

International Journal of Agriculture Extension and Social Development

Volume 9; SP-Issue 7; July 2026; Page No. 135-141

Received: 24-05-2026
Accepted: 28-06-2026

Indexed Journal
Peer Reviewed Journal

A gender-based assessment of livestock-rearing households across climate vulnerability zones of Rajasthan, India

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DOI: <https://doi.org/10.33545/26180723.2026.v9.i7Sb.3997>

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Abstract

Livestock rearing in the dry areas of Rajasthan is a joint household activity, but the men and women of the same house do not have the same education, income or access to information. This study compared the personal, economic and communication characteristics of male and female decision-makers in livestock-rearing households across three climate-vulnerability zones of Rajasthan. One male decision-maker (MDM) and one female decision-maker (FDM) were interviewed from each of 204 households (408 respondents), selected by multistage stratified random sampling from Udaipur (high vulnerability), Tonk (moderate) and Bikaner (low). Data were collected with a pre-tested interview schedule during July-September 2025 and analysed using percentage, paired t test, chi-square test, analysis of variance and the Mann-Whitney U test. Men and women were close in age (42.5 ± 0.69 and 38.5 ± 0.71 years) but differed widely in everything that depends on opportunity. More women than men were illiterate (28.40% against 9.80%; $\chi^2 = 44.81$, $p < 0.001$) and fewer had attended any livestock training (28.43% against 49.02%; $\chi^2 = 18.22$, $p < 0.001$). Most families were nuclear (57.80%), two-thirds of the households had little or no land, and livestock brought ₹71,800 $\pm$ 2,648 of a mean yearly income of ₹1,86,400 $\pm$ 6,419. The gap was widest in communication, as 72.06 percent of the women scored low in social participation, 84.31 percent in extension contact and 69.61 percent in mass media exposure ($p < 0.001$). Differences between districts were small, which shows that these gaps arise from social structure and not from the local climate. Mobile phones and social media groups were used more than any formal institution by both groups, which offers a simple starting point for advisory services meant for women.

Keywords: Climate vulnerability, extension contact, gender disparity, livestock farming, mass media exposure, paired-household design, Rajasthan, socio-economic profile

Introduction

India has the largest livestock population in the world, and the sector now supports the rural economy in its own right and not merely as a part of crop farming. Milk production reached about 247.87 million tonnes in 2024-25 (Basic Animal Husbandry Statistics, 2025) [7]. Households with little or no land own a large share of the animals, and survey analyses show that the smaller the landholding, the more the family depends on income from livestock (National Statistical Office, 2021) [25]. Livestock is therefore mainly the business of households that own the least land. Rajasthan carries this dependence along with a high climatic risk. The state stands second in the country with 56.8 million animals (DAHD, 2019) [13] and gives 14.82 percent of India's milk (Basic Animal Husbandry Statistics, 2025) [7], yet it has barely one percent of the country's water spread over ten percent of its land (Government of Rajasthan, 2010) [17]. More than sixty percent of the state is dry or partly dry, temperatures rose at all five divisional headquarters between 1971 and 2019 (Sharma *et al.*, 2021)

[36], and rainfall is very uneven (Government of Rajasthan, 2022) [18]. The Climate Vulnerability Assessment for Adaptation Planning in India placed the state in the upper-middle vulnerable class (vulnerability index 0.535; DST, 2021) [14]. Animals in such areas face heat stress, shortage of fodder and water and more disease at the same time, but studies from South Asia report again and again that whether a family takes up new coping practices depends less on the climate risk it faces than on its education, assets and contact with institutions (Aryal *et al.*, 2018, 2020, 2021; Kc *et al.*, 2025; Panja *et al.*, 2026) [4, 5, 6, 19, 27].

Women in India do most of the animal care at home, and their share in livestock work has been rising, though official records still miss much of it (Vijayalakshmy *et al.*, 2023; Kumar *et al.*, 2026) [38, 22]. Yet these same women are less likely to own the animals they look after, to be listed as the farmer by an extension officer, or to be called for a training programme (Deere *et al.*, 2013; Doss *et al.*, 2019; Matsepe *et al.*, 2025) [12, 15, 24]. Studies from Haryana, Andhra Pradesh, Kerala, Karnataka and Bihar report that women

meet veterinary and advisory staff only occasionally, while men use both formal and informal sources of information (Bhuyan and Ponnusamy, 2017; Keerthi *et al.*, 2022; Adithyan *et al.*, 2025; Ramya *et al.*, 2026; Pandey and Kritika, 2026)^[8, 20, 1, 31, 26], and clear differences between men and women in the extent of adaptation have been found where climate-smart practices were studied by who takes the decision (Chepkoechi *et al.*, 2025)^[10].

