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Socio-economic characteristics, landholding pattern, and dairy practices of farmers in Vindhyan Region of Mirzapur District, Uttar Pradesh

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Abstract

The study was conducted during 2024–25 in the Vindhyan region of Mirzapur district, Uttar Pradesh, to assess the socio-economic, landholding, educational, and livestock management characteristics of rural farming households. A total of 576 respondents were surveyed through a structured questionnaire administered during veterinary clinical camps, using stratified random sampling to ensure representation across farm size and income categories. Results revealed that agriculture in the region is predominantly smallholder-based, with 80.3 percent of farmers owning less than 10 acres of land. Educational attainment remained low, as 34.03 percent of respondents were illiterate and 27.78 percent had only primary-level education. Nearly 64 percent earned below ₹1,00,000 annually, indicating substantial economic vulnerability. Agriculture and livestock together constituted the primary livelihood source for 79.5 percent of respondents. Dairy practices were largely traditional, dominated by hand milking (73.96%) and local market sales (46.35%). The findings highlight limited livelihood diversification and persistent dependence on low-return subsistence agriculture in Mirzapur district.

Keywords: Dairy practices, Eastern Uttar Pradesh, income distribution, landholding, livelihood, Mirzapur district

Introduction

Agriculture continues to be the backbone of India's rural economy, providing livelihood to a majority of the population, though its contribution to the national GDP remains modest. The sector employs more than 60 percent of the workforce but contributes only about 14 percent to the GDP, reflecting a pattern of underemployment and low productivity (Lanjouw and Sharif, 2002) ^[14]. The agrarian structure in India is predominantly characterized by small and marginal landholdings, particularly across the Indo-Gangetic Plains, where farm size average has declined sharply from 2.82 ha in 1970–71 to 1.16 ha in 2010–11 (Kaur *et al.*, 2021) ^[11]. According to recent estimates, marginal holdings constitute 68.6 percent and smallholdings 18 percent of the total operational holdings (Ali, 2025b) ^[12].

This fragmentation is primarily attributed to inheritance-based land subdivision, population pressure, and continued dependence on agriculture as the principal livelihood source.

In alignment with these national trends, Mirzapur district exhibits a similar pattern, where a majority of farmers possess small and medium-sized farms. A study performed in the western Vidarbha zone of Maharashtra by Sarnaik *et al.* (2020) ^[26] reported that semi-medium (29.17%), small (28.33%), and medium (25.83%) holdings together formed the majority, while marginal (9.59%) and large (7.08%) categories were comparatively fewer. This distribution broadly supports the landholding composition observed in the present study area.

Educational status is another critical determinant of

agricultural performance and adoption of improved technologies. In the *Vindhyan* region of Mirzapur, 34.03 percent of farmers were found to be illiterate and 27.78 percent had attained only primary education, reflecting limited access to formal education. Gupta *et al.* (2019) ^[9] observed that farmers’ participation in extension programs and adoption of innovations were significantly influenced by age, education, and landholding size. Similarly, Jatav (2024) ^[10] emphasized that education enhances access to emerging economic opportunities, especially amid widening rural inequalities, while Nirmala *et al.* (2024) ^[17] highlighted education, farm size, and on-farm income as major determinants of diversification and farmers’ well-being. Panda *et al.* (2022) ^[18] further demonstrated a positive association between education, farming experience, and training exposure with the degree of information source utilization among farmers.

Economic vulnerability remains pronounced, with a considerable share of rural households earning below ₹1,00,000 annually, indicating limited livelihood diversification. Livestock husbandry, particularly dairying, remains integral to household income, yet it largely follows traditional practices. The majority of cattle and buffalo herds are of small size, dominated by local breeds with low productivity. Hand milking continues to be the predominant method, and milk disposal is mostly confined to local markets, reflecting a subsistence-oriented and unorganized dairy sector. Keeping these facts under consideration, the present study was conducted to assess the socio-economic characteristics, landholding patterns, educational status, income distribution, and livestock management practices of farmers in the *Vindhyan* region of Mirzapur district, Uttar Pradesh.

