Potato J (2024) 51 (1): 28-40

A COMPREHENSIVE STUDY ON SOCIO-ECONOMIC ANALYSIS OF POTATO GROWERS IN KANGRA DISTRICT OF HIMACHAL PRADESH

Aditi Raina[1], Pushpak Sharma[1*], Garima Gupta[2] and Arundhati Balouria[2]

ABSTRACT: This study investigated the socio-economic status of potato farmers in the Kangra district of Himachal Pradesh. This district was chosen specifically because it has a substantial area under potato cultivation. The required information was gathered from two potato-growing blocks in the district. The study revealed that the majority of household heads (57%) were in the age group of 16 and 40 years, with an average family size of five to seven members. Agriculture and livestock rearing emerged as the primary sources of income for most farms, with an average farm size of 1.76 ha, 74% of which are irrigated. During the *Kharif* season, vegetable crops were dominant, while potatoes were important during the *Rabi* season, with an average of 21.23 ha per farm. Potato productivity varied, with large farms producing 253.75 q/ha versus 246.43 q/ha on small farms. Agriculture-related earnings, or farm earnings, accounted 45.2% of total farm income, with potatoes accounting for 8%, while non-farm income accounted 26.5%. Future research topics include investigating the impact of climate change on potato farming and evaluating the effectiveness of agricultural policies in terms of income and productivity. Further research could look into the effects of modern farming techniques on sustainability and profitability, potentially providing insights into improving agricultural practices in the region.

KEYWORDS: Crop production, cropping pattern, landholdings, potato growers, socio-economic status

INTRODUCTION

The socio-economic dynamics of agricultural communities' influence farm organization, crop production, and rural livelihoods. Understanding these dynamics is critical for sustainable development in India, where agriculture continues to be the primary source of employment for a large portion of the population (Chand *et al.*, 2017). This study focuses on potato (*Solanum tuberosum* L.) growers in Himachal Pradesh's Kangra district, where potatoes are more than just a crop; it plays an important role in the agricultural economy. Potato is the world's third largest food crop in terms of consumption, after rice and wheat, with a total production of 376 million tonnes from an area of approximately 19 million ha (FAOSTAT, 2023). China leads the world in potato production with approx. 94 million tonnes, followed by India, Russia, Ukraine, and the United States (FAOSTAT, 2023). Potatoes are grown on approximately 2.16 million ha in India, with a total production of around 54 million tonnes, making it the world's second-largest producer after China (FAOSTAT, 2023). Himachal Pradesh, a hill state in northern India, is a major producer of potatoes, with 15,100 ha under cultivation and a total production of 1,95,000 tonnes. In the Kangra district alone, over 1,250 ha, or 16,030 tones, of high-quality potatoes are produced across 15 development blocks (Statistical Yearbook of Himachal Pradesh, 2022-23).

Farmers' socioeconomic profile includes a number of dimensions that all have an impact on their agricultural practices and overall wellbeing. Family structure and size, for example, can influence labor availability, decision-making processes, and the adoption

[1]University of Business School, Chandigarh University, Gharuan (Mohali), Punjab- 140413, India
[2]University Institute of Agricultural Sciences, Chandigarh University, Gharuan (Mohali), Punjab- 140413, India
*Corresponding author; email: pushpak.e13272@cumail.in

of new technologies (Kumari *et al.,* 2023; Sharma *et al.,* 2019). Farmers' receptivity to agricultural innovations, risk-taking behavior, and farm management strategies is influenced by their age and educational attainment (Rana *et al.,* 2016; Peer *et al.,* 2013), particularly among household heads. Land holdings, in terms of size and quality, are the foundation of agricultural operations. The size of landholdings is frequently associated with resource availability, mechanization levels, and the ability to invest in modern farming techniques. In areas like Kangra, where topography limits land availability, efficient land use is critical (Sharma *et al.,* 2017). Cropping patterns and crop productivity shed light on the economic significance of various crops, including potatoes, as well as how factors such as farm size may affect yields (Sharma *et al.,* 2019). Livestock rearing, which is inextricably linked to crop cultivation in Indian agriculture, provides a supplementary income source while also supporting crop production via manure and draft power (Sharma *et al.,* 2019). However, the introduction of mechanization has altered this traditional synergy, with implications for farm economics and sustainability (Kumar *et al.,* 2020). A comprehensive socioeconomic analysis looks beyond the farm gate. Off-farm and non-farm income sources, such as agricultural labor, services, and small businesses, frequently play an important role in smoothing income fluctuations and increasing household resilience (Pandit *et al.,* 2010; Sharma *et al.,* 2019). This diversification of income sources is especially important in areas prone to climatic uncertainties or market fluctuations.

Understanding the various aspects of potato growers' lives is more than just an academic exercise. It provides the foundation for evidence-based policymaking and targeted interventions. Policies based on such analyses can address specific challenges faced by different types of farmers, promote equitable growth, and encourage sustainable agricultural practices (Chand *et al.,* 2017; Rana *et al.,* 2016). The purpose of this study is to conduct a comprehensive socioeconomic analysis of potato growers in Himachal Pradesh's Kangra district. We hope to provide a comprehensive picture of these farmers' lives and livelihoods by investigating factors such as family demographics, educational status, land utilization, cropping patterns, livestock integration, and income diversification. The findings will contribute to a larger discussion about agricultural sustainability, rural development, and the well-being of farming communities in India.

