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## **Impact and Extent of Agricultural Diversification on Cropping Pattern in the Mid Hill Zone of Himachal Pradesh**

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### **1. INTRODUCTION**

In the rural economy of Himachal Pradesh, the crop production is a dominant activity. Initially this sector was dominated by the production of subsistence traditional crops but later on the production of vegetables, fruits and flowers have also been included in the cropping pattern. This State is generally known for apple production and also occupies a pivotal position in the production and supply of off- season vegetables at the time when there is scarcity of fresh vegetables in the market. This study deals with the nature and impact of agricultural diversification on cropping pattern among the sample households in the Mid Hill Zone of Himachal Pradesh. This study is based on primary data which have been collected from 298 selected sample households of Kandaghat block of district Solan, Gohar and Karsog blocks of district Mandi of Himachal Pradesh.

### **2. OBJECTIVES OF THE PRESENT STUDY**

The specific objectives of the present study are: -

1. To study the changes in the cropping pattern in the study area.
2. To study the land use pattern in the study area.
3. To study the impact of agricultural diversification in the study area.

### **3. METHODS AND STATISTICAL TOOLS OF ANALYSIS**

After arranging the data in homogeneous categories and by working out the averages and percentages, the following statistical tool have been used.

### 3.1 Herfindahl Index

The Herfindahl Index has been used to study the extent of agricultural diversification in the present study. The specification of this method is as under:-

$$H = \sum_{i=1}^N P_i^2$$

Where H = Herfindahl index

$P_i$  = Proportion of area under ith crop.

$$P_i = \frac{A_i}{\sum_{i=1}^N A_i}$$

In which  $A_i$  = Area under ith crop (hectare),

$$\sum_{i=1}^N A_i = \text{Total cropped area (hectare)}$$

$i = 1, 2, 3, \dots, n$  (Number of crops)

$N$  = Total number of crops

The value of Herfindahl index (H) varies between zero to one, with the increase in diversification, the Herfindahl index would decrease. This index takes a value one when there is no diversification and when there is a complete specialization it approaches to zero as N get large i.e. if diversification is 'perfect'. It has inverse relationship with diversification.

## 4. CROPPING PATTERN BEFORE AGRICULTURAL DIVERSIFICATION

The cropping pattern reveals the percentage area cultivated under wheat, maize, rice, pulses, peas, tomato, cabbage, cauliflower, capsicum, fruits and flowers before agricultural diversification. In Table 4.1 foodgrain crops include wheat, maize, rice and pulses, whereas non- food grain crops include vegetables such as peas, tomato, cabbage, cauliflower and capsicum, horticultural crops include fruits while floricultural crops include the cultivation of flowers. This table shows that the percentage area allotted for wheat has been worked out 28.86 percent among all size of holdings together, whereas this percentage has been worked out 35.63, 31.87, 25.70 and 23.19 percent on the marginal, small, semi- medium and medium size of holdings respectively. The percentage area cropped area under maize has been worked out 41.38, 38.46, 34.48 and 30.76 percent on marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage among all size of holdings together, come out 34.02 percent. The trend in the foodgrain crops shows that the percentage cropped area has decreased with an increase

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in the size of holdings i.e. semi- medium and medium farmers have allocated less percentage of area under wheat and maize than marginal and small farmers. Before agricultural diversification maize was the main food of the people of the State because, the yield performance of maize remained better than other crops. On the other hand, rice and pulses being costly, the percentage cropped area under both these crops has shown increasing tendency with an increase in the size of holdings. The area under rice accounted for 4.60, 4.94, 8.46 and 10.82 percent of total cropped area on the marginal, small, semi- medium and medium size of holdings respectively. Taking all holdings together, about 8.59 percent of total cropped area has been put under rice crop. Due to high altitude of mid- hill zone, the climatic conditions have not much suitable for the cultivation of paddy. The percentage cropped area for pulses has been worked out 6.80, 7.69, 10.03 and 12.71 percent on the marginal, small semi- medium and medium size of holdings respectively, whereas this percentage for all size of holdings together, come out 10.65 percent.

