

The Degree and Determinants of Commercialisation of Agriculture through Apple Crop in the Western Himalayan State of Himachal Pradesh

Chander Mohan Negi

Department of Finance and Business Economics, University of Delhi, South Campus, Delhi

Abstract

Agriculture is the primary occupation of the people of Himachal Pradesh, contributing approximately ten per cent of the state's gross domestic product. Within the agricultural sector, the horticulture sector plays a dominant role, and the state has been well known as a model state for the development of hill states. The aim of the current study is to assess the extent and determinants of commercialisation among the prominent apple-producing districts and socio-economic groups. This study is based on a primary survey and employs non-parametric tests, such as the Kruskal-Wallis test and multiple regression, for data analysis. The findings indicate a significant variation in the level of commercialisation across different districts and social groups. Small and marginal farmers comprise 72 per cent of the population but own 33.94 per cent of the land. The average size of land is 1.84 ha, with a wide disparity in land ownership. Both education and irrigation have a positive and significant impact on commercialisation. Improved irrigation, transportation systems, storage facilities, and processing units enable farmers to access larger markets and secure better prices. Government policy must be designed to cater to both small and marginal farmers, as well as those from the weaker sections of society.

Key Words: Commercialisation, Diversification, Apple, Mountain agriculture, High value crops

JEL Classification: Q100, Q22, Q12, Q13, Q18

Introduction

The commercialisation of agriculture typically signifies the production of agricultural goods intended for market sales. The origin of this transformation can be traced back to the ever-growing demand stemming from a rising population, urbanisation, and industrialisation. The commercialisation of agriculture has been characterised as a process in which farmers begin to produce primarily for distant market sales rather than solely for their own food needs or local market sales, responding to various stimuli over time (Roy, 2007).

As a country's economic development advances, shifts in consumption patterns emerge. The demand for high-value crops, particularly fruits, vegetables, eggs, milk, and meat, escalates, leading subsistence agriculture to yield to diversified, specialised farming practices. Hazell et al. (2007) linked the commercialisation of agriculture to participation in output markets, particularly in terms of cash income. Pingali and Rosegrant (1995) contend that agricultural commercialisation encompasses more than merely selling products in the output market. They contend that households' marketing decisions related to both input and output choices

should aim to maximise profits. Von Braun (1995) suggests that the commercialisation of subsistence agriculture can take different forms. It can manifest on the output side by increasing the amount of marketable surplus, and on the input side through the adoption of more purchased inputs. Hill agriculture has unique characteristics, including difficult terrain, smaller landholdings, and a greater dependence on local ecosystems. Alagh (1990) has divided the country into five natural regions on the basis of their topography: i) the Himalayas and Associated Hills, ii) the Northern Plains, iii) the Peninsular Plateaus and Hills, iv) the East Coast Plains, and v) the West Coast Plains. The mountainous areas of the country comprise 21 per cent of the total geographical landscape and house 9 per cent of the nation's population. Himachal Pradesh is regarded as one of the success stories in the development of India's hill states. Agriculture is vital for income and employment in this mountainous state, as approximately 90 per cent of the citizens live in rural areas, as per the 2011 Census. Himachal Pradesh (H.P.) has made significant strides in the agricultural sector due to the diversification and commercialisation of farming practices, with the success largely attributed to the transition towards high-value horticultural crops.

Agricultural development in mountainous regions faces unique challenges, including inaccessibility, marginality, and fragility, as well as the need for specific human adaptation strategies due to the distinct vertical dimensions that differentiate them from plains and other ecosystems (Jodha, 2001). It has been suggested that diversifying farming practices from cereal-based systems to high-value cash crops, such as off-season vegetables and fruits, could optimally utilise the region's comparative advantages. Such diversification could stabilise and enhance farm income while simultaneously generating more employment opportunities (Sharma, 2005; Joshi et al., 2004; Vyas, 1996).

The factors contributing to increased commercialisation at the farm level include the rising alternative costs of family labour and the escalating aggregate demand for food and other agricultural products (Okezie et al., 2012). Rahut et al. (2010) identified several key factors influencing commercialisation in the eastern Himalayas, including land size, the gender of the household head, livestock assets, ethnicity, education, and location. Okezie et al. (2012) studied the magnitude and factors of agricultural commercialisation in Nigeria and found that farmers with greater land access tend to be more market-oriented, while households less dependent on subsistence farming generally achieve higher incomes. Their findings indicate that off-farm income significantly contributes to agricultural commercialisation, with labour, fertilisers, and planting materials identified as crucial determinants of this trend.