MATERIALS AND METHODS

The study was conducted in Himachal Pradesh's Kangra district. Potatoes are an important cash crop for the district's farmers due to their high growth potential. A list of potato growing blocks was compiled and arranged in descending order based on the cultivation area. The first two potato growing blocks were purposively chosen. Following block selection, a two-stage stratified random sampling technique was used to select farmers (stage II) and potato-producing villages (stage I). During the initial sample phase, representatives from the revenue and agriculture departments worked together to compile a comprehensive list of all the villages in each chosen block that cultivate potatoes. The study used a sample of ten villages, five from each block. As a result, a manageable sample of 200 farmers was chosen from the selected villages, taking into account time and resource constraints. The sample farmers were arranged in ascending order according to the total area of their operational holdings. Using the square root cumulative frequency approach (Sharma *et*

al., 2017; Kumari *et al.,* 2020), farmers were divided into two groups: small farmers (up to two hectares) and large farmers (more than two hectares). To achieve the current study's objectives, data was collected from potato growers via in-person interviews after the schedule was prepared. Data on the socioeconomic characteristics of potato growers were also collected.

RESULTS AND DISCUSSION

Area and production

Table 1 shows a detailed comparison of potato and vegetable production in Himachal Pradesh and Kangra district. Potatoes are grown on 15,100 ha in Himachal Pradesh, yielding 1,94,500 metric tonnes, accounting for 17.3% of the state's vegetable cultivation area and 10.4% of its vegetable production. Other vegetables, on the other hand, cover 87,485 hectares and produce 1,867,413 metric tonnes, accounting for all remaining vegetable cultivation and production. In the Kangra district, potatoes are grown on 1,250 ha, yielding 16,030 metric tonnes. This accounts for 14.5% of the district's vegetable cultivation area and 10.4% of total vegetable production. Other vegetables in Kangra cover 8,612 ha and produce 1,54,834 metric tonnes, accounting for all remaining vegetable cultivation and production in the district. This comparison shows that, while potatoes are a significant crop in both Himachal Pradesh and the Kangra district, other vegetables have a larger area and production. The proportion of area and production dedicated to potatoes is slightly higher in Himachal Pradesh than in Kangra, indicating a state-level emphasis on potato cultivation. These findings are consistent with the findings of Dahal *et al.* (2023), who investigated the economic, production, and marketing aspects of potato farming in Nepal and discovered that it was a profitable endeavor for farmers. Kumari *et al.* (2023) also examined the socioeconomic characteristics of potato farmers, as well as the trend and growth rate of potato area and production in Bihar's Nalanda district, and discovered a positive growth rate in potato production, emphasizing the importance of potato cultivation in the region.

Table 1. Area and production of vegetables in Kangra district and Himachal Pradesh.

S. No.	Potato		Other Vegetables	
	Area (ha)	Production (MT)	Area (ha)	Production (MT)
1	Himachal Pradesh			
Per cent (%)	15100	194500	87485	1867413
	17.26	10.42	100	100
2	Kangra			
Per cent (%)	1250	16030	8612	154834
	14.51	10.35	100	100

Source: Statistical Year book of Himachal Pradesh, 2022-23.

Family structure and size

A family's social and economic well-being is heavily influenced by its size, which also has a significant impact on agricultural business operations. Family size influences the adoption and choice of farm operations, particularly when hired labor is limited. Table 2 shows the population distribution on sample farms based on family size and structural characteristics. According to the data, up to 1-4 family members constituted

Table 2. Sample farms distribution according to the family size and structure (No).

S.No.	Family size	Small	Large	Overall
1	1-4 members	35(33.3)	29(30.5)	64(32.0)
2	5-7 members	47(44.8)	41(43.2)	88(44.0)
3	8 and above members	23(21.9)	25(26.3)	48(24.0)
4	Total sample farms	105(100.0)	95(100.0)	200(100.0)
5	Total family members	489	463	952
6	Average size of family	4.41	5.15	4.76

Note: Figures in parentheses indicate percentage to the total in each category.

approximately 32% of the surveyed farms, indicating a sizable proportion of smaller-sized households. However, a significant proportion of the farms, approximately 24%, had eight or more family members, indicating the presence of larger households. Surprisingly, the vast majority of farms (44%) had five or seven family members. This suggests that having a large family labor force is beneficial to a sizable proportion of the sample farms. Family sizes varied from 4.41 on small farms to 5.15 on large farms, with an average of 4.76. The findings on family structure and size emphasize the significance of family labor availability for agricultural operations, particularly in areas with limited access to hired labor. Similar findings were reported by Kashyap and Guleria (2015), who discovered that the majority of apple growers in Himachal Pradesh's Mandi district had 5-8 members in their families, indicating the region's prevalence of larger families. Their research also found that larger family sizes were linked to increased apple production, as more family members could contribute to labor-intensive farm operations. However, policymakers should take into account the different needs and challenges those households of different sizes face when designing interventions to promote sustainable and equitable agricultural development.