Methodology

The study was conducted among rural farming households in the *Vindhyan* region of Mirzapur district, Uttar Pradesh, India, located between 23°52'–25°32'N and 82°05'–83°33'E (Sharma *et al.*, 2025) ^[28]. Mirzapur spans 4,521 km² with two main physiographic divisions—the Indo-Gangetic Plains in the north and the *Vindhyan* Uplands in the south, separated by the River Ganga. The survey focused on approaching farmers in veterinary clinical camps in different villages of *Vindhyan* region in district Mirzapur on random basis. The region’s semi-arid to subtropical climate features summers (March–June), monsoons (July–October), and winters (November–February), with annual rainfall of 1000–1200 mm and temperatures ranging from 10 °C to 40 °C (Goparaju and Sinha, 2015) ^[7]. Its undulating terrain supports mixed cropping and livestock rearing, central to rural livelihoods.

A structured questionnaire-based survey was administered to a total of 576 farmers during the study period in (2024–25). Respondents were randomly selected using stratified sampling to capture a representative farmers criteria varying in landholding size, livestock ownership, and socio-economic status. The questionnaire captured comprehensive information across multiple domains: demographic profiles, landholding details (area and tenure), educational attainment, primary occupation, income sources and approximate annual income, livestock ownership and species composition, livestock milking practices, milk production and disposal pattern of their produce.

Data were collected during 2024–25 through face-to-face interviews conducted by trained enumerators fluent in the local language, ensuring accurate and culturally sensitive responses. A structured questionnaire, designed using Google Forms, was administered to the selected farmers. Upon completion, responses were automatically recorded and retrieved on Google Sheets, allowing systematic data cleaning, verification, and standardization prior to analysis. Raw survey data underwent rigorous cleaning and preprocessing to correct for inconsistencies, resolve spelling variants and to handle missing or incomplete entries. Numerical data were standardized for uniformity; for example, landholding sizes recorded in hectares and *bighas* were converted to acres to allow consistent aggregation. Descriptive statistical analyses were performed using statistical software of Microsoft Excel. Data subsets were analyzed for parameters such as livestock ownership patterns, milk yields. Resultant cleaned datasets were synthesized into tabular formats that reflect the distribution and relationships of key variables across the respondent population. These analyses form the empirical basis for insights into rural agrarian socio-economic structures and livestock management practices adopted by the surveyed farmers.

Results

Table 1: Landholding pattern of respondents

Landholding Category	Number of Farmers	Percentage of Respondents (%)
<0.5ac	41	8.1
0.5–1ac	60	11.9
1–2ac	83	16.4
2–5ac	138	27.2
5–10ac	85	16.7
10–20ac	43	8.5
20–50ac	32	6.3
50–100ac	6	1.2
>100ac	2	0.4

Out of the total 576 farmers surveyed in Mirzapur district, 490 respondents provided information for this section. The findings indicate that landholding in the study area is predominantly characterized by small and medium farmers, with 36.4% possessing less than 2 acres (<0.8 ha), 43.9% owning between 2 and 10 acres (≈0.8–4 ha), and only 16.4% holding more than 10 acres. The median holding falls in the 2–5acre range, indicating a fragmented land structure with few large farms. The smallest category (<0.5 acres) accounts for 8.1%, while holdings above 100 acres are extremely rare (0.4%), reflecting a predominantly smallholder-driven agricultural system typical of Eastern Uttar Pradesh.

Table 2: Educational level of respondents

Education Level	Number of Respondents	Percentage (%)
Illiterate	196	34.03
Primary Education	160	27.78
Metric	73	12.67
Intermediate	74	12.85
Graduation	54	9.38
Post Graduation	16	2.78
Missing	3	0.52

Out of the total 576 farmers surveyed in Mirzapur district, 490 respondents provided information on their educational status. The results revealed that a considerable proportion of the respondents (34.03%) were illiterate, while 27.78% had attained only primary-level education. The proportion of farmers educated up to matriculation and intermediate levels stood at 12.67% and 12.85%, respectively, indicating a limited presence of secondary-level education among the respondents. Only 9.38% of the farmers had completed graduation, and a minimal 2.78% held postgraduate qualifications. The data suggest that despite partial literacy, the educational attainment among farmers remains predominantly at the basic level, with nearly two-thirds of the population (61.8%) being either illiterate or having only primary-level education, pointing to educational limitations within the rural farming community of Mirzapur.