In H.P., India, substantial progress has been made in diversifying agriculture through the farming of fruits and off-season vegetables, recognised as a success story in economic transformation driven by horticultural development (Swarup, 1993; Verma et al., 1992). Given the limited growth potential of traditional crops and associated activities in the Himalayas, experts have recommended diversifying agriculture by introducing high-value crops, predominantly fruits and off-season vegetables (Singh, 1990; Swarup, 1993; Pratap, 1995; Chand, 1996; Azad et al., 1987). The state is noted to be the most progressive among 13 hill states and regions in the country and is regarded as a 'model' for developing other hill areas in the Hindu Kush Himalaya region (Chand, 1996; Dreze and Sen, 2002).

Several factors contribute to the success of crop diversification and horticultural development. An analysis of these factors suggests that addressing the specific needs of mountainous regions is crucial when devising development strategies. Agricultural development, owing to the diversification of crops in the state, has greatly enhanced the prosperity of the rural economy, primarily due to the state's decisive investments in infrastructure and its proactive support for marketing arrangements, producers' cooperatives, credit facilities, technological innovations, extension services, and storage networks (Dreze and Sen, 2002).

Sharma (2005, 2007, and 2011) examined the extent, impact, determinants, and challenges of crop diversification in H.P. He found that the diversification process began in the 1950s and 1960s with the cultivation of apples, which accelerated in the 1980s through the growth of vegetable farming. Initially, this process was concentrated in the temperate regions of the state. The momentum of diversification increased in the late 1990s, spreading to new areas of the state, particularly in low-height and mid-height hill districts. While analysing the factors contributing to diversification, he identified that, beyond strategies tailored for mountain agriculture, the establishment of institutions such as the Himachal Pradesh Horticulture Marketing Corporation (HPMC, 1971), institutional support for responsive farmers, and vibrant markets in neighbouring states played significant roles. Negi (2020) utilised time series secondary data to analyse the growth drivers of the apple crop in the hill state across apple-producing districts. The pioneering efforts in the state's commercialisation, the share of apple crops in the area allocated to fruit production, and the distribution among different districts are underexplored. Moreover, the degree of commercialisation among districts and across various social and economic groups has not been sufficiently addressed, along with the major determinants of commercialisation in H.P. This paper aims to bridge the identified literary gap and is structured into four sections: 1) Introduction, 2) Data Sources and Methodology, 3) Major Findings, and 4) Conclusion and Policy Implications.

Data Sources and Methodology

This research is primarily based on primary data sources. Primary data were gathered through comprehensive field research, which included personal interviews conducted using a meticulously structured questionnaire. The stratified sampling method has been adopted to collect the data. The study focused on three districts: Shimla, Kinnaur, and Kullu, due to their significance in apple production and the substantial land allocated for apple farming in the state (Negi, 2020). The number of blocks and villages surveyed varies from district to district, depending on the district's population and the attitudinal differences within and among the districts. Altitude is a crucial factor in determining the quantity and quality of apple production; hence block/blocks was/were selected to represent the entire district. In Kinnaur district, different socio-economic groups are found in a village; however, this is not the case in Shimla and Kullu districts, hence more blocks and villages are selected in these districts. The survey was carried out in June and July 2019.

The Study Area

Kinnaur: Kinnaur is the third-largest district in the H.P., encompassing an area of 6,520 km². Kinnaur is divided into three administrative blocks: Nichar, Kalpa, and Pooh, corresponding to the latitudinal gradient of low hills (2,500 m), middle hills (2,500-3,000 m), and upper hills (> 3,000

m). Four villages were selected for the study: Kamru, Sangla, Thamgarang, and Batsery, with a total of 110 households being interviewed.

Kullu: Kullu is positioned at 31° 57' 28.2636" N and 77° 6' 34.0524" E. The Kullu district comprises four subdivisions: Anne, Kullu, Banjar, and Manali. The study area is situated within the Kullu district, at elevations ranging from 1,200 to 2,500 meters above mean sea level (msl). The region's geography transitions from mid-hill to high hill terrains (Rana et al., 2008). For the survey, two blocks, Banjar and Kullu, were selected, along with seven villages: Bahu, Katrain, Dawala, Shird, Jalora, Kais, and Alwa, which included a total of 100 households.

Shimla: The Shimla district is situated at elevations ranging from 2200 to 3250 meters above sea level. The meteorological observatory in this region is positioned at a latitude of 31°10' N and a longitude of 77°25' E. Shimla district is organised into 10 administrative blocks: Mashobra, Theog, Chaupal, Jubbal Kotkhari, Rohru, Rampur, Narkanda (Kumarsain), Chirgaon, Basantpur, and Nankhari. For this research, the study focused on the Jubbal and Kotkhari blocks, selecting villages such as Ratnari, Nandpur, Badhal, Kathasu, Batur, and Bidiyar. A total of six villages were included in the survey, with 100 households interviewed accordingly. Initially, 310 samples were collected; however, after data cleaning, 297 were left for analysis.