Gender-wise distribution

Farm families' well-being is determined by both the number of family members and the gender distribution, as farming is a labor-intensive occupation. Table 3 shows the distribution of family members by gender. The table shows that there were more men than women on both types of farms. The family consisted of one child and four adults. The data also show that male children made up a higher percentage (12.4%) of all farm groups than female children (6.95%). Kushwaha *et al.* (2019) and Sharma *et al.* (2019) found similar results, indicating that male children outnumbered female children in all farm categories. These findings highlight the need for policies and interventions to promote gender equality, empower women in agriculture, and address cultural biases that perpetuate gender disparities in farm families.

Table 3. Distribution of family and sex wise of population on sample farms (No/farm).

S.No.	Particular	Small	Large	Overall
1	Male	2.68(55.60)	2.84(54.51)	2.76(54.98)
	a) Adult	2.14(44.4)	2.15(41.27)	2.15(42.83)
	b) Children*	0.54(11.2)	0.69(13.24)	0.62(12.35)
2	Female	2.14(44.40)	2.37(45.49)	2.26(45.02)
	a) Adult	1.75(36.31)	2.06(39.54)	1.91(38.05)
	b) Children*	0.39(8.09)	0.31(5.95)	0.35(6.97)
3	Total	4.82(100.00)	5.21(100.00)	5.02(100.00)
	a) Adult	3.89(80.71)	4.21(80.81)	4.06(80.88)
	b) Children*	0.93(19.29)	1.00(19.19)	0.97(19.32)

Note: Figures in parentheses indicate percentages to the total in each category
*Childern upto 15 years of age

Age–wise distribution

The age of the family head is critical for adapting to new ideas and technological advancements. Table 4 depicts the age distribution of the sample farms' heads and respondents. The age distribution of family members, with those under 15 and over 60 classified as dependents, provides insight into

Table 4. Sample farms Distribution according to the age of respondents (No).

S.No.	Age groups (Years)	Small	Large	Overall
1	Up to 40	59(56.19)	55(57.89)	114(57.00)
2	>41 to 60	32(30.48)	30(31.58)	62(31.00)
3	Above 60	14(13.33)	10(10.53)	24(12.00)
	Total	105(100.00)	95(100.00)	200(100.00)

Note: Figures in parentheses indicate percentages to the total in each category.

the family's reliance ratio. A casual glance at the table reveals that the majority of family heads were between the ages of 20 and 40, followed by 41 and 60. In the 60+ age group, the percentage of heads was significantly lower (10%). When small and large sample farms are compared, it can be seen that large farms have a slightly higher percentage of heads between the ages of 41 and 60 and up to 40 years old. In contrast, a larger proportion of heads of families over 60 lived on small farms (13.33%) than on large farms (10.53%). Rana et al. (2016) discovered that the majority of potato growers in Andhra Pradesh were between the ages of 31 and 50, with a greater proportion of younger farmers working on larger farms. Similarly, Kumari *et al.* (2023) reported that the majority of potato farmers in Bihar's Nalanda district were between the ages of 30 and 50, with a higher proportion of older farmers on small farms.

These findings indicate that larger farms are more likely to be managed by younger and middle-aged farmers, who may be more open to implementing new technologies and innovative practices. Smaller farms, on the other hand, are more likely to have older farmers who are risk-averse and resistant to change. These age dynamics have implications for agricultural extension and technology transfer programs, which must be tailored to meet the unique needs and preferences of different age groups and farm sizes.

Educational status of family

When it comes to making sound decisions on the farm to implement new technologies and innovations for the efficient allocation of limited resources and maximizing returns per unit of input, the educational background of the family's leader and members is critical. In light of this, Table 5 shows the analysis and educational status of the family head.

Table 5. Education status of the head of the family on sample farms (No).

S.No.	Level of education	Small	Large	Overall
1	Illiterate	9(8.57)	5(5.26)	14(7.00)
2	Primary	14(13.33)	10(10.53)	24(12.00)
3	Middle	21(20.00)	19(20.00)	40(20.00)
4	Matric	34(32.38)	27(28.42)	61(30.50)
5	Senior secondary	16(15.24)	20(21.05)	36(18.00)
6	Graduate and above	11(10.48)	14(14.74)	25(12.50)
	Total	105(100.00)	95(100.00)	200(100.00)
	Literacy rate (%)	91.43	94.74	93.00

Note: Figures in parentheses indicate percentages to the total in each category.

The table shows that approximately 91.4%, 94.7%, and 93% of family heads were literate. The majority of the heads were found to have completed high school or matriculation. Approximately 12.5% of household heads held degrees equivalent to or higher than those of the average farmer. Large farms, however, had a higher share than small farms. Peer *et al.* (2013) and Dahal *et al.* (2023) found similar trends in their studies, with comparable levels of education among family heads across farm sizes. These findings emphasize the importance of promoting educational opportunities and vocational training programs for farming communities, particularly for family heads, because they can have far-reaching consequences for agricultural productivity, resource efficiency, and rural development.

