

# Information and Communication Technology (ICT) Utilization Patterns among Small Ruminant Farmers in West Bengal

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## ABSTRACT

India's increasing demand for livestock products, driven by a 70% non-vegetarian population and rising meat consumption, is expected to surge by 2050. Meeting this demand necessitates a 3-fold rise in meat production. Small ruminants like goats and sheep are crucial, especially for landless and small farmers. However, constraints such as inadequate veterinary services, poor market access, and limited awareness of scientific practices hinder productivity. With the country's rapid digitalization, ICT tools offer promising solutions. A study of 120 small ruminant farmers in West Bengal found WhatsApp to be the most commonly used tool (100%), followed by YouTube (89.57%), Facebook (82.67%), and Television. WhatsApp was accessed daily by all farmers. However, adoption was limited by high costs (mean score 79.99), lack of relevant content (60.6), and language barriers (54.59). Despite these challenges, expanding smartphone usage and affordable data are boosting ICT penetration in rural areas. The study highlights the potential of digital platforms to improve knowledge dissemination, veterinary services, and market linkages. Strengthening digital infrastructure and integrating AI-driven advisory systems can significantly enhance sustainable livestock production in India.

**Key words:** Digital tools, ICT adoption, ICT Utilization pattern, Sheep and Goat, Small ruminants.

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## INTRODUCTION

India's livestock sector contributes 30.19% to agriculture GVA and 5.73% to total GVA (BAHS, 2025), with 535.78 million animals, including 148.88 million goats and 74.26 million sheep (20<sup>th</sup> Livestock Census, 2019). Sheep and goat farming supports 33 million rural households and provides 4% of rural employment, especially benefiting marginal and landless farmers (Singh *et al.*, 2018). Small ruminants in India produce 2.23 million tonnes of meat, 7 million tonnes of milk, and 33.13 million kg of wool. India ranks 1<sup>st</sup> in goat population and small ruminant meat exports, and 3<sup>rd</sup> in sheep population (BAHS, 2025). Their rising populations and productivity underscore their role in ensuring economic and nutritional security in rural India.

By 2050, India's population will rise by 34%, tripling animal protein needs and doubling meat demand, requiring higher productivity rather than more livestock. Small ruminant farmers, vital to meat production, face major productivity challenges due to information gaps in scientific management, marketing, and farm economics (Gulati *et al.*, 2018). A severe shortage of funds and a 50% staff shortfall in extension services limit outreach, benefiting only 6.8% of farmers (Phand *et al.*, 2021; Thakur & Chander, 2018). In this context, the effective use of Information and Communication Technologies (ICTs) presents a viable solution. ICT refers to a broad range of technologies that enable access to, storage, transmission, and exchange of information through various communication channels (Khan *et al.*, 2012). The digital technologies offer an accessible and scalable means to bridge knowledge gaps. Rising smartphone use, projected to grow

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6% in rural and 2.5% in urban areas, boosts ICT potential to deliver timely, relevant, and location-specific livestock information, enhancing productivity and sustainability (Kemp, 2025). There is a very limited number of studies regarding ICT utilization patterns among small ruminant farmers in the study area. Considering the above facts and significance, the present study was undertaken to evaluate the pattern of ICT tool usage among small ruminant farmers in the Lower Gangetic region of West Bengal to benefit policymakers and extension personnel for the development of strategies for the dissemination of information promptly.