Table 3: Annual income distribution among respondents

Income Range	Frequency	Percentage (%)
Less than 50,000	221	38.37
50,000 - 1 Lakh	147	25.52
1 Lakh - 2 Lakh	112	19.44
2 Lakh - 5 Lakh	63	10.94
5 Lakh - 10 Lakh	11	1.91
Greater than 10 Lakh	1	0.17
BPL* card holder	17	2.95
NA / Missing	4	0.69

*BPL= Below Poverty Line

The income analysis of 576 respondents indicates a predominantly low-income farming population, with 64% earning below ₹1,00,000 annually and 38.4% earning under ₹50,000. About 19.4% fall in the ₹1,00,000–₹2,00,000

range, while incomes above ₹2,00,000 constitute less than 13% of the sample. Only one respondent reported earnings exceeding ₹10,00,000. Around 3% of farmers possess BPL cards, highlighting economic vulnerability. The distribution is heavily skewed toward lower income brackets, reflecting widespread financial constraints and limited access to resources. These findings emphasize the need for livelihood diversification and productivity-enhancing interventions for smallholder and marginal farmers.

Table 4: Income source patterns among the respondents

Income Source	Number of Respondents	Percentage (%)
Agriculture + Livestock	306	53.13
Agriculture Only	152	26.39
Private Job	49	8.51
Business/Shop	36	6.25
Livestock Only	22	3.82
Multiple/Other Combinations*	7	1.22
Missing/Not Specified	4	0.69

The analysis of income sources among the surveyed farmers shows that agriculture remains the primary livelihood activity, either alone or combined with livestock rearing. Over half of the respondents (53.1%) derived income from both agriculture and livestock, while 26.4% depended solely on agriculture. Non-farm income sources were less common, with 8.5% engaged in private jobs and 6.3% in small businesses or shops. A smaller share (3.8%) relied exclusively on livestock for income. Only 1.2% reported multiple or other income combinations, indicating limited livelihood diversification and a continued dominance of agriculture-based income among rural households.

Table 5: Cattle ownership, breed composition, and milk production

Cattle Parameter	Category/Range	Number of Farmers	Percentage (%)
Cattle Number	0	38	6.6
	01-02	216	37.5
	03-05	170	29.6
	06-10	97	16.9
	11-20	29	5
	>20	12	2.1
	Missing/NA	14	2.4
Cattle Breed	Sahiwal	107	18.6
	Desi/Nondescript	121	21
	Gangatiri	60	10.4
	Jersey	59	10.2
	Holstein Friesian (HF)	27	4.7
	Crossbred	45	7.9
	Mixed/Multiple	41	7.1
	Missing/NA	116	20.1
Milk Yield (lit/day)	0	45	7.8
	01-02	133	23.1
	03-05	189	32.8
	06-10	128	22.2
	11-20	55	9.6
	>20	12	2.1
	Missing/NA	14	2.4
Milk Rate (Rs/litre)	<30	4	0.7
	30-40	367	63.7
	41-50	102	17.7
	51-60	8	1.4
	>60	1	0.2
	NA/Missing	94	16.3

Cattle ownership in Mirzapur district was dominated by smallholders, with most farmers maintaining 1–2 (37.5%) or 3–5 (29.6%) animals. The cattle population was largely composed of indigenous and nondescript types (21%), followed by Sahiwal (18.6%), Gangatiri (10.4%), Jersey (10.2%), Holstein Friesian (4.7%), and crossbreds (7.9%)

breeds of cattle. Daily milk yield was primarily produced as 3–5 L (32.8%) and 6–10 L (22.2%) ranges, while high yields above 20 L/day were rare (2.1%). Most farmers sold their produce (market milk) at the rate of Rs 30–40 per litre (63.7%).