**Table: 4.1 Cropping Pattern before Agricultural Diversification among the Sample Households**

(Area in Hectares)

Sr. No.	Crops	Marginal Holdings	Small Holdings	Semi-Medium Holdings	Medium Holdings	All Holdings
	Food Grain Crops					
	1. Wheat	0.31 (35.63)	0.58 (31.87)	0.82 (25.70)	1.35 (23.19)	0.84 (28.86)
	2. Maize	0.36 (41.38)	0.70 (38.46)	1.10 (34.48)	1.79 (30.76)	0.99 (34.02)
	3. Rice	0.04 (4.60)	0.09 (4.94)	0.27 (8.46)	0.63 (10.82)	0.25 (8.59)
	4. Pulses	0.06 (6.80)	0.14 (7.69)	0.32 (10.03)	0.74 (12.71)	0.31 (10.65)
A	Total Area Under Food Grain Crops(1+2+3+4)	0.77 (88.51)	1.51 (82.97)	2.51 (78.68)	4.51 (77.49)	2.39 (82.13)
	Non-Food Grain Crops					
	5. Peas	0.03 (3.45)	0.13 (7.14)	0.29 (9.09)	0.53 (9.11)	0.21 (7.21)
	6. Tomato	0.013 (1.49)	0.03 (1.65)	0.06 (1.88)	0.11 (1.90)	0.03 (1.60)
	7. Cabbage	0.02 (2.30)	0.05 (2.75)	0.12 (3.76)	0.23 (3.95)	0.10 (3.44)
	8. Cauliflower	0.026 (2.99)	0.06 (3.30)	0.13 (4.07)	0.29 (4.98)	0.12 (4.12)
	9. Capsicum	0.01 (1.15)	0.04 (2.19)	0.08 (2.51)	0.15 (2.58)	0.06 (2.06)
B	Total Area Under Non-Food Grain Crops (5+6+7+8+9)	0.10 (11.38)	0.31 (17.03)	0.68 (21.32)	1.31 (22.51)	0.52 (17.87)
C	Horticultural Crops	_____	_____	_____	_____	_____
D	Floricultural Crops	_____	_____	_____	_____	_____
E	Total Area (A+B+C+D)	0.87 (100)	1.82 (100)	3.19 (100)	5.82 (100)	2.91 (100)
F	Diversification Index	0.30	0.25	0.21	0.19	0.22

**Note :** Figure in parentheses indicates percentages to the column total.

Before diversification, among vegetable crops peas accounted for about 3.45, 7.14, 9.09 and 9.11 percent of the total cropped area on the marginal, small, semi- medium and medium size of holdings respectively, whereas taking all size of holdings together, 7.21 percent of the total cropped area was put under peas. The cultivation of peas is the most dominant crop activity in the mid-hill zone of the State due to topographical and climatical suitable conditions for its cultivation. The percentage share of tomato in the total cropped area has been worked out 1.49, 1.65, 1.88 and 1.90 percent on the marginal, small, semi- medium and medium size of holding respectively, whereas this percentage for all size of holdings together, has been calculated 1.60 percent. In case of cabbage, its percentage share in the total cropped area has been accounted for 2.30, 2.75, 3.76 and 3.95 percent on the marginal, small, semi-medium and medium size of holdings respectively, whereas this percentage has been worked out 3.44 percent for all size of holdings together. Cauliflower has been the second important vegetable after peas , the percentage share of cauliflower in the total cropped area has been worked out 2.99, 3.30, 4.07 and 4.98 percent on the marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage has been calculated to 4.12 percent for all size of holdings together. Taking capsicum, its percentage share in the total cropped area has been calculated 1.15, 2.19, 2.51 and 2.58 percent on the marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage for all size of holdings together has been worked out 2.06 percent. This table clearly indicates that percentage share of area under maize and wheat has shown decreasing tendency with an increase in the size of holdings. Whereas contrary to it the percentage share of area under vegetables has shown an increasing tendency with an increase in the size of holding mainly due to their quite high remunerative quality. The value of Herindahl index of diversification, for the marginal, small, semi- medium and medium size of holdings has been calculated to 0.30, 0.25, 0.21 and 0.19 respectively, whereas for all size of holdings together, this value come out 0.22. The value of the diversification index clearly indicates that the extent of diversification increases with an increase in the size of holdings.