Occupational pattern

The occupations of the family head and other family members have a direct impact on the family's income and financial stability. Table 6 shows the occupations of the heads of families on the sample farms. A large proportion of the family heads stated that agriculture, particularly animal husbandry, was their primary source of income. The average percentage of family heads who worked in agriculture was 46.5%,

Table 6. Occupational pattern of respondents on sample farms (No).

S. No.	Occupation	Small	Large	Overall
1	Agriculture including livestock	50(47.62)	43(45.26)	93(46.5)
2	Private service	10(9.52)	12(12.63)	22(11.00)
3	Government service	15(14.29)	16(16.84)	31(15.5)
4	Business	6(5.71)	5(5.26)	11(5.50)
5	Daily paid labourer	10(9.52)	9(9.47)	19(9.50)
6	Others (artisans, craftsman, etc.)	14(13.33)	10(10.53)	24(12.00)
	Total	105(100.00)	95(100.00)	200(100.00)

Note: Figures in parentheses indicate percentages to the total in each category

indicating a strong reliance on the industry. When small farms were compared to large farms, the former had a significantly higher percentage of household heads who worked in agriculture. The service industry employed 26.5% of all heads, making it the second largest source of employment. Only 9.5% of the heads of families worked as daily wage laborers in agriculture or other fields. This is a very small percentage. Small and large farms had similar percentages of heads working in the service sector. Pandit *et al.* (2010) and Dahal *et al.* (2023) found similar trends and reported comparable findings in their studies. The high proportion of household heads involved in agriculture, particularly animal husbandry, demonstrates the sector's importance as a primary source of income for rural communities. However, the diversification of occupations, with a significant number of heads employed in service sectors and other non-farm activities, emphasizes the importance of policies that promote sustainable agriculture while also providing alternative income opportunities. This diversification could be used as a risk management strategy as well as to supplement agricultural income, improving rural households' overall financial stability.

Land holding and utilization

Agriculture is a land-based activity, so land resources are critical to farming and the foundation of the farmer's economy. The size of a farm household's holding demonstrates the fundamental strength of the farming family, as does how well they use this natural resource. Table 7 displays the distribution of holdings across the various farm categories. According to the data, the average farm holding size was 0.82 hectares, with 66% irrigated. Leasing in and out was common on both small and large farms. Approximately 2% of the total land holding

Table 7. Land inventory and its utilization on sample farms (ha /farm).

Sr. No.	Particulars	Small			Large			Overall		
		UIR	IR	Total	UIR	IR	Total	UIR	IR	Total
1	Owned land	0.32 (96.97)	0.75 (89.29)	1.07 (91.45)	0.55 (94.83)	1.67 (95.98)	2.22 (95.69)	0.44 (95.65)	1.21 (93.08)	1.65 (93.75)
2	Leased in	0.01 (3.03)	0.08 (9.52)	0.09 (7.69)	0.03 (5.17)	0.03 (1.72)	0.06 (2.59)	0.02 (4.35)	0.06 (4.62)	0.08 (4.55)
3	Leased out	0 (0.00)	0.01 (1.19)	0.01 (0.85)	0 (0.00)	0.04 (2.30)	0.04 (1.72)	0 (0.00)	0.03 (2.31)	0.03 (1.70)
4	Total land holding	0.33 (100.00)	0.84 (100.00)	1.17 (100.00)	0.58 (100.00)	1.74 (100.00)	2.32 (100.00)	0.46 (100.00)	1.3 (100.00)	1.76 (100.00)
i	Operational holding	0.08 (24.24)	0.49 (58.33)	0.57 (48.72)	0.12 (20.69)	0.76 (43.68)	0.88 (37.93)	0.1 (21.74)	0.63 (48.46)	0.73 (41.48)
ii	Orchards	0.05 (15.15)	0.07 (8.33)	0.12 (10.26)	0.02 (3.45)	0.1 (5.75)	0.12 (5.17)	0.04 (8.70)	0.09 (6.92)	0.12 (6.82)
iii	Pastures/grasslands	0.09 (27.27)	0.1 (11.90)	0.19 (16.24)	0.18 (31.03)	0.38 (21.84)	0.56 (24.14)	0.14 (30.43)	0.24 (18.46)	0.38 (21.59)
iv	Fallow land	0.08 (24.24)	0.12 (14.29)	0.2 (17.09)	0.23 (39.66)	0.43 (24.71)	0.66 (28.45)	0.16 (34.78)	0.28 (21.54)	0.43 (24.43)
v	Others	0.03 (9.09)	0.06 (7.14)	0.09 (7.69)	0.03 (5.17)	0.07 (4.02)	0.1 (4.31)	0.03 (6.52)	0.07 (5.38)	0.1 (5.68)

Note: Figures in parentheses indicate percentages to the total in each category. UIR= Un-irrigated, IR= Irrigated.

was leased, whereas an average farm leases 10% of its area. It was discovered that the average operational holding size was 0.62 hectares, accounting for approximately 76% of total land holdings. The average operational holding size increased with holding size, according to a comparison of small and large farms. Pasture and meadow areas accounted for a sizable portion of total land holdings, ranging from 11% to 14% for small to large farms. The data also revealed that, on average, farms had irrigation covering more than 80% of their operating area. In the research area, kulhs were the primary irrigation source. The table also shows that as holding size increased, the proportion of fallow land to total holding decreased. On large farms, it ranged between 7.61 and 11.43% of the total holding on small farms. Dahal *et al.* (2023) found a similar pattern in their study of potato farming in Nepal, where the average landholding size was 0.48 hectares, 62% of the land was irrigated, and the practice of leasing in and leasing out land was common. The findings demonstrated the prevalence of smallholder agriculture and the importance of livestock rearing as a complement to crop cultivation. Furthermore, the practice of land leasing, as well as the availability of irrigation facilities via kulhs, were critical to the region's efficient use of land resources.