Table 6: Buffalo ownership, breed composition, and milk production

Buffalo Parameter	Category/Range	Number of Farmers	Percentage (%)
Buffalo Number	0	286	49.7
	1-2	134	23.3
	3-5	132	22.9
	6-10	19	3.3
	11-20	3	0.5
	>20	1	0.2
	Missing/NA	1	0.2
Buffalo Breed	Murrah	87	15.1
	Nondescript/Desi	69	12
	Bhadawari/Tarai/Native	32	5.5
	Crossbred	12	2.1
	NA/Missing	376	65.3
Milk Yield (lit/day)	0	301	52.3
	1-2	62	10.8
	3-5	120	20.8
	06-10	60	10.4
	11-20	29	5
	>20	3	0.5
	Missing/NA	1	0.2
Milk Rate (Rs/litre)	<30	1	0.2
	30-40	93	16.1
	41-50	229	39.8
	51-60	33	5.7
	>60	1	0.2
	NA/Missing	219	38

For buffaloes, nearly half of the farmers (49.7%) did not own any, while 23.3% kept 1–2 animals. Among identified breeds, Murrah (15.1%) was most common, followed by nondescript (12%) and regional types such as Bhadawari and Tarai (5.5%). More than half of the buffaloes (52.3%)

were non-lactating, and milk production mainly fell within 3–5 L/day (20.8%) and 6–10 L/day (10.4%) categories. The prevailing milk price for buffalo milk was Rs 41–50 per litre (39.8%).

Table 7: Milking methods and milk disposal practices among surveyed farmers

Parameter	Category / Method	Number of Respondents	Percentage (%)
Milking Method	Hand Milking	426	73.96
	Machine Milking	2	0.35
	Hand + Machine Both	1	0.17
	Not Specified / Missing	147	25.52
Milk Disposal	Local Market	267	46.35
	Family/Household Consumption	144	25
	In Village Consumption	40	6.94
	Cooperative Collection Center	13	2.26
	Urban Market	4	0.69
	Home Made/Processed	2	0.35
	Random/Occasional	6	1.04
	Not Specified / Missing	100	17.36

The survey of 576 farmers in Mirzapur district revealed that hand milking was the predominant practice, adopted by 73.96% of respondents, while only 0.35% used machine milking and 0.17% employed both methods. Approximately 25.52% provided no specific response, indicating limited awareness or access to milking technologies. In terms of milk disposal, most farmers sold milk directly in local

markets (46.35%), followed by household (25%) and in-village consumption (6.94%). A small proportion supplied milk to cooperative centers (2.26%) or urban markets (0.69%), whereas home processing (0.35%) and occasional sales (1.04%) were minimal. Overall, the findings suggest that Mirzapur's dairy sector remains largely traditional, subsistence-based, and dependent on local marketing

channels.

Discussion

The observed pattern in our survey is consistent with literature showing that marginal and small farms dominate the Indo-Gangetic Plains (Kaur *et al.*, 2021) ^[11], where average landholding has fallen from 2.82 ha in 1970–71 to around 1.16 ha in 2010–11. National statistics (Ali, 2025b) ^[2] indicate marginal holdings make up 68.6% and smallholdings around 18%, aligning with Mirzapur's large share of farmers below 5 acres. Studies in Bihar (Shah *et al.*, 2019) ^[27] and Uttar Pradesh (Singh, 2015) ^[30] similarly highlight the prevalence of small and semi-medium farms, while Rajkhowa *et al.* (2021) ^[25] reported that 63% of households fall in marginal or small categories, matching Mirzapur's 63.6% in the same range. The causes of this similarity include steady population growth, inheritance-based subdivision, and reliance on agriculture as a primary livelihood, all contributing to structural fragmentation.