Degree of Commercialisation: The primary question in our study is to determine the extent or degree of commercialisation in the hill state. Leavy et al. (2007) and Rahut et al. (2010) measured this by the value of output sold relative to the value of output produced. They devised an index defined as the value of the output sold by a household in a year, divided by the total value of output produced by the household in that year, multiplied by 100. By that formula, the study found that a homogeneous value was obtained for the households studied, as the value of apples sold comprised 98-99 per cent of the value of the outputs produced by the households. Hence, the study devised a new method in which the study measured the degree of commercialisation by the proportion of apple trees to the total land owned by the household.

$$Y = \frac{\text{Area under apple orchards}}{\text{Total cropped area}} \times 100$$

The multiple regression analysis (Wooldridge, 2013) has been applied to understand the underlying variables that affect commercialisation (Y).

$$Y_i = \alpha + \beta_i X_i + \epsilon_i$$

$i = 1, 2, 3, \dots, n$, where Y_i is the dependent variable, is the degree of commercialisation, α is the intercept term, β_i are the coefficients of the regression and X_i represents the vectors of independent variables that determine the degree of commercialisation and ϵ_i is the error term.

The degree of commercialisation = f (the education of the household head, number of family members in a household, total land owned, distance to the nearest town, availability of a bank in a village, irrigated land, and internet connectivity).

Where Y, the response variable, is the degree of commercialisation. The education of the household head has been considered to examine the impact of education on the level of commercialisation, the number of family members measure family labour, land owned, an asset, distance to the nearest town, the availability of the nearest market, irrigated land, infrastructure, banks in the village, and internet access, the influence of financial institutions, technology, and connectivity. Other control variables, such as the cost of inputs used and prices of other crops, etc., also affect the response variable; however, they could not be considered due to the lack of available data.

ANOVA – Analysis of Variance: It is a procedure used for hypothesis testing to determine if mean differences exist between two or more samples or treatments. ANOVA (Fisher, 1925) tests the equality of means among some groups via testing of equality of variations due to 'within group' and due to 'among group'. Therefore, the variation between groups and within groups must be the same. Thus, it uses test statistics called 'F' statistics, which is a ratio defined as below-

$$F = \frac{\text{Variation between the group}}{\text{Variation within the group}}$$

The total variation is equal to the sum of the variations within the groups and the variation between the groups.

Kruskal-Wallis Test: The Kruskal-Wallis (Kruskal & Wallis, 1952) test is a non-parametric statistical test used to compare more than two independent groups to determine if there is a significant difference among them. It serves as an alternative to the one-way ANOVA when the data (either ordinal or continuous) do not meet the assumptions of normality or equal variances. This test assesses whether the samples originate from the same distribution.

Null Hypothesis (H_0): All groups come from the same population distribution.

Alternative Hypothesis (H_1): At least one group comes from a different population distribution.

The test combines all data from the groups and ranks them, calculating the sum of ranks for each group. The Kruskal-Wallis H statistic is computed based on these ranks, and this statistic is compared to a chi-square distribution (with $k - 1$ degrees of freedom, where k is the number of groups) to determine significance. A significant p-value (less than the chosen alpha) suggests rejecting H_0 , indicating that at least one group differs from the others. Post-hoc tests are used to determine which groups differ significantly from one another.

Results and Discussions

Socio-Economic Profiles of Sample Orchardists in Himachal Pradesh

The socio-economic features of apple growers in the three selected districts, Kinnaur, Kullu, and Shimla, are discussed in this section.

As Table 1 shows, 40 per cent of farmers in the state fall under the class of marginal farmers owning less than one hectare (equivalent to 12.35 bigha¹), with the maximum number of this class being enumerated in Kullu district (54%), followed by Shimla district (53%), and the lowest being in Kinnaur district, where only one-fourth of farmers fall under this group. Marginal and small farmers comprise 72 per cent of the total farmers in the state, with the highest percentage in district Kullu (85%), followed by district Shimla (75%), and the lowest in Kinnaur district (59%). Only six per cent of farmers comprise the group of medium and large farmers, with a maximum in Kinnaur district (8%), followed by Kullu (6%) and Shimla districts (4%), as shown in Table 1.