Livestock inventory and investment

Raising cattle and farming together maximizes income and benefits from their mutual association. Table 8 shows an

Table 8. Inventory of livestock on sample farms (per farm).

S. No.	Particulars	Small		Large		Overall	
		No.	Rs.	No.	Rs.	No.	Rs.
1	Local cow						
	In milk	0.65	9750 (17.32)	0.61	9150 (12.36)	0.63	9450 (14.51)
	Dry	0.07	560 (1.00)	0.1	800 (1.08)	0.09	680 (1.04)
	Total	0.72	10310 (18.32)	0.71	9950 (13.45)	0.72	10130 (15.55)
	Improved cow						
	In milk	1.25	28750 (51.08)	1.91	43930 (59.36)	1.58	36340 (55.79)
	Dry	0.13	1170 (2.08)	0.15	1350 (1.82)	0.14	1260 (1.93)
	Total	1.38	29920 (53.16)	2.06	45280 (61.19)	1.72	37600 (57.72)
2	Buffaloes						
	In milk	0.36	12240 (21.75)	0.44	14960 (20.22)	0.4	13600 (20.88)
	Dry	0.07	560 (1.00)	0.09	720 (0.97)	0.08	640 (0.98)
	Total	0.43	12800 (22.74)	0.53	15680 (21.19)	0.48	14240 (21.86)
3	Heifer						
	Cow (local)	0.11	550 (0.98)	0.16	800 (1.08)	0.14	675 (1.04)
	Cow (improved)	0.25	500 (0.89)	0.12	240 (0.32)	0.19	370 (0.57)
	Buffalo	0.18	1440 (2.56)	0.19	1520 (2.05)	0.19	1480 (2.27)
4	Calves	0.04	40 (0.07)	0.03	30 (0.04)	0.04	35 (0.05)
5	Bullocks	0.36	720 (1.28)	0.25	500 (0.68)	0.31	610 (0.94)
6	Others	1.15	3450 (6.13)	1.2	3600 (4.86)	1.18	3525 (5.41)
	Total livestock	4.62	56280 (100.00)	5.25	74000 (100.00)	4.97	65140 (100.00)

Note: Figures in the parentheses indicate percentages to the total in each category

examination of the sample farms' livestock inventories. According to the available data, the average farm in the study area kept 4.97 animals. Large farms kept slightly more animals than small farms (4.62), with 5.25. Typically, farmers kept one or no buffaloes and three cattle. Raising sheep, goats, and horses was uncommon in the study area, accounting for only 1.17 percent of average farms. Furthermore, the findings revealed that neither type of farm kept many local cows; rather, farmers kept better animals because they produced more milk. The percentage of farmers who kept bullocks for ploughing was discovered to be quite low, ranging from 0.25 bullocks on large farms to 0.36 bullocks on small farms. All farms spent a total of Rs. 65,140 on animals; large farms spent more than Rs. 74,000, compared to small farms (Rs. 56,280), as shown in Table 8. The data also revealed that, across all farms, cow investments accounted for approximately 57.72% of total farm animal investments. Nonetheless, it was found that large farms had a higher percentage (61%) than small farms (53%). The significance of the local cattle came in second. On an average farm, dairy animals received a higher combined value of all livestock investments (95.13%). The percentage differed between small farms (94.22%) and large farms (95.83%). It was discovered that the amount invested in bullocks was relatively small, between one and two percent of the total amount. This phenomenon can be explained by the widespread use of tractors and power tillers for ploughing and other field operations in the study area. This trend is consistent with findings from Sharma *et al.* (2019) and Kumari *et al.* (2023), indicating a broader regional shift toward modern agricultural practices. The data revealed that dairy animals, particularly cows, dominated the livestock inventory, indicating the importance of milk production as a major agricultural activity in the region. Furthermore, the low investment in bullocks and widespread use of mechanized equipment for field operations emphasized the region's transition to modern agricultural practices.

Cropping patterns

The cropping pattern sheds light on how operational holdings are distributed among various crops at a given time, revealing the relative importance of each crop in the cultivated region. Cropping patterns must be analyzed in order to understand the level of crop diversification in a given region. Table 9 details the cropping patterns of farms in the study area. Notably, during the *kharif* season, vegetable crops were the most important crop, accounting for 24% of total cropped area, followed by paddy (11.64%), fodder crops, and maize (7.53%). Radish, tomato, cucumber, and okra were among the most popular vegetables grown during the *kharif* season. In the *kharif* season, there was no discernible difference between small and large farms in terms of total cropped area allocation to different crops.