## **5. CROPPING PATTERN AFTER AGRICULTURAL DIVERSIFICATION**

After agricultural diversification a major change has been noticed in the cropping pattern among the sample households. All the categories of holdings have shifted the major area from food grain crops to more remunerative non-food crops i. e. vegetables, horticultural and floricultural crops. Table 5.1 shows that the area covered under wheat crop has been worked out 11.68 percent to the total cropped area on all holdings together, whereas on the marginal, small, semi- medium and medium size of holdings have allocated

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16.09, 13.74, 8.15 and 7.90 percent area respectively. The area under maize allocated by the marginal, small, semi- medium and medium size of holdings has been worked out 19.54, 18.68, 14.42 and 11.85 respectively, whereas on all size of holdings together, this percentage come out 16.15 percent. This table further shows that after diversification farmers have reduced the area under traditional crops as compared to the area allocated before agricultural diversification. In case of rice crop marginal, small, semi- medium and medium farmers have allocated 2.30, 0.55, 0.54 and 0.46 percent of the total cropped area respectively, whereas this percentage for all size of holdings together, has been worked out 0.75 percent. In case of pulses, the area cropped has been worked out 2.30, 0.44, 0.38 and 0.31 percent respectively, whereas this percentage has been worked out 0.65 percent for all size of holdings together. The vegetables has been grown on the maximum land area. Under peas, the marginal, small, semi- medium and medium farmers have allocated 25.29, 26.92, 27.27 and 27.32 percent of the total cropped area respectively, whereas this percentage for all size of holdings together has been come out 26.80 percent. The area allocated for tomato crop has been worked out 10.34, 13.19, 14.10 and 14.94 percent on the marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage for all farmers together, has been worked out 13.40 percent. For cabbage, the area allocated has been worked out 3.45, 4.39, 5.64 and 6.01 percent on the marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage for all size of holdings together, has been worked out 4.81 percent.

**Table: 5.1 Cropping Pattern after Agricultural Diversification among the Sample Households**

(Area in Hectares)

Sr. No.	Crops	Marginal Holdings	Small Holdings	Semi-Medium Holdings	Medium Holdings	All Holdings
	Food Grain Crops					
1.	Wheat	0.14 (16.09)	0.25 (13.74)	0.26 (8.15)	0.46 (7.90)	0.34 (11.68)
2.	Maize	0.17 (19.54)	0.32 (18.68)	0.46 (14.42)	0.69 (11.85)	0.47 (16.15)
3.	Rice	0.02 (2.30)	0.01 (0.55)	0.021 (0.54)	0.027 (0.46)	0.022 (0.75)
4.	Pulses	0.02 (2.30)	0.008 (0.44)	0.012 (0.38)	0.018 (0.31)	0.019 (0.65)
A	Total Area Under Food Grain Crops (1+2+3+4)	0.35 (40.23)	0.59 (32.42)	0.75 (23.51)	1.19 (20.45)	0.85 (29.21)
	Non-Food Grain Crops					
5.	Peas	0.22 (25.29)	0.49 (26.92)	0.87 (27.27)	1.59 (27.32)	0.78 (26.80)
6.	Tomato	0.09 (10.34)	0.24 (13.19)	0.45 (14.10)	0.87 (14.94)	0.39 (13.40)
7.	Cabbage	0.03 (3.45)	0.08 (4.39)	0.18 (5.64)	0.35 (6.01)	0.14 (4.81)
8.	Cauliflower	0.08	0.17	0.33	0.67	0.30

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		(9.19)	(9.34)	(10.34)	(11.51)	(10.31)
	9. Capsicum	0.02 (2.29)	0.06 (3.30)	0.14 (4.39)	0.28 (4.81)	0.10 (3.44)
B	Total Area Under Non-Food Grain Crops (Vegetables) (5+6+7+8+9)	0.44 (50.57)	1.04 (57.14)	1.97 (61.76)	3.76 (64.60)	1.71 (58.76)
C	Horticultural Crops	0.05 (5.75)	0.12 (6.59)	0.32 (10.03)	0.59 (10.14)	0.23 (7.90)
D	Floricultural Crops	0.03 (3.45)	0.07 (3.85)	0.15 (4.70)	0.28 (4.81)	0.12 (4.12)
E	Total Area (A+B+C+D)	0.87 (100)	1.82 (100)	3.19 (100)	5.82 (100)	2.91 (100)
F	Diversification Index	0.17	0.15	0.14	0.13	0.14