## MATERIALS AND METHODS

To comprehensively examine the ICT utilization patterns among commercial small ruminant farmers, the researcher purposively selected West Bengal as the study area. This decision was driven by the state's notable growth rate in goat population (41.49%), the highest in the country. Additionally, West Bengal is known for its significant indigenous breeds such as Garole sheep and Black Bengal goats, which further justify its selection. The region's predominantly non-vegetarian population (98%) also contributes to a high demand for small ruminant meat, making it a suitable area for studying commercial farming practices. For the purpose of data collection, two districts each were selected based on the presence of commercial farms, Howrah and Hooghly for goats, and North 24 Parganas and South 24 Parganas for sheep. From each of these districts, one block with a relatively high concentration of commercial farms was purposively chosen: Jagatballavpur (Howrah), Jangipara (Hooghly), Barrackpore I (North 24 Parganas), and Patharpratima (South 24 Parganas). Lists of commercial farms in these areas were then collected from Krishi Vigyan Kendras (KVKs) and Block Livestock Development Officers. Using this information, a sampling frame was created, and within each block, clusters with the highest farm concentrations were identified. From each block, one cluster was randomly selected. Within each cluster, 30 respondents were chosen following a random sampling without replacement method, all of whom operated farms with a minimum flock size of 50 animals. This multi-stage sampling process resulted in a total of 60 goat farmers and 60 sheep farmers being selected, making the final sample size 120. Data was collected with the help of a pre-tested structured interview schedule. The statistical methods employed for data analysis comprised frequency distribution, percentage analysis, calculation of mean and standard deviation, and correlation analysis. To analyze the challenges faced by the small ruminant farmers, the Garrett ranking technique was utilized. The formula for calculating the Garrett score is as follows:

$$\text{Percent position of each rank} = \frac{100(R_{ij} - 0.05)}{N_j}$$

Where,  $R_{ij}$  = Rank given for the  $i^{\text{th}}$  factor for the  $j^{\text{th}}$  respondent, and  $N_j$  = Number of factors ranked by the  $j^{\text{th}}$  respondent

Empirical data were tabulated and analyzed using suitable statistical methods with SPSS software. The utilization pattern was assessed through three main components: types of ICT tools used, frequency and experience in use of different ICT tools, monthly spending on ICT tools, and the challenges faced in their use. The primary outcome variable in the study was how frequently different ICT tools were used. Responses from small ruminant farmers regarding this aspect were collected using a three-point continuum scale,

categorizing usage as daily, weekly, and occasionally. These categories were assigned scores of 3, 2, and 1, respectively. The final scores were calculated by multiplying the number of responses for each category by the corresponding score (3, 2, and 1).

## RESULTS AND DISCUSSION

### Use of Different ICT Tools

Table 1 presents the extent to which various ICT tools are adopted by small ruminant farmers. A closer look at the Table 1 showed that WhatsApp is the most widely used ICT tool, with full adoption among all respondents (100%), followed by YouTube (95.83%), television (85.83%), Facebook (62.5%), online payment apps (61.67%), radio (52.5%), websites (34.17%), and KCC (2.5%). Notably, none of the sheep farmers used the KCC service, and only 5% of goat farmers reported utilizing it. Usage patterns of WhatsApp, Facebook, and YouTube are relatively similar between goat and sheep farmers, with 100% of both groups using WhatsApp, 70% and 55% using Facebook, and 100% and 91.67% using YouTube, respectively. The results of Thakur and Chander (2018) fall in line with the current study, where they reported that most livestock owners in Himachal Pradesh relied on social media for livestock-related information, likely due to its ease of access, real-time updates, and interactive features that facilitate communication with experts and fellow farmers. In contrast, Mukherjee and Jha (2024), in their study on the utilization pattern of ICTs among the farming community in West Bengal, found that the majority of respondents depended on television for agricultural information. This highlights the continued relevance of television, especially channels like Krishi Darshan, which focus primarily on broadcasting agriculture-specific content to rural audiences.

### Frequency of Use of Different ICT Tools

The investigation into ICT tool usage frequency for small ruminant farming, as shown in Table 2, revealed WhatsApp as the most widely used platform, accessed daily by 100% of respondents. Other tools frequently used daily included YouTube (89.57%), Facebook (82.67%), online money transfer apps (85.13%), and television (71.84%). Radio and websites were mostly used occasionally by 98.42% and 51.2% of respondents, respectively, while all participants occasionally used the Kisan Call Centre. WhatsApp ranked highest with a Total Rank Order Score (TROS) of 360, followed by YouTube (323), television (254), money transfer apps (211), and Facebook (209). Facebook was also used daily by a majority of goat (70%) and sheep (55%) farmers, owing to its ease of use and support for multimedia communication. YouTube usage was higher among goat farmers (164) than among sheep farmers (129), with most users engaging daily (67.27%). Its popularity is attributed to a vast variety of farming-related content and its on-demand accessibility. Similarly, the frequent use