Potatoes emerged as the most important crop during the *rabi* season, covering approximately 21.23% of the total area planted on an average farm. Vegetable crops accounted for approximately 10% of the total planted area, with wheat emerging as the main crop. During the *rabi* season, there was a noticeable difference in how large and small farms divided their total cultivated area between crops. Potatoes occupied two and a half times the total cultivated area of large farms (27.12%) as they did on small farms (12.28%). Large farms, on the other hand, dedicated a higher percentage of their total cultivated area (39.55) to vegetable crops than small farms (29%). Both large and small farms allocated land to fodder crops in a similar pattern. Crop intensification on the farm was 200% overall, 200% for small farms, and 201%

Table 9. Cropping pattern on sample farms.

S. No.	Particulars	Small		Large		Overall	
		Area (ha)	% of total cropped area	Area (ha)	% of total cropped area	Area (ha)	% of total cropped area
A	Kharif						
1	Maize	0.07	6.14	0.14	7.91	0.11	7.53
2	Paddy	0.14	12.28	0.19	10.73	0.17	11.64
3	Vegetables	0.26	22.81	0.43	24.29	0.35	23.97
i	Tomato	0.05	4.39	0.07	3.95	0.06	4.11
ii	Capsicum	0.02	1.75	0.03	1.69	0.03	2.05
iii	Radish	0.03	2.63	0.1	5.65	0.07	4.79
iv	Brinjal	0.03	2.63	0.02	1.13	0.03	2.05
v	Cucumber	0.05	4.39	0.07	3.95	0.06	4.11
vi	Okra	0.04	3.51	0.08	4.52	0.06	4.11
vii	Other vegetables	0.04	3.51	0.06	3.39	0.05	3.42
4	Fodder (Chari/Bajra)	0.1	8.77	0.12	6.78	0.11	7.53
	Sub-Total	0.57	50	0.88	49.72	0.73	50
B	Rabi						
1	Wheat	0.18	15.79	0.12	6.78	0.15	10.27
2	Fodder (Berseem/Oat)	0.06	5.26	0.07	3.95	0.07	4.79
3	Vegetables	0.33	28.95	0.7	39.55	0.52	35.62
i	Potato	0.14	12.28	0.48	27.12	0.31	21.23
ii	Cauliflower	0.06	5.26	0.06	3.39	0.06	4.11
iii	Cabbage	0.04	3.51	0.05	2.82	0.05	3.42
iv	Onion	0.02	1.75	0.03	1.69	0.03	2.05
v	Garlic	0.02	1.75	0.02	1.13	0.02	1.37
vi	Other vegetable	0.05	4.39	0.06	3.39	0.06	4.11
	Sub-total	0.57	50	0.89	50.28	0.73	50
C	Total cropped area	1.14	100	1.77	100	1.46	100
D	Net sown area	0.57		0.88		0.73	
	Cropping intensity (%)	200		201.14		200	

for large farms. Similar results were reported by Pandit *et al.* (2010) and Sharma *et al.* (2019) reported similar findings, observing that larger farms in Himachal Pradesh allocated more land to potato cultivation than smaller farms. The findings highlight the importance of vegetable cultivation and potato production as major agricultural activities in the region, with large farms placing a greater emphasis on potato cultivation than smaller farms. Furthermore, the high cropping intensity observed across farm sizes suggests intensive agricultural practices and effective land use.

Crop production

Table 10 displays the calculated per-farm production of various crops. The table shows that among food grains, paddy produced the most (10.54 q/farm on average), followed by wheat (5.4 q/farm) and maize (4.7 q/farm).

Table 10. Production and productivity of different crops on sample farms.

S.No.	Crops	Small		Large		Overall	
		(q/farm)	(q/ha)	(q/farm)	(q/ha)	(q/farm)	(q/ha)
1	Maize	3.12	44.57	6.27	44.79	4.7	44.68
2	Paddy	6.4	45.71	9.43	49.63	10.54	47.67
3	Wheat	6.3	35	4.5	37.5	5.4	36.25
4	Chari	35.6	356	42.85	357.11	39.23	356.56
5	Bajra	42.3	423	51.6	430	46.95	426.5
6	Oats	12.67	456.33	15.21	459.43	13.94	457.88
7	Berseem	13.4	398	14	400	13.7	399
8	Vegetables						
i	Cucumber	7.2	144	10.76	153.71	8.98	148.86
ii	Cabbage	5.12	128	6.5	130	5.81	129
iii	Okra	4.45	111.25	11.32	141.5	7.89	126.38
iv	Brinjal	7.54	251.33	5.12	256	6.33	253.67
v	Tomato	9.35	187	13.3	190	11.33	188.5
vi	Potato	**34.5**	**246.43**	**121.8**	**253.75**	**78.15**	**250.09**
vii	Cauliflower	8.15	135.83	8.56	142.67	8.36	139.25
viii	Radish	5.23	174.33	18.34	183.4	11.79	178.87
ix	Capcicum	3.85	192.43	5.95	198.45	4.9	195.44
x	Onion	4.56	228.22	7.03	234.43	5.8	231.33
xi	Garlic	2.37	118.32	2.43	121.59	2.4	119.96