Table 2 illustrates the distribution of land ownership across various categories of farmers in the studied districts of the H.P. Notably, marginal farmers possess only 12.65 per cent of the total land, while small farmers account for a larger share at 33.94 per cent. The combined proportion of land held by marginal and small farmers varies across districts, ranging from 23.67 per cent in Kinnaur to 54.64 per cent in Kullu and 35.54 per cent in Shimla. Marginal farmers account for 43 per cent of the total number of farmers but possess only 12.65 per cent of the land in the state. In contrast, marginal and small farmers represent 72 per cent of the total but control 33.94 per cent of the land. Meanwhile, medium and large farmers make up 6 per cent of the total but hold a significant share of the land at 36.18 per cent.

Table 3 illustrates the average land sizes owned by different types of farmers in the state and the studied districts.

Marginal farmers own an average of only 0.54 ha, while medium and large farmers possess an average of 10.54 ha. In the three sampled districts, marginal farmers have a per capita land ownership of less than one ha. The highest per capita land size is recorded in Kinnaur district at 2.55 ha, followed by Shimla district at 1.52 ha. For medium and large farmers, the average land size is 10.54 ha, with Kinnaur having the largest average at 13.33 ha and Kullu district having the smallest at 6.43 ha. This data indicates a highly unequal distribution of land among the apple growers in the state. Overall, the average landholding among apple growers is 1.84 ha.

Table 3 depicts the educational status of the selected orchardists, indicating that the average years of education are positively correlated with the size of the farm. The average years of education among the Apple growers in the state come out to be 9.77 years, which is equivalent to matriculation. The average number of years of education is highest for the district of Shimla, followed by Kinnaur and Kullu. In the Shimla district, the highest education level is found among small farmers, followed by large farmers. The small farmers in Shimla district are better educated than their counterparts, with an average education level at the senior secondary level. In Kullu and Kinnaur districts, a linear relationship exists between farmers' educational level and the size of their farms. The large farmers in Kullu district are the most educated compared to other categories of farmers in the state. Education level is an important factor in the socio-economic progress of any region.

Degree of Commercialisation: Apple, being a perennial crop, has a long gestation period; the plants start giving samples from three to four years onwards, and if everything remains the same, the process goes on for the next 40 years. Once the plants occupy a fertile land, it becomes difficult to grow other crops in that parcel of land. As trees grow, the possibility of growing crops in the same plot remains dim

Table 1: Cumulative percentage distribution of households

Class size- Land Holding	Kinnaur			Kullu			Shimla			Total		
	No.	Per- cent	C% age	No.	Per- cent	C% age	No.	Per- cent	C% age	No	Per- cent	C% age
Marginal < 1(ha)	27	25	25	51	54	54	51	53	53	129	43	43
Small < 2 (ha)	37	34	59	29	31	85	21	22	75	87	29	72
Semi Medium < 4 (ha)	36	33	91	8	9	93	21	22	96	65	22	93
Medium and large > 4 (ha)	9	8	100	6	6	100	4	4	100	19	6	100
Total	109	100		94	100		97	100		300	100	

Note: 'C' refers to cumulative

¹Bigha is standard measure of land in H.P. wherein one acre equals five bigha and one hectare is equivalent to 12.35 bigha.

Table 2: Cumulative percentage distribution of area owned

Class size - Land Holding	Kinnaur			Kullu			Shimla			Total		
	No.	Per- cent	C% age	No.	Per- cent	C% age	No.	Per- cent	C% age	No.	Per- cent	C% age
Marginal	16.19	5.78	5.78	28.58	22.58	22.58	25.26	17.15	17.15	70.03	12.65	12.65
Small	50.17	17.90	23.72	40.58	32.06	54.64	27.08	18.39	35.54	117.83	21.29	33.94
Semi-Medium	93.33	33.30	57.09	18.83	14.88	69.52	53.25	36.16	71.71	165.42	29.88	63.82
Medium and Large	120.00	42.81	100	38.58	30.48	100.00	41.67	28.29	100.00	200.25	36.18	100
Total	279.69	100.00		126.57	100.00		147.26	100.00		553.53	100.00	

Note: 'C' refers to cumulative

Table 3: Average area owned per household (Ha) and the education level of the household head

Size of farm	Average land holding size (Ha)				Education level (in years)			
	Shimla	Kullu	Kinnaur	Overall	Shimla	Kullu	Kinnaur	Overall
Marginal	0.50	0.56	0.60	0.54	10.78	7.89	8.67	9.33
Small	1.29	1.40	1.36	1.35	12.05	8.59	9.83	9.84
Medium	2.54	2.35	2.59	2.54	10.95	9.5	11.63	10.23
Large	10.42	6.43	13.33	10.54	11	9.44	12.83	10.84
Average	1.52	1.35	2.55	1.84	11.1	8.78	9.54	9.77

Source: Primary Survey, 2019

as the crops compete for soil nutrition, and sunlight barely reaches the ground crops owing to the apple trees. In this way, Apple growers are taking a great risk of losing the fertile land from which they can raise at least two crops every year. The study has estimated the degree of commercialisation based on the proportion of land under apple trees to the total cropped area, using survey data. The study found that more than 90 per cent of the apple crop is sold in the market, while the rest is used for self-consumption, as gifts to family and friends, and as fodder for animals.