A profile of this kind matters because such personal and economic characteristics themselves decide what is practised on the farm, as shown for dairy households in Punjab (Saran *et al.*, 2025)^[34]. Most profile studies, however, interview only one person per household, usually the man treated as its head, and so cannot show inequality inside the house, while studies that compare separate groups of men and women mix the effect of gender with that of village, wealth, caste and farming conditions. A paired design, in which one man and one woman of the same household are interviewed, holds the household constant and shows the effect of gender alone. Rajasthan is a strict test case, as it has the widest gap between male and female literacy among Indian states (79.19% against 52.12%, Census of India, 2011)^[9] along with strong customs limiting the movement of women. This paper therefore profiles livestock-rearing households of the state and asks how far the man and the woman of the same household differ, and whether the district climate-vulnerability class or gender explains more of the variation, which decides whether adaptation programmes should be aimed at areas or at people.

Materials and Methods

Research Design and Locale

The study followed an ex post facto and exploratory research design. Rajasthan, the largest Indian state by area (342,239 km²) and second in livestock population, was selected purposively because it combines climatic vulnerability with gender inequality.

Sampling Procedure

A multistage stratified random sampling procedure was used. The sample size was worked out with Cochran's formula for large populations, $n = Z^2p(1-p)/e^2$, taking $Z = 1.96$ at the 95 percent confidence level, $p = 0.50$ and $e = 0.05$, which gave a minimum of 385 respondents. Since the study used a paired-household design, in which one male and one female decision-maker were interviewed from each household, this worked out to about 193 households, and the figure was rounded up to 204 households, giving 408 respondents.

Districts were stratified by the vulnerability classification of the Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework (DST, 2021)^[14], and one district was selected at random from each category, namely Udaipur (relatively high, VI = 0.62), Tonk (relatively moderate, VI = 0.55) and Bikaner (relatively low, VI = 0.48). Two blocks were selected at random from each district, two villages from each block and 17 households from each village, giving 68 households per district. A household was included only if it had at least five years of livestock farming experience and owned more than five animals (cattle or buffalo), and one male decision-maker

(MDM) and one female decision-maker (FDM) were interviewed separately from each.

Variables and their Measurement

The socio-personal variables were age (young, up to 35 years; middle, 36-50 years; and old, 51 years and above), education (six ordinal categories from illiterate to graduate), training exposure, primary and secondary occupation, and livestock farming experience. The household-level variables were family type, family size and family education status, the last being the mean educational score of all household members above six years of age on a 0-5 scale. The socio-economic variables were total annual household income, annual income from livestock, landholding (standard operational-holding categories) and herd size in livestock units (LU).

The communication variables were social participation, extension contact and mass media exposure, each item being recorded on a three-point frequency scale (often = 2, occasionally = 1, never = 0). For ranking the channels, a Total Rank Order Score (TROS) was worked out for every source by adding the weighted responses of all respondents in the group. For classifying the respondents, the individual scores were added across items to give a mean rank score (MRS), and the respondents were placed in low, medium and high categories.

Data Collection and Statistical Analysis

Data were collected with a pre-tested structured interview schedule during July-September 2025, supplemented by in-depth discussion and participant observation. Male and female respondents from the same household were interviewed separately to reduce response contamination, because joint interviewing in patriarchal settings tends to suppress women's independent responses. The data were analysed in IBM SPSS 26.0 using percentage analysis, the chi-square test for categorical comparisons, one-way analysis of variance and the paired t test for continuous variables, and the Mann-Whitney U test for the ordinal communication distributions, which departed from normality. Significance was tested at the 5 and 1 percent levels.