The educational profile of farmers in Mirzapur aligns with earlier studies across agrarian regions of India, reflecting low to moderate educational attainment among rural populations. Out of 576 surveyed farmers, 490 responded, with 34.03% illiterate and 27.78% educated only up to the primary level. Similar patterns were reported by Patel *et al.* (2013) ^[20] and Prajapati (2017) ^[24], who found that 50–76% of tribal and livestock farmers had education limited to the primary or secondary level. Koli *et al.* (2019) ^[12] likewise noted that half of their respondents were educated up to secondary school and belonged to small landholding categories. In contrast, Singh (2015) ^[30] observed higher literacy in the Eastern Plain Zone, with over 50% educated up to or beyond secondary school—indicating intra-regional disparities. The relatively low tertiary education in Mirzapur (12.16%) supports Swaminathan *et al.* (2020) ^[36], who highlighted inadequate higher educational infrastructure across rural India.

In India, agriculture continues to sustain a disproportionately large share of the population despite its modest contribution to the national economy. The sector contributes approximately 14% to the Gross Domestic Product (GDP) while employing over 60% of the workforce, indicating widespread underemployment (Lanjouw and Sharif, 2000) ^[14]. Analysis of income data from 576 farmers surveyed in Mirzapur revealed that the largest segment (38.4%) earned below ₹50,000 annually, highlighting pronounced economic constraints. These results align with Government of India (2013) estimates, which reported ₹70,285 as the average annual income in the *Vindhyan* zone during 2011–12. Similarly, the 70th NSS Round (2012–13) indicated a monthly average income of ₹4,900 (₹58,800 annually), suggesting persistent low-income conditions among farmers in Mirzapur. Comparable findings were reported by Singh *et al.* (2019), who observed that 48% of Jaunpur farmers earned ₹50,001–₹2,00,000 annually, closely corresponding with 44.96% in the same bracket in the present study. Tripathi (2022) ^[37] estimated the average household income in Uttar Pradesh at ₹1,53,488, supporting the observation that 64% of Mirzapur farmers earned below ₹1 lakh per annum. Prabha *et al.* (2019) ^[23] also noted that 74% of Mirzapur farmers fell within the ₹75,001–₹1,75,000 range. Furthermore, Ali (2022) ^[1] reported that Mirzapur

ranks among Uttar Pradesh districts with above-average poverty levels. Income above ₹2 lakh was rare (<13%), consistent with Prabha *et al.* (2019) ^[23], whereas Patidar (2023) ^[22] documented 83.89% of farmers in Madhya Pradesh in the medium-income category (₹71,960–₹4,26,042), reflecting greater diversification. Educational attainment also influenced income, as Sundar and Sharma (2000) ^[35] found that four additional years of schooling enhanced productivity by 7%, a benefit limited among Mirzapur's low-educated farming population.

Regarding income sources, 53.1% of households depended on agriculture plus livestock, indicating an integrated mixed farming system. Similar trends were observed by Pandey (2024) ^[19] (69.25%) and Vekariya *et al.* (2016) ^[38] as 54.17% from agriculture and livestock. Pathak *et al.* (2022) ^[21] in Prayagraj (Uttar Pradesh) reported 21.20% of farmers engaged in both farming and animal husbandry—lower than Mirzapur's figures—demonstrating the strong role of livestock in Mirzapur's rural economy.

Cattle ownership in Mirzapur was dominated by small herds (1–2 animals; 37.5%), followed by medium herds (3–5; 29.6%), similar to findings by Singh and Shukla (2017) ^[33] and Singh *et al.* (2023) ^[31] in Eastern Uttar Pradesh.

The dominance of Desi and Sahiwal cattle indicates a strong reliance on traditional genetic resources that are well adapted to local conditions but exhibit modest milk yields. The limited presence of high-yielding breeds such as Holstein Friesian and Jersey, and the small share of crossbreds, point to restricted adoption of improved germplasm—likely due to feeding constraints, poor breeding support, and adaptability issues. Similarly, buffalo breeding remains largely traditional, with Murrah adoption being modest. Comparable observations were made by Singh and Shukla (2017) ^[33], who reported that Eastern Uttar Pradesh farmers typically reared Desi, Sahiwal, and Hariyana cows, along with Jersey and Friesian crossbreds.