The commercialisation statistics are detailed in Table 4, highlighting the varying degrees of commercialisation across different districts. The maximum degree of commercialisation is observed in Shimla, followed by Kullu and Kinnaur districts. The mean values for commercialisation are 0.98,

0.93, and 0.69 for the Shimla, Kullu, and Kinnaur districts, respectively, with standard deviations of 0.10, 0.14, and 0.20. The range of commercialisation in each district is depicted in the last two columns of the table. Additionally, a gender-wise comparison of the degree of commercialisation is illustrated in Figure 1, indicating that male-headed households are more likely to adopt commercialisation practices.

Furthermore, the caste-wise degree of commercialisation is analysed, revealing that the general caste significantly outpaces its counterparts in this regard. Over 90 per cent of arable land is dedicated to apple trees for the general caste, with more than 80 per cent for the scheduled caste and 78 per cent for the scheduled tribe category, as illustrated in Figure 1. To assess whether any significant differences exist in mean values of commercialisation across various districts

Table 4: Descriptive Statistics of sample households

	Districts	No.	Average	Standard deviation	S. E.	CI for mean (95%)		Min. value	Max. value
						Lower end	Upper end		
Degree of commercialisation	Kinnaur	109	0.69	0.20	0.02	0.65	0.73	0.07	1
	Kullu	91	0.93	0.14	0.01	0.90	0.96	0.42	1
	Shimla	97	0.98	0.10	0.01	0.96	1.00	0.10	1
	Total	297	0.86	0.20	0.01	0.83	0.88	0.07	1

Note: CI- Confidence Interval

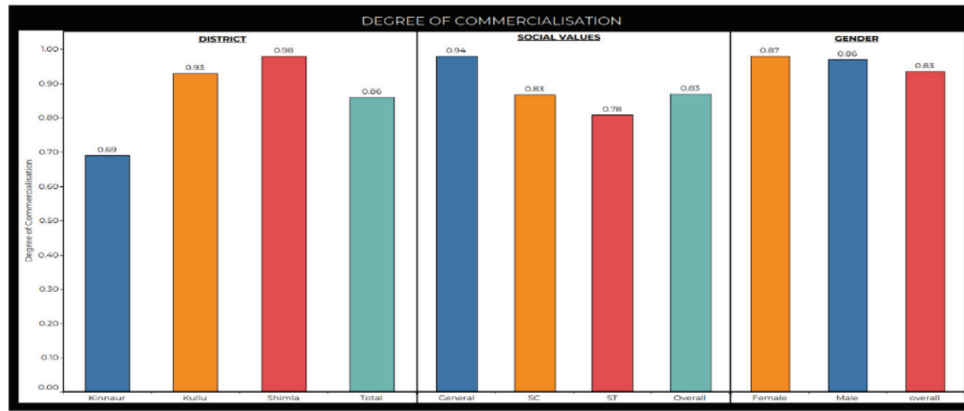


Figure 1: District-wise, caste wise and gender-wise degree of commercialisation

and caste groups, the study applies Analysis of Variance (ANOVA), which is premised on the assumptions of data normality and the equality of variances (Homogeneity). The first step involves checking for normality.

Assumption 1, H_0 = Degree of Commercialisation is normally distributed.

H_1 = Degree of Commercialisation is not normally distributed.

To evaluate the normality condition, the study employed the JB (Jarque-Bera) test, and the corresponding statistic is presented below;

Degree of Commercialisation		
Jarque-Bera test:	91.42	Chi (2) 1.4e-20 (p-value)

Given that the calculated p-value is below the significance threshold of 0.05, the study cannot uphold the null hypothesis. The same is true with the assumption of homogeneity of variances, as shown in Table 5. Hence, the assumptions of normality and homogeneity are not satisfied, so the study can't apply the parametric ANOVA (Analysis of Variance).