Results and Discussion

Socio-Personal Profile of Respondents

Age: The mean age of male and female decision-makers was 42.5 ± 0.69 and 38.5 ± 0.71 years (Table 1). Middle-aged respondents formed the largest group in both cases (51.00% of MDM and 42.60% of FDM), and among women the young group was almost as large (42.20% against 28.40%). The difference between men and women was significant ($t = 38.88$, $df = 203$, $p < 0.01$), but the difference between districts was not ($F = 1.74$, $p = 0.177$). Both groups were therefore in their working years, which is favourable for taking up new practices, as also reported by Rajpurohit *et al.* (2020)^[30], Choudhary *et al.* (2018)^[11] and Keerthi *et al.* (2022)^[20].

Education Status

The pattern for education was very different. Among men the largest group had studied up to high school (25.50%), followed by middle school (22.50%), primary school

(19.60%), senior secondary (14.70%), illiterate (9.80%) and graduate (7.80%), so nearly half (48.00%) had reached high school or above. Among women, 28.40 percent were illiterate and another 29.40 percent had studied only up to the primary level, while 20.60 percent had reached middle school and only 16 women in the whole sample had studied beyond high school. The difference between men and women was significant ($\chi^2 = 44.81$, $df = 5$, $p < 0.001$) while the difference between districts was not ($\chi^2 = 3.13$, $df = 10$, $p = 0.978$), so the gap follows gender and not location, as also seen by Rajpurohit *et al.* (2020) [30] in Bikaner. Education decides whether a farmer can read an advisory, follow a weather forecast, use a mobile application or deal with office staff, so it affects every other result in this study (Sharma *et al.*, 2023; Yadav *et al.*, 2026) [35, 39].

Training Exposure

Nearly half of the men (49.02%) had attended at least one livestock training programme against 28.43 percent of the women, and 71.57 percent of the women had never attended any ($\chi^2 = 18.22$, $df = 1$, $p < 0.001$). The same gap was found in each district (Udaipur, $\chi^2 = 5.39$, $p < 0.05$; Tonk, $\chi^2 = 4.48$, $p < 0.05$; Bikaner, $\chi^2 = 8.73$, $p < 0.01$), while differences between districts within each group were not significant. If distance or local climate stress were the cause, the gap would change from district to district, but it does not. It changes only with gender, which points to the way training is arranged, that is, its timing, its place, the travel it needs and the habit of calling the head of the family. Choudhary *et al.* (2018) [11] found that 87.5 percent of their respondents had received no livestock training, and

Rajpurohit *et al.* (2020) [30] recorded 91.33 percent attendance among men against 60.67 percent among women. Studies on advisory work for women suggest training at times and places suited to women, and more women extension staff (Siaw *et al.*, 2024; Matsepe *et al.*, 2025; Ramya *et al.*, 2026) [37, 24, 31].

Occupation

Agriculture was the main occupation of 64.70 percent of the men and 58.80 percent of the women, followed by livestock rearing (14.70% and 23.50%) and labour (20.60% and 17.60%), and the difference was not significant ($\chi^2 = 5.19$, $df = 2$, $p = 0.075$). Livestock rearing was the main side occupation for both groups, and here the share of women was higher (66.70% against 58.80%), with the same pattern in all three districts. This matches the known Indian pattern in which women do most of the animal care at home even when livestock is counted as a side activity (Vijayalakshmy *et al.*, 2023) [38]. Work that is daily, done at home and unpaid is usually recorded as secondary, which is one reason why the animal-care work of women goes unrecorded (Kumar *et al.*, 2026; Doss *et al.*, 2019) [22, 15].

Livestock Farming Experience

Mean experience was 15.1 ± 0.61 years for the men and 8.1 ± 0.43 years for the women. Among men, 28.90 percent had long experience and 34.30 percent short, while among women the figures were 5.40 and 67.60 percent ($t = 14.81$, $df = 203$, $p < 0.01$), with little change between districts. Choudhary *et al.* (2018) [11] also placed most of their respondents in the medium experience group.

