	50,241	26,745	63,811	19,592	18,764	11,101	17,141	12,854
13.	Cost C_2 (Rs.)	53,999	28,328	68,211	20,578	23,637	11,716	18,031	13,574
14.	Yield levels (qtl./ha)	205	80	97.7	69.6	91.5	16.00	37.4	17.30
15.	Prices (Rs./qtl)	466	937	2,472	1,630	500	600	450	1,335
	Net returns over								
16.	Cost A_1 (Rs.)	57,776	60,201	197,467	66,918	34,137	3,448	7,936	500
17.	Cost A_2 (Rs.)	57,776	60,201	197,467	66,918	34,137	3,448	7,936	1,335
18.	Cost B_1 (Rs.)	56,561	59,159	196,805	66,750	34,116	2,999	7,006	714
19.	Cost B_2 (Rs.)	52,803	57,719	184,288	65,764	32,956	2,384	6,117	435
20.	Cost C_1 (Rs.)	45,118	47,857	177,663	57,184	26,976	-1,501	-311	-4,314
21.	Cost C_2 (Rs.)	41,359	46,274	173,262	53,772	22,103	-2,116	-1,201	-5,034
22.	Net returns per quintal over cost C_2 (Rs.)	202	578	1,773	773	242	-132	-32	-291

(Contd.)

TABLE 13. *(Concld.)*

Sr. No. (1)	Particulars (2)	Potato (3)	Peas (4)	Cabbage (5)	Cauliflower (6)	Tomato (7)	Wheat (8)	Barley (9)	Maize (10)
				Seraj					
1.	Seed cost (Rs.)	13,339	3,084	3,428	6,026	2,709	999	865	431
2.	FYM quantity (qtl.)	111	67	68	102.24	100	60.23	25.56	63.09
3.	Nutrient quantity (kg.) (a) N	65	64	90.86	118	81.32	96.62	10.06	55.61
	(b) P	88	17	38.75	49.11	47.52	7.59	1.04	6.58
	(c) K	43.5	8.3	19.38	24.47	20.02	3.86	0.58	3.30
4.	Plant protection (Rs.)	114	1,941	3,935	7,107	4,850	-	-	-
5.	Human labour (days)	202	126	264	306	400	121	110	153
6.	Bullock labour (days)	15	14.68	10.24	9.2	15.08	24	22	22
7.	Packing/Mkg./tpt cost (Rs.)	9,937	11,032	7,275	6,604	16,838	-	-	-
8.	Cost A_1 (Rs.)	25,973	13,012	14,496	25,628	18,065	9,818	7,152	8,202
9.	Cost A_2 (Rs.)	25,973	13,012	14,496	25,628	18,065	9,818	7,152	8,202
10.	Cost B_1 (Rs.)	26,248	13,113	14,640	25,655	18,088	9,950	7,268	8,336
11.	Cost B_2 (Rs.)	28,846	14,458	16,089	28,214	19,894	10,932	7,984	9,156
12.	Cost C_1 (Rs.)	37,905	20,536	29,589	43,836	40,676	17,001	13,813	17,182
13.	Cost C_2 (Rs.)	40,504	21,881	31,039	46,394	42,483	17,983	14,528	18,003
14.	Yield levels (qtl./ha)	144	70	208	135	166.5	24.56	21.4	27.4
15.	Prices (Rs./qtl)	499	925	653	683	693	600	500	450
	Net returns over								
16.	Cost A_1 (Rs.)	45,738	51,182	121,511	83,446	95,924	5,666	4,722	5,418
17.	Cost A_2 (Rs.)	45,738	51,182	121,511	83,446	95,924	5,666	4,722	5,418
18.	Cost B_1 (Rs.)	45,463	51,081	121,367	83,419	95,901	5,533	4,606	5,284
19.	Cost B_2 (Rs.)	42,865	49,725	119,918	80,860	94,095	4,552	3,890	4,464
20.	Cost C_1 (Rs.)	33,806	43,658	106,418	65,239	73,312	-1,518	-1,939	-3,562
21.	Cost C_2 (Rs.)	33,682	42,313	104,968	62,680	-71,506	-2,499	-1,987	-4,333
22.	Net returns per quintal over cost C_2 (Rs.)	234	604	505	464	429	-102	-93	-158

Source: Field survey 2001-02.

crops like wheat, barley and maize, which accounted for a significant per cent of cropped area were Rs. 5,666, Rs. 4,722 and Rs. 5,418 over cash variable expenses.[3] In our sample blocks, the apple plantation was found only in two blocks, namely, Theog and Seraj. The details of costs and returns of apple plantation have been set out in Table 14. The Table shows that the average returns per hectare were Rs. 1,12,811 in Theog and Rs. 1,29,741 in Seraj. The returns per box of 20 kilograms were Rs. 240 and Rs. 263 respectively. The profitability for apple cultivation was also evident from the results of different project worth measures (Table 15). For example, net present values were Rs. 81,705 in Theog and Rs. 64,845 in Seraj; the benefit-cost ratios were 1.86 in the former and 1.98 in the latter and the internal rates of return were 24 per cent for Theog and 22 per cent for Seraj.