Table 6 presents the mean rank of the degree of commercialisation for each group, categorised by district and caste. This information can be used to compare the influence of different districts and castes on the dependent variables. To determine whether these factors affect the dependent variables in distinct ways, the study analyses the results of the Kruskal-Wallis H test, which is also included in Table 8. The Kruskal-Wallis H test reveals a statistically significant difference in the degree of commercialisation

Table 5: Homogeneity of variances test (Degree of commercialisation)

Levene Statistic	df1	df2	Sig.
28.698	2	294	.000

Table 6: Kruskal-Wallis test (Rank)

	District	N	Mean rank	Caste	N	Mean rank
Degree of Commercialisation	Kinnaur	109	79.49	SC	28	145.13
	Kullu	91	177.19	ST	130	115.21
	Shimla	97	200.66	General	139	181.38
	Total	297		Total	297	

Table 7: Test statistics of sample households

Grouping variable: district	Degree of commercialisation	Grouping variable: caste	Degree of commercialisation
Chi-Square	50.24	Chi-Square	146.31
Df	2	Df	2
Asymp. Sig.	0	Asymp. Sig.	0

Table 8: Post Hoc tests

Dependent variable	(1) Districts	(2) Districts	Mean difference (1-2)	Standard error	Sig.	CI for mean (95%)	
						Lower bound	Upper bound
Degree of commercialisation	Kinnaur	Kullu	-0.242*	0.022	0	-0.294	-0.190
		Shimla	-0.289*	0.022	0	-0.340	-0.238
	Kullu	Kinnaur	0.242*	0.022	0	0.190	0.294
		Shimla	-0.047**	0.023	0.097	-0.101	0.006
	Shimla	Kinnaur	0.289*	0.022	0	0.238	0.340
		Kullu	0.047**	0.023	0.097	-0.006	0.101

Note: CI-Confidence Interval

*significant at 1%, ** significant at 10%

Table 9: Multiple comparisons of sample households

Dependent variable: Degree of commercialisation

Caste	Caste	Mean difference (1-2)	Standard error	Significance level	CI (95%)	
					Lower end	Upper end
SC	ST	.055	.04	.472	-.038	.149
	General	-.109*	.04	.016	-.202	-.015
ST	SC	-.055	.04	.472	-.149	.038
	General	-.164*	.02	.000	-.219	-.109
General	SC	.109*	.04	.016	.015	.202
	ST	.164*	.02	.000	.109	.219

Note: CI-Confidence Interval, *Significant at 1%

among different districts, with $\chi^2(2) = 50.24$, $p < 0.001$ (Table 7). The mean rank scores were as follows: 79.49 for district Kinnaur, 177.19 for district Kullu, and 200.16 for district Shimla (Table 6). For the castes, the test also indicated a significant difference, with $\chi^2(2) = 146.31$, $p < 0.001$ (Table 7). The mean rank scores were 145.13 for Scheduled Castes, 115.21 for Scheduled Tribes, and 181.38 for the General Caste (Table 6). The results indicate statistically significant differences between the groups (districts and castes) as a whole. The next step is to identify which specific groups differ from one another. To accomplish this, the study will refer to the Multiple Comparison table, which includes the results of the Tukey post hoc test. Table 8 presents the results of the multiple post hoc comparisons among the districts. From Table 8, the study reveals significant differences in the mean values of commercialisation across specific districts: Kinnaur and Kullu ($p = 0.00$), Shimla and Kinnaur ($p = 0.02$), and Shimla and Kullu ($p = 0.09$). Table 9 further illustrates the significant differences in mean values of the degree of commercialisation across various castes. A notable difference exists between the scheduled caste and the general category ($p = 0.01$), as well as between the scheduled tribe and the general caste ($p = 0.00$). However, there is no significant difference

between the scheduled caste and the scheduled tribe ($p = 0.47$). Therefore, the study concludes that the Kruskal-Wallis H test reveals a statistically significant difference in the average levels of commercialisation across different districts (Kinnaur, Kullu, and Shimla) and castes (General Caste and Scheduled Caste, as well as General Caste and Scheduled Tribe) (Lazikova et al., 2019).