Table 1: Socio-personal profile of male and female decision-makers (n = 204 each)

Particulars	MDM (n = 204)	FDM (n = 204)	Gendered comparison
Age (years)			
Young (up to 35)	58 (28.4)	86 (42.2)	t = 38.88, df = 203, $p < 0.01$
Middle (36-50)	104 (51.0)	87 (42.6)	
Old (51 and above)	42 (20.6)	31 (15.2)	
Mean $\pm$ SE	42.5 $\pm$ 0.69	38.5 $\pm$ 0.71	
Education Status			
Illiterate	20 (9.8)	58 (28.4)	$\chi^2 = 44.81$, df = 5, $p < 0.001^{**}$
Primary school	40 (19.6)	60 (29.4)	
Middle school	46 (22.5)	42 (20.6)	
High school	52 (25.5)	28 (13.7)	
Sr. Sec. school	30 (14.7)	12 (5.9)	
Graduate	16 (7.8)	4 (2.0)	
Training attainment			
None	104 (50.98)	146 (71.57)	$\chi^2 = 18.22$, df = 1, $p < 0.001^{**}$
Received	100 (49.02)	58 (28.43)	
Primary occupation			
Agriculture	132 (64.7)	120 (58.8)	$\chi^2 = 5.19$, df = 2, $p = 0.075$ ns
Livestock farming	30 (14.7)	48 (23.5)	
Labour	42 (20.6)	36 (17.6)	
Secondary occupation			
Agriculture	48 (23.5)	35 (17.2)	$\chi^2 = 3.17$, df = 2, $p = 0.205$ ns
Livestock farming	120 (58.8)	136 (66.7)	
Labour	36 (17.6)	33 (16.2)	
Livestock farming experience (years)			
Low (up to 10)	70 (34.3)	138 (67.6)	t = 14.81, df = 203, $p < 0.01^{**}$
Medium (11-20)	75 (36.8)	55 (27.0)	
High (above 20)	59 (28.9)	11 (5.4)	
Mean $\pm$ SE	15.1 $\pm$ 0.61	8.1 $\pm$ 0.43	

****** Significant at 1 percent or beyond ($p < 0.01$); ns = not significant; df = degrees of freedom. Figures in parentheses indicate percentages.

Household Profile

Nuclear families made up 57.80 percent of the households and joint families 42.20 percent, with almost no change across districts ($\chi^2 = 0.04$, $df = 2$, $p = 0.980$). Most families had five to seven members (64.20%), giving a mean of 5.9 ± 0.17 members ($F = 0.14$, $p = 0.87$). Family education status placed nearly two-thirds of the households (63.20%) in the medium group (2.1-4.0), with a mean of 3.0 ± 0.10 on a five-point scale and again no district effect ($F = 0.08$, $p =$

0.92), so the average family had studied up to about middle school (Table 2). This agrees with Rajpurohit *et al.* (2020)^[30] for Bikaner and with the family size reported by Kujur (2026)^[21]. One point deserves attention. The family education score is pulled down by the low schooling of adult women, so this household measure, often used in adoption studies, already carries within it the gender gap it is meant to control.

Table 2: Household profile of respondents, pooled and district-wise comparison

Particulars	Udaipur (High)	Tonk (Moderate)	Bikaner (Low)	Pooled (n = 204)	District-wise comparison
Family type					
Nuclear	40 (58.8)	39 (57.4)	39 (57.4)	118 (57.8)	$\chi^2 = 0.04$, df = 2, p = 0.980 ns
Joint	28 (41.2)	29 (42.6)	29 (42.6)	86 (42.2)	
Family size (members)					
Up to 4	15 (22.1)	10 (14.7)	13 (19.1)	38 (18.6)	F = 0.14, df = 2,201, p = 0.87 ns
5-7	38 (55.9)	45 (66.2)	48 (70.6)	131 (64.2)	
8 or more	15 (22.1)	13 (19.1)	07 (10.3)	35 (17.2)	
Mean $\pm$ SE	5.8 $\pm$ 0.29	6.0 $\pm$ 0.28	6.0 $\pm$ 0.30	5.9 $\pm$ 0.17	
Family education status (score)					
Low (0.0-2.0)	17 (25.0)	13 (19.1)	15 (22.1)	45 (22.1)	F = 0.08, df = 2,201, p = 0.92 ns
Medium (2.1-4.0)	40 (58.8)	46 (67.6)	43 (63.2)	129 (63.2)	
High (4.1-5.0)	11 (16.2)	09 (13.2)	10 (14.7)	30 (14.7)	
Mean $\pm$ SE	3.0 $\pm$ 0.17	3.0 $\pm$ 0.17	3.1 $\pm$ 0.17	3.0 $\pm$ 0.10	

ns = not significant; df = degrees of freedom. Figures in parentheses indicate percentages.