TABLE 14. COSTS AND RETURNS FROM APPLE PLANTATION

(Rs./ha)

Age of trees (Years) (1)	Average production (boxes) (2)	Total fixed cost (3)	Total variable cost (4)	Transport charges (5)	Total cost (6)	Total cost per box (7)	Gross returns (8)	Net returns (9)	Returns per box (10)
				Theog					
0-8	-	24,359	48,414	-	72,773	-	-	-	-
9	438	6,089	21,908	3,066	31,063	71	142,350	111,287	254
10	460	6,765	31,250	3,445	41,460	90	159,680	118,160	257
11 to 20	418	10,148	33,936	2,883	46,967	112	152,988	106,021	254
21 to 30	485	16,913	39,244	3,449	59,606	123	178,480	118,874	245
31 to 40	550	23,678	25,854	4,279	53,811	98	185,350	131,539	239
Average	470	14,659	33,434	2,854	50,947	108	163,758	112,811	240
				Seraj					
0-8	-	15,301	43,022	-	58,323	-	-	-	-
9.10	470	4,240	24,750	1,578	30,568	65	164,150	133,582	285
11.20	595	6,360	28,816	1,700	36,876	62	193,375	156,499	263
21-30	491	10,600	24,814	1,435	36,849	75	168,032	131,183	278
31-40	436	14,840	25,398	1,330	41,568	95	155,216	113,648	261
Average	493	10,268	29,360	1,209	40,837	83	170,578	129,741	263

Source: Field Survey 2001-02.
Note: One box contains 20 kilograms of apple.

TABLE 15. FINANCIAL VAIBAILITY OF APLLE PLANTATION

Measures (1)	Theog (2)	Seraj (3)
Net present value (Rs./ha)	81,705	64,845
Benefit-cost ratio	1.86	1.98
Internal rate of return (per cent)	24	22

Note: The net present value and benefit-cost ratio have been estimated at a discount rate of 10 per cent.

VI

FACILITATING FACTORS

From the policy perspective, it is more important to understand the factors that facilitated the process of agricultural development and crop diversification. These

factors operate both at the micro and macro level. While the factors at the macro level create enabling environment for agricultural development and crop diversification, those at the household level induce the farmers to make use of the enabling environment by switching over to the cultivation of high value cash crops. The present section discusses the important factors that facilitated the process of agricultural development and diversification. We begin with the macro factors.

First, the adoption of development strategy incorporating mountain specificities has been the single most important contributory factor in facilitating the whole process of agricultural development and crop diversification in the state. The planners accorded very high priority to create the basic infrastructural facilities, *ab initio*. Table 16 shows that transport and communication, power and social services including education and health, accounted for more than half of the total plan outlay in the first three five year plans. These heavy allocations created a reasonably good network of roads, schools and hospitals. This led to the enhancement of 'social opportunities' and created conditions for widely shared growth, both across regions and sections of the society. The roads connected the interiors with the main towns thus breaking the barriers of inaccessibility and isolation and fostering the process of crop diversification. More recently, the widespread expansion of telephone facilities in the interiors including tribal areas has given further impetus to the ongoing process of crop diversification. The hypothesis that breaking of inaccessibility barrier triggers the process of diversification has been supported by the results of the regression equation, given below, fitted to a cross-section of data for twelve districts.

$Y = 14.58 + 0.24^{*} X_1 + 3.59^{**} X_2 \quad R^{-2} = 0.76$ and N = 12
(4.96) (2.07)

where Y is per cent of total cropped area under non-foodgrain crops; X_i is road length per hundred hectares of the net sown area and X_2 is the number of telephones per 100 persons.

Figures in parentheses are 't' values.

* and ** denote significance at 0.01 and 0.05 levels of probability, respectively.