of money transfer apps reflects user preference for simple, secure, and efficient transactions. The Mann-Whitney U test confirmed significant differences ( $p < 0.05$ ) in ICT tool usage frequency between goat and sheep farmers. These findings aligned with Jha and Kashyap (2021), who reported that the majority of the respondents were using mobile and social media daily in Uttarakhand. However, these results contrast with Verma and Sharma (2013), who found that the majority of livestock owners did not use television or mobile phones (81.7%) for information purposes.

### Experience in Use of Different ICT Tools

Table 2 further highlights respondents' experience with various ICT tools over time. Among goat farmers, 75% reported using WhatsApp for 1-5 years, indicating consistent engagement. In contrast, sheep farmers showed greater experience with traditional media, which were radio (75%), Face book (72.72%), and television (50.91%). Notably, no sheep owners reported using the Kisan Call Centre, pointing to a gap in awareness or access. Both groups showed diverse experience levels with WhatsApp and YouTube, particularly

**Table 1:** Distribution of respondents according to the use of ICT tools

ICT tool	Goat owners (n = 60)		Sheep owners (n =60)		Pooled (N = 120)	
	Use	Don't use	Use	Don't use	Use	Don't use
Radio	39 (65.00)	21 (35.00)	24 (40.00)	36 (60.00)	63 (52.50)	57 (47.50)
TV	48 (80.00)	12 (20.00)	55 (91.67)	5 (8.33)	103 (85.83)	17 (14.17)
KCC	3 (50.00)	57 (95.00)	0 (00.00)	60 (100.00)	3 (2.50)	117 (97.50)
Website	22 (36.67)	38 (63.33)	19 (31.67)	41 (68.33)	41 (34.17)	79 (65.83)
WhatsApp	60 (100)	00(00)	60 (100)	00 (00)	120 (100)	00 (00)
Face book	42 (70.00)	18 (30)	33 (55)	27 (45)	75 (62.50)	45 (37.50)
Apps for online money transactions	43 (73.67)	17 (28.33)	31 (51.67)	29 (48.33)	74 (61.67)	46 (38.33)
YouTube	60 (100)	0(00)	55 (91.67)	5 (8.33)	115 (95.83)	5 (4.17)
Mann-Whitney U Test	1663.00 <sup>NS</sup>					

**Table 2:** Distribution of respondents according to the frequency of use and experience in the use of different ICT tools