Socio-Economic Profile

Annual Income: Most households earned ₹1-2 lakh a year (42.20%), followed by ₹2-3 lakh (27.00%), below ₹1 lakh (18.60%) and above ₹3 lakh (12.30%), giving a mean of $₹1,86,400 \pm 6,419$ with a significant difference between districts ($F = 5.81$, $p = 0.004$). The lowest mean income was found in Bikaner (₹1,56,400), the district ranked lowest in vulnerability, against ₹1,98,200 in Udaipur and ₹2,04,600 in Tonk. Income from livestock followed the same order, ₹62,500 in Bikaner, ₹74,800 in Udaipur and ₹78,100 in Tonk, with a mean of $₹71,800 \pm 2,648$ ($F = 3.28$, $p = 0.040$) (Table 3).

The vulnerability rank of a district is built from many indicators of exposure, sensitivity and adaptive capacity, so a district may stand lower in vulnerability and still be poorer. The drier climate of Bikaner may limit fodder supply and milk yield whatever its overall rank, and a similar picture was reported for buffalo-rearing households by Aiswarya *et al.* (2026)^[2]. Livestock provided about 38

percent of the mean total income of the sample.

Landholding and Herd Size

Two-thirds of the households were landless (32.80%) or marginal (34.30%), with a mean of 3.8 ± 0.5 acres and no significant difference between districts ($F = 0.05$, $p = 0.947$). Herds were also small, as 48.00 percent of the households kept less than 5 LU, 37.30 percent kept 5-10 LU and 14.70 percent kept more, giving a mean of 6.2 ± 0.3 LU with no district effect ($F = 0.10$, $p = 0.906$). Small holdings with small herds describe a system kept for family needs rather than for the market. This agrees with the national pattern in which landless, marginal and small households keep most of the animals (National Statistical Office, 2021)^[25] and with Rajpurohit *et al.* (2020)^[30] for Bikaner, but differs from Kumar *et al.* (2015)^[23] for tribal households in Jharkhand, where the farming conditions and the animals kept were different.

Table 3: Socio-economic profile of households, pooled and district-wise comparison

Particulars	Udaipur (High)	Tonk (Moderate)	Bikaner (Low)	Pooled (n = 204)	District-wise comparison
Total annual income (₹)					
Up to 1,00,000	9 (13.2)	9 (13.2)	20 (29.4)	38 (18.6)	F = 5.81, df = 2,201, p = 0.004**
1,00,001-2,00,000	29 (42.6)	27 (39.7)	30 (44.1)	86 (42.2)	
2,00,001-3,00,000	21 (30.9)	21 (30.9)	13 (19.1)	55 (27.0)	
Above 3,00,000	9 (13.2)	11 (16.2)	5 (7.4)	25 (12.3)	
Mean ± SE	1,98,200 ± 11,074	2,04,600 ± 11,468	1,56,400 ± 9,995	1,86,400 ± 6,419	
Annual income from livestock (₹)					
Below 50,000	25 (36.8)	17 (25.0)	28 (41.2)	70 (34.3)	F = 3.28, df = 2,201, p = 0.040*
50,000-1,00,000	26 (38.2)	32 (47.1)	28 (41.2)	86 (42.2)	
Above 1,00,000	17 (25.0)	19 (27.9)	12 (17.6)	48 (23.5)	
Mean ± SE	74,800 ± 4,706	78,100 ± 4,613	62,500 ± 4,278	71,800 ± 2,648	
Landholding (acres)					
Landless (0)	23 (33.8)	23 (33.8)	21 (30.9)	67 (32.8)	F = 0.05, df = 2,201, p = 0.947 ns
Marginal (up to 2.50)	23 (33.8)	24 (35.3)	23 (33.8)	70 (34.3)	
Small (2.51-5.00)	8 (11.8)	5 (7.4)	7 (10.3)	20 (9.8)	