Determinants of Commercialisation

To measure the determinants of commercialisation in Himachal Pradesh, the study applies the ordinary least squares regression method, and the result is presented in Table 10. The household head's education level and irrigated areas have a significant influence on commercialisation, as shown in Table 10. As the educational attainment of the household head and the size of the irrigated area rise, one can expect an increase in the level of commercialisation. However, the total land owned, the distance to the nearest town from the village, and internet facilities have negatively affected the degree of commercialisation. Okezie et al. (2012) found a positive relationship between land access and commercialisation, which contrasts with our findings. The survey observed that a portion of the land is left open to cultivate traditional crops for

Table 10: Determinants of commercialisation in Himachal Pradesh

Dependent variable: Degree of commercialisation	Coeff.	Std.error	t- statistics	P>t
Head education	0.0073	0.00213	3.47	0.00
HH members	0.00313	0.00226	1.39	0.16
Land owned	-0.0017	0.00029	-5.81	0
Distance to nearest town	-0.0014	0.00012	-11.78	0
Bank	0.02468	0.01967	1.25	0.21
Irrigated area	0.00218	0.00051	4.27	0
Internet connection_ dummy	-0.0574	0.01877	-3.06	0.00
Constant	0.94862	0.03631	26.13	0

N = 297, R² = 0.45

Source: Author's own calculations

self-consumption. Currently, there is a growing demand for traditional cereals as more people become health-conscious, largely due to the excessive use of fertilisers and chemicals in agriculture. In contrast, mountain regions typically use fewer chemicals and pesticides. Consequently, larger land areas tend to dedicate more space to traditional cereal crops. The distance to the town indicates the distance between the farm and the market for crop sales; the longer distance to the market discourages the trend towards commercialisation. The internet connection serves as a proxy for the impact of communication on commercialisation, but its effect is negative on commercialisation, and this requires further research. Furthermore, the availability of banks and the number of family members have a positive but insignificant impact on commercialisation. Therefore, it can be concluded that factors such as education, irrigation, land size, proximity to markets, and access to the internet play a significant role in influencing the degree of commercialisation. Our study confirms the findings of Rahut et al. (2010), who identified the gender of the household head and education as important determinants of commercialisation in the Himalayan regions.

Conclusions and Policy Implications

This paper highlights a significant shift in apple farming practices in Himachal Pradesh, a region well-known for its transition from subsistence to market-oriented agriculture. The findings indicate that male-headed households are more commonly engaged in commercialisation, while households from general castes tend to excel in this process. More than two-thirds of orchardists belong to the small and marginal category, and female-headed households, as well as the scheduled caste and scheduled tribe, lag behind their counterparts in the pursuit of commercialisation. Hence, the Government needs to pay special attention to small and marginal farmers, as well as those belonging to weaker sections of society. Elements like education, irrigation, land ownership, market proximity, and internet access play a

significant role in the commercialisation process, with higher educational attainment and irrigated areas leading to greater commercialisation. Improved connectivity, transportation systems, storage facilities, and processing units enable farmers to access larger markets and secure better prices. It is crucial to address these inequalities and enhance farmers' capabilities through training and capacity-building initiatives to foster inclusive and sustainable agricultural development in Himachal Pradesh and other similar agricultural regions.

The extent of land dedicated to apple orchards serves as a measure of the degree of commercialisation in Himachal Pradesh. Shimla stands out as the most commercialised district, followed by Kullu and Kinnaur. Statistical analysis reveals a significant difference in the average levels of commercialisation among various districts and caste groups within the state. The rural economy is undergoing a significant transformation driven by the commercialisation of agriculture, particularly through the cultivation of high-value crops, such as apples. Enhanced transportation infrastructure and the growing demand for high-quality apples motivate farmers to prioritise quality production. Institutional support and policy frameworks also play a crucial role in determining the level of commercialisation. Understanding these factors is crucial for developing effective policies and interventions that improve the living standards of orchardists in the region.

References

- Alagh Y K 1990. Agro-climatic planning and regional development. *Indian Journal of Agricultural Economics* 45: 244-268. DOI: <https://doi.org/10.22004/ag.econ.272434>.
- Azad K C, Swarup R and Sikka B K 1987. *Horticulture Development in Hill Areas*. Mittal Publications, Delhi.
- Chand R 1996. Ecological and economic impact of horticultural development in the Himalayas: Evidence from Himachal Pradesh. *Economic and Political Weekly* 31: A93-99. <https://www.jstor.org/stable/4404336>.