Farmers	ICT tools	Frequency of use			TROS	Years of using the ICT tool		
		Daily	Weekly	Occasionally		>5 yrs	1-5 yrs	<1 yr
Goat owners (n=60)	Radio (n=39)	0 (00)	1 (2.56)	38 (97.44)	40	19 (48.72)	16 (41.03)	4 (10.25)
	TV (n=48)	37 (77.08)	3 (6.25)	8 (16.67)	125	9 (18.75)	33 (68.75)	6 (12.5)
	KCC (n=3)	0 (00)	0 (00)	3 (100)	3	0 (00)	2 (66.67)	1 (33.33)
	Website (n=22)	0 (00)	8 (36.36)	14 (63.64)	30	2 (9.10)	14 (63.63)	6 (27.27)
	WhatsApp (n=60)	60 (100)	0 (00)	0 (00)	180	10 (16.67)	45 (75)	5 (8.33)
	Facebook (n=42)	34 (80.95)	6 (14.28)	2 (4.77)	116	22 (52.38)	16 (38.09)	4 (9.53)
	Apps for online money transfer (n=43)	38 (88.37)	5 (11.63)	0 (00)	124	2 (4.65)	17 (39.53)	24 (55.82)
Sheep owners (n=60)	YouTube (n=60)	51 (85.00)	2 (3.33)	7 (11.67)	164	25 (41.67)	29 (48.33)	6 (10.00)
	Radio (n=24)	0 (00)	0(00)	24 (100)	24	18 (75.00)	6 (25.00)	0 (00)
	TV (n=55)	52 (94.55)	0 (00)	3 (5.45)	159	28 (50.91)	24 (43.64)	3 (5.45)
	KCC (n=0)	0 (00)	0 (00)	0 (00)	00	0 (00)	0 (00)	00 (00)
	Website (n=19)	10 (52.63)	2 (10.52)	7 (36.85)	41	0 (00)	17 (89.47)	2 (10.53)
	WhatsApp (n=60)	60 (100)	0 (00)	0 (00)	180	12 (20)	28 (46.67)	20 (33.33)
	Facebook (n=33)	28 (84.85)	4 (12.12)	1 (3.02)	93	24 (72.72)	9 (27.28)	0 (00)
Pooled (n=1200)	Apps for online money transfer (n=31)	25 (80.64)	6 (19.36)	0 (00)	81	0 (00)	26 (83.87)	5 (16.13)
	YouTube (n=55)	37 (67.27)	0 (23.34)	18 (32.73)	129	3 (5.45)	46 (83.64)	6 (10.91)
	Radio (N=63)	0 (00)	1 (1.58)	62 (98.42)	64	37 (58.73)	22 (34.92)	4 (6.35)
	TV (N=103)	74 (71.84)	3 (2.91)	26 (25.25)	254	12 (11.65)	79 (76.7)	12 (11.65)
	KCC (N=3)	0 (00)	0 (00)	3 (100)	3	0 (00)	2 (66.67)	1 (33.33)
	Website (N=41)	10 (24.40)	10 (24.40)	21 (51.20)	71	2 (4.88)	31 (75.61)	8 (19.51)
	WhatsApp (n=120)	120 (100)	0 (00)	0 (00)	360	22 (18.33)	73 (60.83)	5 (4.16)
Pooled (n=1200)	Facebook (n=75)	62 (82.67)	10 (13.33)	3 (4)	209	46 (61.33)	25 (33.33)	4 (5.34)
	Apps for online money transfer (n=74)	63 (85.13)	11 (14.87)	0 (00)	211	2 (2.70)	43 (58.10)	29 (39.20)
	YouTube (N=115)	103(89.57)	2 (1.93)	10 (9.70)	323	53 (46.09)	53 (46.09)	9 (7.82)
Mann-Whitney U Test	1383.50*						--	

within the 1-5 years range. While television remained a stable medium across groups, preferences for other tools differed. The pooled data emphasized the continued relevance of TV and radio, suggesting a need for targeted ICT strategies that align with farmers' existing familiarity and tool-specific adoption patterns. The findings indicate that although television continues to serve as a reliable information source, the use of other ICT tools varies widely among small ruminant farmers.

### Monthly Expenditure Level on Internet

Table 3 presents the monthly internet expenditure patterns of 120 respondents, including 60 goat owners and 60 sheep owners. The findings show that a similar percentage of goat (53.33%) and sheep (50.0%) owners spend over Rs. 300 per month on internet usage. Additionally, approximately half of the respondents from both groups fall within the Rs. 150-300 spending range. Notably, no respondents reported spending less than Rs. 150 per month, highlighting a baseline level of digital investment among small ruminant farmers. The similar internet expenditure patterns observed between goat and sheep farmers suggest a shared interest or need for internet access across both groups. This indicates that digital connectivity plays an important role in their farming practices. Further investigation into the specific purposes for which these farmers use the internet could help inform more targeted interventions or support initiatives. These findings aligned with those of Senthilkumar *et al.* (2018), who reported that the majority of goat and sheep farmers in Tamil Nadu (71.66%) spent over 200 rupees per month on ICT services, reinforcing the importance of digital tools in small ruminant farming.