Semi-medium (5.01-10.00)	6 (8.8)	8 (11.8)	10 (14.7)	24 (11.8)	F = 0.05, df = 2,201, p = 0.947 ns
Medium (10.01-25.00)	7 (10.3)	6 (8.8)	5 (7.4)	18 (8.8)	
Large (> 25.00)	1 (1.5)	2 (2.9)	2 (2.9)	5 (2.5)	
Mean ± SE	3.6 ± 0.7	4.0 ± 0.8	3.9 ± 0.8	3.8 ± 0.5	
Herd size (livestock units)					
Small (below 5 LU)	33 (48.5)	31 (45.6)	34 (50.0)	98 (48.0)	F = 0.10, df = 2,201, p = 0.906 ns
Medium (5-10 LU)	25 (36.8)	26 (38.2)	25 (36.8)	76 (37.3)	
Large (above 10 LU)	10 (14.7)	11 (16.2)	9 (13.2)	30 (14.7)	
Mean ± SE	6.0 ± 0.6	6.4 ± 0.6	6.2 ± 0.5	6.2 ± 0.3	

** Significant at 1 percent or beyond ($p < 0.01$); * significant at 5 percent ($p < 0.05$); ns = not significant; df = degrees of freedom. Figures in parentheses indicate percentages.

Communication Profile:

Social Participation: Among the men, social media groups had the highest participation (TROS = 202, Rank I), followed by agricultural cooperative societies, farmer organisations and dairy cooperative societies, with self-help groups last (TROS = 72, Rank V). Women followed a similar order, with social media groups first (TROS = 136), but their level of participation was much lower and the answer 'never participated' was the most common for every organisation, reaching 83.82 percent for self-help groups (Table 5). By level (Table 4), most men (54.90%) were in the medium group with a mean score of 4.08 ± 0.12 , while 72.06 percent of the women were in the low group with 2.51 ± 0.11 ($U = 31208$, $p < 0.001$), the same contrast reported by Rajpurohit *et al.* (2020) [30]. The place of self-help groups is worth noting, because such groups are expected to carry the collective participation of women. Their last rank for both groups shows that few livestock-rearing women in these villages are covered by them, a gap that cooperative programmes have been shown to reduce (Farnworth *et al.*, 2023; Purwanti *et al.*, 2025; Pandey and Kritika, 2026) [16, 29, 26].

Extension Contacts

Private veterinary practitioners (Rank I) and veterinary hospitals or sub-centres (Rank II) were contacted most by both groups, followed by cooperatives, ICAR institutes and KVKs, while the state veterinary university came last for both. The order was the same for men and women but the level of contact was not, as the answer 'never' among women ranged from 63.73 to 79.90 percent across the sources. By level, 50.98 percent of the men were in the medium group and 2.45 percent in the high group, while 84.31 percent of the women stayed in the low group and

none reached the high group ($U = 33230$, $p < 0.001$). Both groups thus depend on the nearby person who comes when an animal falls ill rather than on knowledge institutions, so advice on climate-resilient practices travels through channels meant for treatment and not for prevention, although such advice needs to be given before the season rather than after the problem (Prabex *et al.*, 2024) [28]. The near absence of women from institutional contact matches reports from dairy households in Haryana (Bhuyan and Ponnusamy, 2017) [8] and other work on the barriers women face in reaching advisory services (Alvi *et al.*, 2021; Matsepe *et al.*, 2025) [3, 24].

Mass Media Exposure

Mobile phones came first for both groups (TROS = 219 for men and 196 for women), followed by television. After these two the orders differ. Newspapers came third among men but fifth among women (70.59% never), while radio moved from fifth among men to third among women, because it costs little, is available at home and does not need reading. The Kisan Call Centre came last for both. By level, 67.16 percent of the men were in the medium group against 69.61 percent of the women in the low group, and again no woman reached the high group ($U = 31867$, $p < 0.001$); Rajpurohit *et al.* (2020) [30] and Choudhary *et al.* (2018) [11] reported similar differences. The channels that need reading are exactly the ones that leave out women with little schooling, while those based on sound and pictures do reach them. Since mobile phones and social media groups stand above every formal institution for both groups, advisory services for women will work best through these, provided the message is given in the local language as voice or picture, because owning a phone does not by itself mean being able to use it (Adithyan *et al.*, 2025) [1].