Large farms had higher per-farm maize and paddy production than small farms. The data also shows that small farms had higher per farm wheat production (6.3 q/farm) than large farms (4.5 q/farm). Bajra had the highest per farm production of any fodder crop (46.95 q/farm), followed by chari (39.23 q/farm), oats (13.94 q/farm), and berseem (13.7 q/farm). Large farms produced more potatoes per farm than small farms, with an average of 75.13 quintals per farm. In terms of other vegetables grown on farms, radish had the highest per farm production (11.79 q/farm), followed by tomato (11.33 q/farm), cucumber (8.98 q/farm), and other vegetables such as cauliflower, okra, and brinjal. This pattern sheds light on the varying levels of crop production across crops and farm sizes, highlighting the importance of crop selection and management practices in optimizing yields. Birthal*et al.* (2015) and Kumari *et al.* (2023) found similar trends in their studies, supporting these observations about crop productivity differences between large and small farms. These findings highlight the importance of crop selection and management practices in maximizing yields. The findings show that paddy and potato cultivation is dominant in the region, with large farms producing more of these crops than small farms. Furthermore, the large production of fodder crops emphasizes the importance of livestock rearing as a supplement to crop cultivation.

Crop productivity

A crop's output per unit area is represented by its yield rate, which generally indicates its economic importance. Table 10 shows the average yields of different crops in the study

area. The table shows that all food grain crops were more productive on large farms. The average farm yield was 44.68 q/ha for maize, 47.67 q/ha for paddy, and 36.25 q/ha for wheat. Potato productivity averaged 250.09 q/ha, with large farms producing slightly more (253.75 q/ha) than small farms (246.43 q/ha). Large farms produced more vegetables than small farms, including cucumber, brinjal, cauliflower, radish, and garlic. Crops such as cabbage, okra, and tomato, on the other hand, yielded similarly across both farm sizes, indicating that the relationship between farm size and vegetable productivity varies. These findings are consistent with those reported by Rana *et al.* (2016), who discovered that potato cultivation is more economically viable on larger farms in Andhra Pradesh, India. Sharma *et al.* (2019) also discovered that potato yields were higher on larger farms in the Kangra district of Himachal Pradesh, India. These studies back up the observation that farm size can affect crop productivity, especially for crops like potatoes and other vegetables. The findings highlight large farms' relatively higher productivity levels for major crops such as paddy, maize, wheat, and potatoes, which could be attributed to better resource access and the adoption of improved agricultural practices. However, the differences in yield across vegetables indicate that factors other than farm size, such as crop management techniques, soil fertility, and environmental conditions, may play a more important role in determining vegetable productivity.

Farm, off farm and non-farm income

Farm and non-farm activities generate the majority of income, with off-farm income accounting for only a small portion of total farm income. Farm income was calculated as the value of the primary product and byproducts minus costs such as seed, fertilizers, pesticides, hired labor, and draft power. Off-farm income was defined as income earned by family members working as agricultural labourers on other farmers' fields. Non-farm income was defined as income generated by non-agricultural activities such as services, business/trade/ shop, and non-agricultural labor. Table 11 presents the various components of farm and non-farm income. According to the data, agriculture provided approximately 45.19% of total farmer income, with potato crops accounting for 8.63%. Livestock contributed approximately 2.7% of farmer income. When comparing small and large farms, potatoes contributed three times more to total income

Table 11. Composition of farm and non-farm income on sample farms.

(Rs /farm/annum)

S. No.	Particulars	Small	Large	Overall
I	Farm income			
1	Agriculture	216788 (49.69)	326657 (42.62)	271723 (45.19)
i	Potato	20360 (4.67)	83461 (10.89)	51911 (8.63)
ii	Other crops	65000 (14.9)	87500 (11.42)	76250 (12.68)
2	Livestock	14050 (3.22)	18440 (2.41)	16245 (2.70)
3	Horticulture	20455 (4.69)	31000 (4.04)	25728 (4.28)
	Sub-total	336653 (77.16)	547058 (71.38)	441857 (73.48)
II	Non-farm income			
1	Trade/shop	21076 (4.83)	40685 (5.31)	30881 (5.14)
2	Government service	34224 (7.84)	76500 (9.98)	55362 (9.21)
3	Private service	41334 (9.47)	98500 (12.85)	69917 (11.63)
4	Non- agricultural labourer	3000 (0.69)	3672 (0.48)	3336 (0.55)
III	Sub-total	99634 (22.84)	219357 (28.62)	159496 (26.52)
	Total	436287 (100.00)	766415 (100.00)	601353 (100.00)