- Dreze J and Sen A 2002. *India: Development and Participation*. Oxford University Press, New Delhi. <https://global.oup.com/academic/product/india-9780199257492>.
- Fisher R A 1925. *Statistical Methods for Research Workers*. Oliver & Boyd, Edinburgh. <https://psychclassics.yorku.ca/Fisher/Methods/>.
- Hazell P, Poulton C, Wiggins S and Dorward A 2010. The future of small farms: Trajectories and policy priorities. *World Development* **38**:1349-1361. DOI: <https://doi.org/10.1016/j.worlddev.2009.06.012>.
- Jodha N S 2001. *Life on the edge: Sustaining agriculture and community resources in fragile environments*. Oxford University Press, New Delhi.
- Joshi P K, Gulati A, Birthal P S and Tiwari L 2004. Agriculture diversification in South Asia: Patterns, determinants and policy implications. *Economic and Political Weekly* **39**: 2457-2467. <https://cgspace.cgiar.org/items/344a3569-eea7-40bb-985f-e754b162410c>.
- Kruskal W H and Wallis W A 1952. Use of ranks in one-criterion variance analysis. *Journal of the American Statistical Association* **47**: 583-621. DOI: <https://doi.org/10.1080/01621459.1952.10483441>.
- Laziková J, Laziková Z, Takáč I, Rumanovská Land Bandlerová A 2019. Technical efficiency in the agricultural Business – the case of Slovika. *Sustainability* **11**:5589. <https://doi.org/10.3390/su11205589>.
- Leavy J and Poulton C 2007. Commercialisation in agriculture. *Ethiopian Journal of Economics* **16**: 3-42. <https://www.ajol.info/index.php/eje/article/view/39822>.
- Negi C M 2020. Dynamics of apple production in Himachal Pradesh. *Agricultural Situation in India* **78**: 20-30. <https://eands.da.gov.in/PDF/May2020.pdf>.
- Okezie C, Sulaiman J and Nwosu A C 2012. Farm-level determinants of agricultural commercialization. *International Journal of Agriculture and Forestry* **2**: 1-5. DOI: <https://doi.org/10.5923/j.ijaf.20120202.01>.
- Pingali P L and Rosegrant M W 1995. Agricultural commercialization and diversification: Processes and policies. *Food Policy* **20**: 171-185. DOI: [https://doi.org/10.1016/0306-9192\(95\)00012-4](https://doi.org/10.1016/0306-9192(95)00012-4).
- Pratap T 1995. High value cash crops in mountain farming: Mountain development processes and opportunities. International Centre for Integrated Mountain Development, Kathmandu.
- Rahut D B, Castellanos I V and Sahoo P 2010. Commercialization of agriculture in the Himalayas: An econometric analysis. Institute of Developing Economies, Japan, Discussion Paper No.256. <https://econpapers.repec.org/paper/jetdpaper/dpaper265.htm>.
- Rana R S, Bhagata R M, Kalia V and Lal H 2008. Impact of climate change on shift of apple belt in Himachal Pradesh. *ISPRS Archives XXXVIII-8/W3*:131-137. https://isprs.org/proceedings/XXXVIII-8-W3/b2/10-B10-179_ISRO%20F.pdf.
- Roy T 2007. *The Economic History of India 1857-1947*. Oxford University Press, New Delhi. DOI: <https://doi.org/10.1093/acprof:oso/9780198074175.001.0001>.
- Sharma H R 2005. Agricultural development and crop diversification in Himachal Pradesh: Understanding the patterns, processes, determinants and lessons. *Indian Journal of Agricultural Economics* **60**: 71-93. <https://econpapers.repec.org/article/agsinijae/204388.htm>.
- Sharma H R 2007. Crop diversification in Himachal Pradesh: Extent, impact, determinants and challenges. *Indian Journal of Labour Economics* **50**: 689-701.
- Sharma H R 2011. Crop diversification in Himachal Pradesh: Patterns, determinants and challenges. *Indian Journal of Agricultural Economics* **66**: 97-114. DOI: <https://doi.org/10.22004/ag.econ.204738>.
- Singh D V 1990. *Production and Marketing of Off-season Vegetables*. Mittal Publications, Delhi. <https://agris.fao.org/search/en/providers/122535/records/65dde4420f3e94b9e5c6f89d>.
- Swarup R 1993. *Agriculture Economy of Himalayan Region*. Gyanodya Prakash, Nainital.
- Verma L R and Pratap T 1992. The experiences of an area-based development strategy in Himachal Pradesh, India. In: Jodha N S, Banskota M and Pratap T (eds), *Sustainable Mountain Agriculture: Perspectives and Issues 2*. Oxford and IBH Publishing Company, New Delhi.
- Von Braun J 1995. Agricultural commercialisation: impacts on income and nutrition and implications for policy. *Food Policy* **20**: 187-202. DOI: [https://doi.org/10.1016/0306-9192\(95\)00013-5](https://doi.org/10.1016/0306-9192(95)00013-5).
- Vyas V S 1996. Diversification in agriculture: concept, rationale and approaches. *Indian Journal of Agricultural Economics* **51**: 636-643. <https://www.cabidigitallibrary.org/doi/full/10.5555/19971808487>.
- Wooldridge J M 2013. *Introductory Econometrics: A Modern Approach* (5th ed.). South-Western Cengage Learning, Boston.

Received: July 28, 2025 Accepted: October 23, 2025