**Note:** Figures in parentheses indicate percentages to the column total.

For the cultivation of cauliflower about 9.19, 9.34, 10.34 and 11.51 percent of the total cropped area have been allocated by the marginal, small, semi-medium and medium size of holdings respectively, whereas this percentage for all size of holdings together, has been worked out 10.31 percent. The area covered under capsicum has been worked out 2.29, 3.30, 4.39 and 4.81 percent on marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage for all size of holdings together, come out 3.44 percent. The horticultural and floricultural crops being more profitable after agricultural diversification, the area allocated for horticultural crops has been worked out 5.75, 6.59, 10.03 and 10.14 percent on the marginal, small, semi-medium and medium size of holdings respectively, whereas this percentage for all size of holdings together, has been worked out 7.90 percent. For floricultural crops, the area allocated has been worked out 3.45, 3.85, 4.70 and 4.81 on the marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage for all size of holdings together come out 4.12 percent. The value of Herfindahl index of diversification has been worked out 0.17, 0.15, 0.14 and 0.13 on the marginal, small, semi- medium and medium size of holdings respectively, which clearly shows that the extent of diversification has increased with an increase in the size of holdings.

## **6. IMPACT OF AGRICULTURAL DIVERSIFICATION ON CROPPING PATTERN**

The impact of agricultural diversification has been presented in Table 6.1 This table clearly shows that due to agricultural diversification the marginal, small, semi- medium and medium size of holdings have reduced the area under foodgrain crops. However, the percentage reduction in the area under wheat and maize crops comparatively on the large size of holdings shows less decrease because semi- medium and medium holdings group are still cultivating wheat and maize crops on large area due to their large size of holdings than marginal and small holdings.

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**Table: 6.1 Cropping Pattern after Agricultural Diversification among the Sample Households**

(Area in Hectares)

Sr. No.	Crops	Marginal Holdings	Small Holdings	Semi-Medium Holdings	Medium Holdings	All Holdings
	Food Grain Crops					
	1. Wheat	- 0.17 (-19.54)	- 0.33 (-18.13)	- 0.56 (-17.55)	- 0.89 (-15.29)	- 0.50 (-17.18)
	2. Maize	- 0.19 (-21.84)	- 0.38 (-20.88)	- 0.64 (-20.06)	- 1.10 (-19.80)	- 0.52 (-17.87)
	3. Rice	-0.02 (-2.30)	- 0.08 (- 4.39)	- 0.25 (-7.83)	- 0.60 (-10.31)	- 0.23 (-7.90)
	4. Pulses	-0.04 (-4.59)	- 0.13 (-7.14)	- 0.31 (-9.72)	- 0.72 (-12.37)	- 0.29 (-9.96)
A	Change in Area Under Food Grain Crops (1+2+3+4)	- 0.42 (-48.27)	- 0.92 (-50.55)	- 1.76 (-55.17)	- 3.32 (-57.04)	- 1.54 (-52.91)
	Non-Food Grain Crops					
	5. Peas	+0.19 (+21.84)	+ 0.36 (+19.78)	+ 0.58 (+18.18)	+ 1.05 (+18.04)	+ 0.57 (+19.59)
	6. Tomato	+ 0.08 (+9.19)	+ 0.21 (+11.54)	+ 0.39 (+12.22)	+ 0.76 (+13.06)	+ 0.36 (+12.37)
	7. Cabbage	+ 0.01 (+1.15)	+ 0.03 (+1.65)	+ 0.06 (+1.88)	+ 0.12 (+2.06)	+ 0.04 (+1.37)
	8. Cauliflower	+ 0.05 (+5.75)	+ 0.11 (+6.04)	+ 0.20 (+6.26)	+ 0.38 (+6.53)	+ 0.18 (+6.18)
	9. Capsicum	+ 0.01 (+1.15)	+ 0.023 (+1.26)	+ 0.06 (+1.88)	+ 0.13 (+2.23)	+ 0.04 (+1.37)
B	Change in Area Under Non- Food Grain Crops (5+6+7+8+9)	+ 0.34 (+39.08)	+ 0.73 (+39.56)	+ 1.29 (+40.43)	+ 2.44 (+41.92)	+ 1.19 (+40.88)
C	Change in Area Under Horticultural Crops	+ 0.05 (+5.75)	+ 0.12 (+6.59)	+ 0.32 (10.03)	+ 0.59 (+10.14)	+ 0.23 (+7.90)
D	Change in Area Under Floricultural Crops	+ 0.03 (+3.45)	+ 0.07 (+3.85)	+ 0.15 (+4.70)	+ 0.28 (+4.81)	+ 0.12 (+4.12)
E	Change in Total Area (B+C+D)= A	+ 0.42 (+48.27)	+ 0.92 (+50.55)	+ 1.76 (+55.17)	+ 3.32 (+57.04)	+ 1.54 (+52.91)