Note: Figures in the parentheses indicate percentages to the total in each category

on large farms than on small farms. However, the contribution of livestock to total farm income was similar between small and large farms. Farm income accounted for about 73.48% of total income on average, with little difference between small (77.17%) and large farms (71.38%). Non-farm income was dominated by services, including government and private services, which accounted for more than 20.84% of total income. This sector contributed more to large farms (22.83%) than to small farms (17.31%). Business/trade/ shop contributed about 10% of total income, while non-agricultural labour contributed only 5.14%. Non-farm income accounted for approximately 26.53% of the total, ranging from 22.82% in large farms to 28.62% in small farms. These findings are consistent with those reported by Pandit *et al.* (2010), who discovered that potato cultivation significantly increased farm income in both irrigated and rainfed conditions in Himachal Pradesh. Furthermore, Rana *et al.* (2016) found that potato cultivation was economically viable in Andhra Pradesh, with the potential to generate income for farmers. Sharma *et al.* (2019) also highlighted the importance of potato cultivation as a source of income for farmers in Himachal Pradesh's Kangra district. The findings emphasize the importance of agriculture, particularly potato cultivation, to the overall income of farmers in the region. Furthermore, non-farm income sources, such as services and business activities, play a significant role in supplementing household income, indicating that farming communities' livelihood strategies are becoming more diverse.

CONCLUSION

The study conducts a comprehensive socioeconomic analysis of potato growers in Himachal Pradesh's Kangra district. It emphasizes the importance of various socioeconomic factors in shaping potato cultivation in the region, including family size, household head age, educational status, land holdings, and income diversification. The findings highlight the importance of agriculture, particularly potato cultivation and livestock rearing, as primary sources of income, while also emphasizing the importance of non-farm and agriculture-related activities in sustaining rural livelihoods. Furthermore, the study shows that larger farms have higher potato yields per hectare than smaller farms, indicating the influence of resource availability on production. To improve potato growers' resilience and well-being, the study recommends developing targeted interventions that take into account the relationship between agricultural outcomes and socioeconomic factors. Furthermore, policies aimed at promoting equitable growth and long-term agricultural development should consider how socioeconomic factors affect farm organization and productivity.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest

ETHICAL STATEMENT

This article does not contain any studies with human participants or animals performed by any of the authors

LITERATURE CITED

Birthal PS, Hazrana J and Negi DS (2015). Crop diversification and farm labor use in India. *Agricultural Economics Research Review***28**(2): 171-184.

Chand R, Srivastava SK and Singh J (2017). Changing structure of rural economy of India: Implications for employment and growth. NITI Aayog. https://niti.gov.in/writereaddata/files/document_publication/Rural_Economy_DP.pdf

Dahal S, Regmi B, Panta HK, Timalsina P, Chaudhary R, Khadka T and Poudel A (2023). Analysis of economic, production, and marketing aspects of

potato farming in Changunarayan Municipality of Bhaktapur, Nepal. *Archives of Agriculture and Environmental Science***8**(4): 545–552.

Department of Economics and Statistics, Himachal Pradesh. (2022-23). Statistical Year Book of Himachal Pradesh. https://himachalservices.nic.in/economics/pdf/YearBook2022-23.pdf

FAO,(2023). Global potato statistics. Latest. https://www.potatogrower.com/2023/01/global-potato-statistics-latest

Gautam Y and Andersen P (2016). Rural livelihood diversification and household well-being: Insights from Humla, Nepal. *Journal of Rural Studies***44**: 239-249.

Kashyap R and Guleria A (2015). Socio-economic and marketing analysis of apple growers in Mandi district of Himachal Pradesh. *Journal of Hill Agriculture***6**(2): 202-206.

Kumari J, Singh AK and Maji S (2020). Analysis of communication profile of beneficiaries under skill development mission in Chhattisgarh. *Research Journal of Agricultural Science***11**(4): 881-884.

Kumari S, Maurya M, Kumar S and Noel AS (2023). Analysis of socio-economic characteristics of potato farmers and trend, growth rate of area, production of potato in Nalanda district of Bihar, India. *International Journal of Environment and Climate Change***13**(8): 53-60.

Kushwaha RR, Kumar P, Singh VK, Supriya, Singh A and Yadav RS (2019). An economic analysis of potato cultivation: A case study in Kannauj district of Uttar Pradesh. *Journal of Pharmacognosy and Phytochemistry***8**(3): 4609–4612.

Pandit A, Kumar A, Rana RK, Pandey NK and Kumar NR (2010). A study of socio-economic profile of potato farmers: comparison of irrigated and rainfed conditions in Himachal Pradesh. *Potato Journal* **37**(1–2): 56–63.

Peer QJA, Ahmad N, Kaur J, Chesti MH, Ahmad HS, Bhat A and Bhat BA (2013). Study on economics of potato growing towards livelihood security. *African Journal of Agricultural Research***8**(45): 5639–5644.

Rana RK, Arya S, Kadian MS, Singh BP, Quiroz R and Monneveux P (2016). Socio-economic feasibility of potato cultivation in Andhra Pradesh, India. *Potato Research***59**: 167–179.

Sharma V, Lal H, Debnath U and Hatte V (2017). Economics of potato production in Kangra district of Himachal Pradesh, India. *International Journal of Current Microbiology and Applied Sciences***6**(10): 123-129.

Sharma V, Lal H, Rajput AS and Sharma I (2019). Socio-economic analysis of potato growing farmers in Kangra district of Himachal Pradesh. International Journal of *Agriculture Sciences***11**(3): 7844-7848.

MS Received : June 14, 2024; Accepted : June 28, 2024