Second, a network of institutions was created that facilitated the process of crop diversification. The Himachal Pradesh Horticultural Produce Marketing and Processing Corporation (HPMC) was set up in 1971 with the assistance of World Bank to provide post-harvest infrastructural facilities such as link roads, cold storage, grading and packing facilities. A network of R & D institutions had been created to evolve new technologies and provide technical know-how and extension back up to the farmers. In addition to an Agricultural University, a separate University of Horticulture and Forestry was established in 1985 to provide technical and extension back up to the growing horticultural sector. The Central Government also established research institutions/centres in the state to strengthen the R & D infrastructure; Central Potato Research Institute at Shimla, National Institute of Mushroom Research

TABLE 16. PATTERN OF RESOURCE ALLCOATION IN DIFFERENT FIVE YEAR PLANS: FIRST FIVE YEAR PLAN TO NINTH FIVE YEAR PLAN

(per cent)

Sectors	First Plan 1951-56	Second Plan 1956-61	Third Plan 1961-66	Annual Plan 1966-69	Fourth Plan 1969-74	Fifth Plan 1974-79	Sixth Plan 1980-85	Seventh Plan 1985-90	Eighth Plan 1992-97	Ninth Plan 1997-2002
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Agriculture and allied services	17.56	22.90	28.43	27.74	30.76	22.49	22.61	25.70	20.72	19.22
2. Irrigation	9.78	3.22	2.69	4.85	2.91	5.10	6.21	7.09	4.78	4.54
3. Power	5.87	14.52	7.05	19.56	15.23	25.11	24.94	25.22	20.21	18.23
4. Industry	1.95	3.23	3.62	4.27	4.14	3.66	3.22	2.53	3.02	2.63
5. Transport and communication	44.66	31.16	34.08	28.65	29.90	23.04	21.91	15.67	13.23	10.78
6. Social services of which:	19.96	23.16	22.63	14.25	16.69	18.14	19.33	20.19	29.90	36./95
(a) Education	8.86	7.74	7.98	5.82	7.01	5.19	3.17	6.21	11.36	14.33
(b) Health	6.37	5.41	6.12	3.37	4.09	3.13	2.89	2.50	4.84	5.57
(c) Others	4.73	10.01	8.53	5.06	5.69	9.82	13.27	11.48	13.70	17.04
7. Miscellaneous	0.22	1.81	1.50	0.68	0.37	2.46	2.50	3.60	8.14	7.65
8. Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
9. Plan outlay (Rs. lakh)	564.40	1,472.53	2.793	4,022	10,140	23,895	56,000	1,05,000	2,50,200	5,70,000
10. Per capita per annum investment (Rs.)	4.00	11.00	21.00	40.00	61.20	100.50	287.80	544.59	1,353.60	2,205.03

Source: Statistical Outlines of Himachal Pradesh, Directorate of Economics and Statistics, Government of Himachal Pradesh, Shimla (various years).

at Solan, IARI Regional Research Station for Vegetable Research at Katrain (Kullu) and Institute of Himalayan Bio-resources Technology at Palampur are the notable examples. These research institutions/centres provided the much needed technical back up for the cultivation of high value cash crops by evolving suitable technologies in terms of breeding high-yielding varieties and advising the farmers about varieties suited to the agro-climatic conditions of their respective areas, their agronomic practices and crop protection measures. The readily available technical know-how in these institutions and its transfer to the farmers through their network of regional research stations and government line departments played an important role in accelerating the process of crop diversification.[4] The implementation of New Policy on Seed Development (NPSD) by the Government of India since October 1988 made the import of good quality seeds much easier and hastened the spread of the cultivation of high value cash crops. In addition, the support prices for different fruit crops have been introduced to insulate the farmers from fluctuations in the market prices. In more recent times, the market intervention scheme has been launched under which the prices of different fruit crops are fixed according to their grade and quality, and if prices happen to fall below these levels, the state government purchases the produce at fixed prices.

Third, rapid spread of the cultivation of high value cash crops has also been on account of very high level of market consciousness among the farmers. A number of factors have contributed towards this development. The farmers in Shimla, Solan and Kullu districts have been traditionally growing cash crop like potato and have remained in touch with markets outside the state. They have acquired a spirit of innovativeness and are always ready to experiment with new crops/enterprises that promise high economic returns. For instance, when potato ceased to be a cash crop in the fifties and the early sixties due to dwindling yields and falling demand, they switched over to fruit cultivation mainly apple, and subsequently to off-season vegetables. Likewise, in recent times, when apple production is fluctuating and becoming uncertain because of erratic weather, farmers in some areas have started switching over to high value cash crops like garlic and off-season vegetables and even to more risky crops like floriculture (Sharma, 1996).[5]