Table 4: Distribution of respondents by level of social participation, extension contact and mass media exposure

Particulars	MDM (n = 204)	FDM (n = 204)	Pooled (N = 408)	Mann-Whitney U test
Social participation				
Low (0-3)	75 (36.76)	147 (72.06)	222 (54.41)	U = 31208, $p < 0.001^{**}$
Medium (4-6)	112 (54.90)	56 (27.45)	168 (41.18)	
High (7-10)	17 (8.33)	1 (0.49)	18 (4.41)	
MRS (mean $\pm$ SE)	4.08 $\pm$ 0.12	2.51 $\pm$ 0.11	3.30 $\pm$ 0.09	
Extension contacts				
Low (0-5)	95 (46.57)	172 (84.31)	267 (65.44)	U = 33230, $p < 0.001^{**}$
Medium (6-10)	104 (50.98)	32 (15.69)	136 (33.33)	
High (11-14)	5 (2.45)	0 (0.00)	5 (1.23)	
MRS (mean $\pm$ SE)	5.53 $\pm$ 0.19	3.43 $\pm$ 0.16	4.48 $\pm$ 0.14	
Mass media exposure				
Low (0-5)	62 (30.39)	142 (69.61)	204 (50.00)	U = 31867, $p < 0.001^{**}$
Medium (6-10)	137 (67.16)	62 (30.39)	199 (48.77)	
High (11-14)	5 (2.45)	0 (0.00)	5 (1.23)	
MRS (mean $\pm$ SE)	6.43 $\pm$ 0.18	4.27 $\pm$ 0.19	5.35 $\pm$ 0.14	

** Significant at 1 percent or beyond ($p < 0.01$). MRS = mean rank score. Figures in parentheses indicate percentages.

Table 5: Total Rank Order Scores and ranks of social organisations, extension sources and mass media channels

Source / organisation	MDM TROS	MDM Rank	FDM TROS	FDM Rank
Social organisations				
Social media groups	202	I	136	I
Agri cooperative society	181	II	97	IV
Farmer organisations	180	III	109	II
Dairy cooperative society	169	IV	99	III
Self-help groups	72	V	45	V
Extension contacts sources				
Private veterinary practitioners	189	I	112	I
Veterinary hospitals/sub-centres	187	II	105	II
Cooperatives	183	III	99	III
ICAR institutes	177	IV	97	IV
KVK	169	V	94	V
Input dealers	159	VI	93	VI
State veterinary university	109	VII	58	VII
Mass media channels				
Mobile phone	219	I	196	I
Television	211	II	186	II
Newspaper	169	III	90	V
Kisan mela / Pashu mela	167	IV	88	VI
Radio	159	V	150	III
Internet access	156	VI	97	IV
Kisan Call Centre	150	VII	84	VII

TROS = Total Rank Order Score, computed as the weighted sum of responses (often = 2, occasionally = 1, never = 0) across respondents in each group.

Overall Pattern

Age, family type, family size, landholding and herd size were similar for men and women of the same households and also across the three districts. Clear differences between men and women appeared only in education, training, membership of organisations, contact with institutions and use of media, while differences between districts stayed very small. The unequal access of women to information, resources and support therefore comes from social and family structure rather than from climate vulnerability, as also reported in studies on gender and climate-smart adoption (Rao *et al.*, 2019; Rietveld *et al.*, 2023; Chepkochi *et al.*, 2025) [32, 33, 10].

Conclusion

In 204 paired livestock-rearing households of three climate-vulnerability zones of Rajasthan, men and women were alike in landholding (3.8 acres), herd size (6.2 livestock units), income and main occupation, but differed sharply in everything shaped by social opportunity, as women showed higher illiteracy (28.4% against 9.8%), lower attendance at livestock training (28.4% against 49.0%), fewer recorded years of experience (8.1 against 15.1 years) and almost no contact with extension services and mass media. Climate vulnerability at the district level had little influence on these differences, which shows that the gaps are social rather than geographical. Livestock programmes should therefore reach women directly through village-level training, flexible timings, women extension workers and messages addressed to women farmers and not only to the head of the family, supported by advisory services in the local language given as voice or picture, and should record the work women do with animals, which at present remains largely invisible.

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