**Note:** Figures in parentheses indicate percentages to the column total.

- + Indicates increase.
- Indicates decrease.

The reduction in the percentage cropped area for wheat has been worked out 19.54, 18.13, 17.55 and 15.29 percent on the marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage for all size of holdings together, has been worked out 17.18 percent. In case of maize, the percentage reduction in the cropped area has been worked out 21.84, 20.88, 20.06 and 19.80 percent of the total cropped area on the marginal, small, semi- medium and medium size of holdings respectively, whereas for all size of holdings together, this percentage come out 17.87 percent. The percentage reduction in the cultivated area under rice and pulses shows an increasing tendency with an increase in the size of holding, this percentage reduction in the cultivated area under rice has been worked out 2.30, 4.39, 7.83 and 10.31 percent for marginal, small, semi- medium and medium size of holdings

respectively, whereas this percentage for all size of holdings together, has been worked out 7.90 percent. For pulses, the percentage reduction in the cultivated area has been worked out 4.59, 7.14, 9.72 and 12.37 percent respectively, whereas for all farmers together, this percentage has been worked out 9.96 percent.

After agricultural diversification, a major increase has been noticed in the percentage cultivated area under vegetables. The crop of peas has been recorded the highest increase in the total cropped area due to suitable topography and climatic conditions for its cultivation in the study area. The percentage increase in the cropped area under peas has been worked out 21.84, 19.78, 18.18 and 18.04 percent on the marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage for all holdings together, has been worked out 19.59 percent. The production of tomato being the second largest crop after peas, has accounted for 9.19, 11.54, 12.22 and 13.06 percent increase on the marginal, small, semi- medium and medium size of holdings respectively, whereas for all size of holdings together, this percentage increase come out 12.37 percent. For cabbage, the percentage cultivated area has increased by 1.15, 1.65, 1.88 and 2.06 percent on the marginal, small, semi- medium and medium size of holdings respectively. For all size of holdings together, this percentage has been worked out 1.37 percent. Cauliflower has been another important vegetable crop after agricultural diversification, the percentage increase in the cropped area under this crop has been worked out 5.75, 6.04, 6.26 and 6.53 percent on the marginal, small, semi- medium and medium farmers respectively, whereas this percentage has been worked out 6.18 for all size of holdings together. The increase in the cropped area under capsicum has been calculated 1.15, 1.26, 1.88 and 2.23 percent on the marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage increase for all size of holdings together, has been worked out 1.37 percent. The horticultural and floricultural crops have become more profitable. The increase in cultivated area under horticultural crops has been recorded 5.75, 6.59, 10.03 and 10.14 percent on the marginal, small, semi- medium and medium size of holdings respectively, whereas this percentage for all size of holdings together, has been worked out 7.90 percent. In case of floricultural crops, 3.45, 3.85, 4.70 and 4.81 percent increase has been recorded on the marginal, small, semi- medium and medium size of holdings respectively. For all size of holdings together, this percentage has been recorded 4.12 percent.

## **7. CONCLUSION**

This study clearly states that there is a significant change in the cropping pattern after diversification. The households are now shifted from traditional crops to high yielding cash crops i.e vegetables, floricultural and horticultural



crops due to higher generating income from these crops. On the other hand, the households are also generating employment opportunities.

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