Fourth, the availability of huge market at Delhi and in other cities in the neighbouring states of Punjab and Haryana has been yet another important contributory factor encouraging the cultivation of fruits and off-season vegetables in the state. Practically from all the far-off parts of the state, the distance to Delhi can be covered in less than twenty-four hours. This puts the state in an advantageous position compared to other mountainous regions including Jammu and Kashmir and north-eastern states where lack of nearby markets has been one of the most limiting factors in the cultivation of high value cash crops. In fact, accessibility of the mountain areas to final markets is a common theme underlying all success stories of crop diversification, especially towards off-season vegetables, in whole of the Hindu Kush Himalayan region (Nagpal, 1999).

Fifth, the emergence of relatively efficient marketing system is also an important factor that has contributed towards the adoption and popularisation of high value cash crops. In areas where the cultivation of off-season vegetables is 15-20 years old, the local youths have formed some sort of informal groups to market their produce. In some other areas a different marketing system has evolved that is relatively less efficient. Under this the growers sell their produce to traders at a price much lower than that prevailing in the market. However, the formation of informal groups by the local youths has also started taking place in these areas. The state marketing board also played an important role in facilitating the marketing of high value cash crops. It has opened marketing yards and established regulated markets where the small and marginal growers can sell their produce. There are around 45 regulated markets including marketing yards in the state, and more than thirty are located in the off-season vegetable producing districts.

Sixth, the emergence of self-help institutions like fruit growers' associations/co-operatives in some of the producing regions is yet another factor that has played an important role in promoting the cultivation of high value cash crops. These institutions help the farmers, particularly the small and marginal, in different ways like procuring inputs and also in marketing their produce. The Lahaul Potato Growers Co-operative Society, the Fruit Growers' Associations in Kullu and Shimla districts are notable examples of such co-operative endeavours by the farmers.[6]

The analysis of household data on costs and returns denotes the profitability of different high value cash crops in comparison to traditional cereal crops in all the three study areas. Nevertheless, given the profitability of these crops, there are a number of factors, like size of landholdings, accessibility in terms of the distance of cropland from the road head, the availability of family labour, income from non-farm sources, the availability of irrigation facilities, farm assets, etc. that influence the farmers' decision to bring their cropland under these crops. It is hypothesised that factors like the size of landholdings, availability of irrigation facilities, family labour and farm assets encourage the farmers to bring in higher per cent of their cropland under these crops. Likewise, the longer distance of cropland from the road head and the higher amount of income from non-farm sources are expected to have a discouraging effect. The effect of these factors on the per cent of total cropped area under high value cash crops has been studied using multiple regression analysis separately for three study areas. However, when all the factors were tried together the regression coefficients associated with some variables like farm assets were neither statistically significant nor had the expected signs. Therefore, the regression equations were re-estimated by dropping such variables. The results of regression analysis, given below, show that while the size of landholdings had a positive and significant effect on the per cent of total cropped area under these crops in Seraj, in two other areas, it had a negative effect implying that the small and marginal farmers put in higher per cent of their cropped land under these crops as compared to their large counterparts. The availability of family labour and irrigation facilities had a

positive effect, though the statistical significance for coefficients associated with family labour was noted only Sangrah and that with irrigation in Sangrah and Seraj. Nevertheless, in all the three areas, the distance of cropland from road head had a negative effect on the per cent of total cropped area under high value cash crops. In addition, the non-farm income had a negative and significant effect on the per cent of total cropped area under high value cash crops in Seraj.

Theog

$Y = 77.67 - 11.74^{*} X_1 + 0.64 X_2 + 6.02 X_3 - 0.85 X_4$ $R^{-2} = 0.06$ F = 2.12 N = 75
(2.25) (0.27) (1.13) (0.22)

Sangrah

$Y = 37.22 - 1.32 X_1 + 4.37^{*} X_2 + 24.07 X_3 - 5.79 X_4^{**}$ $R^{-2} = 0.07$ F = 2.32 N = 75
(1.51) (2.10) (0.90) (1.63)

Seraj

$Y = 46.48 + 6.47^{**} X_1 + 0.25 X_2 + 14.29^{**} X_3 - 43.27 X_4^{**} - 12.19^{*} X_5$ $R^{-2} = 0.12$ F = 3.11 N = 75
(1.82) (0.09) (1.68) (1.60) (2.01)

where Y = the per cent of total cropped area under high value crops; X_1 = the size of landholdings; X_2 = the family labour; X_3 = takes the value 1 if a household has area under irrigation, 0 otherwise; X_4 = the distance of crop land from road head and X_5 is the non-farm income (takes value 1 if a household had non-farm income, 0 otherwise).