**Table 3:** Distribution of respondents according to their monthly expenditure level on the internet

Amount (Rs)	Goat owners (n=60)	Sheep owners (n=60)	Pooled (n=120)
Rs.> 300	32 (53.33)	30 (50.00)	62 (51.67)
Rs. 150-300	28 (46.67)	30 (50.00)	58 (48.33)
Rs.< 150	0 (00)	0 (00)	0 (00)
Chi-square test	0.133 <sup>NS</sup>		

### Challenges Faced by Small Ruminant Farmers in Use of ICT Tools

Respondents were asked to rank the challenges they faced in using ICT tools. As shown in Table 4, the most significant challenge was the high cost, with a mean score of 79.99, earning the top rank. This was followed by the unavailability of relevant information via ICT (60.6), lack of training (55.84), language barriers (54.59), and technical incompetence (53.78). These results highlight the need for improved educational initiatives and support systems to help farmers effectively utilize ICT tools for accessing information related to small ruminant farming. The results partially aligned with those of Rajoria *et al.* (2022), who found that high cost (66.67%) and lack of training (60%) were key challenges faced by livestock farmers in Rajasthan. In contrast, Anand *et al.* (2020) identified inadequate power supply (mean score 2.24) as the most significant barrier. Similarly, Tamizhkumaran and Natchimuthu (2016) reported that livestock farmers in Puducherry struggled with network and signal issues (68%) and language barriers, particularly due to limited English proficiency (46%). These varying findings underscore the need for context-specific solutions to address ICT adoption challenges.

### Correlation of Socio-Economic Variables with Use of ICT Tools

The study found a significant positive correlation ( $p < 0.05$ ) between flock size and ICT tool usage, indicating that farmers managing larger flocks tend to use ICT tools more extensively, likely due to the greater need for monitoring and management that technology can help address. Additionally, these farmers often have more financial resources, which may encourage investment in ICT solutions to improve efficiency and productivity. Conversely, a significant negative correlation was observed between age and ICT usage, suggesting that younger farmers are more inclined to adopt and engage with digital technologies compared to their older counterparts (Table 5).

**Table 4:** Mean scores and ranking of the constraints perceived by small ruminant farmers in use of ICT tools

Constraints	Goat owners (n=60)		Sheep owners (n=60)		Pooled (N=120)	
	Mean	Rank	Mean	Rank	Mean	Rank
Technical incompetency	53.98	5	53.57	5	53.78	5
Lack of training	57.13	3	54.55	4	55.84	3
Language barrier	54.57	4	54.62	3	54.59	4
Ignorance	47.28	6	47.67	7	47.48	6
Poor internet connectivity	44.62	7	49.65	6	47.14	7
Unavailability of information through ICT	58.6	2	62.6	2	60.6	2
Slow functioning of tools	38.32	8	37.75	8	38.04	8
Lack of upgradation	29.7	10	29.48	9	29.58	9
High cost	77.97	1	82	1	79.99	1
Power failure	30.78	9	27.27	10	29.03	10



**Table 5:** Correlation (r) of socio-economic variables use of ICT tools

Socio-economic variables	Use of ICTs
Age	-0.179*
Education	-0.610
Landholding	0.023
Flock size	0.041*
Income from small ruminant	0.047
Experience	-0.008
Social participation	0.035
Extension agency contact	-0.033

## CONCLUSION

The research highlights increased use of ICT tools by small ruminant farmers, with WhatsApp as the overall most widely used platform, followed by YouTube, television, and Facebook. The younger group and farmers with larger herds showed increased use of ICTs, and hence, both digital literacy and operational size were observed to be determinants of technology use. WhatsApp and YouTube were preferred due to accessibility, ease of interface, and variety of content. Traditional media like television and radio still hold much significance and remain widely used by sheep farmers. The Kisan Call Centre was noted as underestimated in its use, particularly by sheep owners, and therefore needs to be given thrust by using appropriate awareness initiatives, and to be used as it has vast information at its disposal. Although internet use was widespread, high cost, absence of training to use it, language issues, and unavailability of appropriate content were observed to be the main hurdles and need to be addressed by context-specific interventions. To overcome these issues, a one-stop solution like a dedicated chatbot for small ruminant farmers can be created, and the content of ICT tools should be prepared in regional dialects. The results would suggest that enlarging digital infrastructure, enhancing farmer-friendly training schemes, and content customization according to users' needs and capabilities can improve access continuously. The results confirm that there is substantial scope for using digital tools to increase productivity, transfer of information, and rural livelihoods.

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