Milk yield patterns revealed that most cattle produced 3–5 L/day (32.8%) or 6–10 L/day (22.2%), matching reports from Singh and Shukla (2017) ^[33]. Buffalo milk yield was lower, with 52.3% non-lactating or <3 L/day. These results correspond to NABARD (2018) ^[16], which recorded 2.5 L/day for indigenous cows, 5.0 L/day for crossbreds, and 4.4 L/day for buffaloes in Mirzapur. Compared to national averages (BAHS 2024) ^[3], Mirzapur's milk yields align with non-descript and indigenous breeds, showing low-input, smallholder production systems. The lower buffalo yields may result from poor breed quality and limited feeding resources, as also described by Singh *et al.* (2006).

Milk pricing data revealed that most cattle milk sold for ₹30–40/L (63.7%), while buffalo milk fetched ₹41–50/L (39.8%), confirming its higher market value due to fat content and cultural preference. Prices have increased since Singh and Shukla (2017) ^[33], who reported ₹25.33/L average. Yadav *et al.* (2020) ^[39] also observed seasonal variations, with buffalo milk prices highest in summer (₹38.78/L).

The dominance of hand milking in Mirzapur is consistent with previous studies across Uttar Pradesh. Singh and Pandey (2018) ^[19] reported exclusive reliance on hand milking among all herd sizes in Etawah district, while Malik *et al.* (2005) ^[15] and Kumar *et al.* (2020) ^[13] observed similar trends, with 60–79% of farmers using the knuckling method

and very few adopting full-hand or machine milking techniques. These similarities suggest that throughout central and eastern Uttar Pradesh, low mechanization levels and limited awareness of automated milking persist. The negligible share of machine milking in Mirzapur (0.35%) aligns with these findings, reflecting both economic constraints and small herd sizes that reduce the cost-effectiveness of investing in mechanized systems. Additionally, consistent with Dattatraya (2024) ^[5], who reported 79.2% practice of knuckling in buffalo milking. In terms of milk disposal, Mirzapur's pattern mirrors conventional rural marketing channels where smallholders depend on nearby buyers rather than organized systems. Earlier studies, such as Sinha *et al.* (2010) ^[34], observed that milk disposal practices differ by urbanization level, with rural farmers preferring local sales and consumption, while urban areas benefit from structured cooperative networks. The relatively low share of cooperative-based disposal (2.26%) in Mirzapur thus reflects limited institutional linkage and inadequate milk collection infrastructure. These findings also correspond indirectly with the socio-educational profile of farmers (Desai, 2011; Patel *et al.*, 2013), ^[4, 20] indicating that lower education levels contribute to reduced adoption of improved milking and marketing practices. Hence, Mirzapur's dairy sector, while consistent with broader regional trends, underscores the need for training, cooperative development, and technological awareness to enhance milk hygiene, productivity, and market value realization.

Conclusion

The results indicate that farmers in Mirzapur rely heavily on mixed farming systems combining agriculture and livestock rearing, yet face major constraints in productivity, income diversification, and access to improved breeds. The predominance of indigenous and nondescript cattle, along with limited adoption of high-yielding or crossbred animals, reflects smallholder, low-input dairy systems that prioritize hardy, locally adapted stock over improved but management-sensitive breeds. Consequently, both average earnings and milk yields remain below state and national benchmarks. Enhancing productivity through better breeding services, feed management, and livelihood diversification is essential for improving rural income and sustainability.

Highlights

- Landholding is dominated by small and medium farmers, reflecting fragmented agricultural structures.
- Educational attainment is low, with most farmers illiterate or having only primary-level education.
- Majority of households earn below ₹1,00,000 annually, indicating economic vulnerability.
- Agriculture combined with livestock rearing is the principal livelihood for most respondents.
- Dairy practices are traditional, dominated by hand milking and local market sales.
- Limited mechanization, low income, and education gaps highlight subsistence-oriented farming in Mirzapur.

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