Notes: (i) Figures in parentheses are 't' values.
(ii) * and ** denote significance at 0.05 and 0.10 levels of probability, respectively.

VII

CONCLUSIONS AND LESSONS

In sum, the foregoing analysis shows that agriculture in Himachal Pradesh recorded a fairly high growth during the past three decades, more so in the eighties. The foodgrains production increased from 9.99 lakh tonnes in the triennium ending 1974-75 to 14.11 lakh tonnes in the triennium ending 1999-2000. The yield levels of different crops had also increased over the period by varying degrees. The horticulture sector also registered significant increase in terms of area and production of fruits. Further, the state's agriculture over the years, especially since the late eighties, had diversified towards fruits and off-season vegetables like peas, potato, cabbage, cauliflower, etc. The process of crop diversification was, however, more pronounced in the districts/areas enjoying favourable (temperate) agro-climatic conditions. The household data show that the net returns from different crops like garlic, ginger, cabbage, cauliflower, peas and tomato were very high compared to traditional field crops. Further, an analysis of factors that facilitated the process of agricultural development and crop diversification indicated that the explicit consideration of mountain specificities in formulating developmental strategies that resulted in the creation of basic infrastructural facilities (roads, schools, hospitals and

R & D institutions), availability of huge market in the neighbouring states, high level of market consciousness among the farmers and the emergence of self-help institutions were some of the important factors. In brief, agricultural development and diversification in the state that contributed to the prosperity of rural economy 'owes much to the state's bold infrastructural investments and active promotion of marketing arrangements, producer co-operatives, credit facilities, technological innovation, extension services and storage network' (Dreze and Sen, 2002, p. 109). These factors created enabling environment for the process of agricultural development and crop diversification to get underway even in remote tribal areas like Lahaul and Spiti, Kinnaur, etc. On the other hand, nearness of crop land from road head, adequate availability of family labour and the availability of irrigation facilities were important factors that prompted the farmers to switch over to the cultivation of high value cash crops.

The agricultural development and crop diversification experience of Himachal Pradesh throws up some important lessons. First, committed state intervention and adoption of developmental strategies incorporating regional specificities is an essential pre-requisite for creating enabling conditions for fostering the process of agricultural development and crop diversification. Second, the creation of basic infrastructural facilities like transport, health, education, etc. is essential for harnessing of local niches and spurring widespread process of agricultural development and crop diversification. Third, the market savvy farming communities, their initiatives to innovate, experiment and adopt new production options and form self-help institutions to solve the production and marketing related problems is yet another important lesson. Fourth, economic viability and ecological sustainability of agricultural diversification process requires continuous technological upgradation. This assumes more importance in an era when the comparative advantage of a region cannot be taken as given forever due to ongoing process of liberalisation and globalisation and rapid changes in technologies and climatic conditions.

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NOTES

1. For a comparative analysis of the performance of Himachal Pradesh in terms of a number of socio-economic indicators vis-à-vis other states, see Dreze and Sen, 2002, pp. 101-110; 117-184 and Appendix Table 3.

2. The horticultural sector in the state is currently at the crossroads because of the threats it faces from the ongoing process of globalisation, technological and climatic changes. See Sharma *et al.*, 2003.

3. The implications of the cultivation of high value cash crops, especially fruits and off-season vegetables for ecological sustainability have been well documented by now. For details see Chand, 1996 and Sharma, 1996.

4. Some of the high-yielding varieties evolved by the R & D institutions/centres located in the state during the eighties like Arkel (early peas), Azad P-1 (Main season peas), Kufri Jyoti (Potato), Pusa Snow Ball K-1 (Cauliflower), Golden Acre (Cabbage), Contender (French bean) and California wonder

(Capsicum) gave a big boost to the cultivation of high value cash crops in the state. These varieties have been widely adopted by the farmers of the state.

5. For a historical account of the introduction of different cash crops like potato, tea, etc. in different districts like Kullu in the early years of the twentieth century, see Singh, 1998.

6. Dreze and Sen have attributed the rapid economic and social transformation of Himachal Pradesh to three important enabling factors: (i) well directed public intervention in support of social opportunities; (ii) active agency of women, (iii) local democracy and social co-operation. For details see, Dreze and Sen 2002, pp. 105-110 and 179-184.

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