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Scale to Measure Farmers' Attitude towards ICT-Based Agro-Advisory Services

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HIGHLIGHT

- The Attitude Scale with 48 items was developed with 0.86 reliability coefficient value.
- Captured six dimensions: usefulness, trust, accessibility, personalization, adoption, and general attitude.
- Demonstrated high reliability and strong content validity.
- The items were selected on the basis of Relevancy Percentage, Relevancy Weightage and Mean Relevancy Score (MRS) for all statements.

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ABSTRACT

In recent years, rapid advancements in Information and Communication Technologies (ICT) have transformed agricultural extension by enabling timely, accurate, and farmer-specific agro-advisories. Farmers' attitudes play a crucial role in determining the acceptance, sustained use, and practical application of such services. Therefore, a study was undertaken in 2025 to develop and standardise an attitude scale for farmers toward ICT-based agro-advisory services. An initial pool of 110 statements was generated through literature review, farmer interactions, and expert consultations. After item screening and statistical analysis, 48 statements were finalised under six dimensions: Perceived Usefulness, Trust and Credibility, Accessibility and Convenience, Responsiveness and Personalisation, Adoption Behaviour, and General Attitude. Content validity was assessed through expert evaluation, wherein Item-level CVI values ranged from 0.80 to 0.95, and the Scale-level CVI/Average (S-CVI/Ave) was 0.91, reflecting excellent relevance. A multistage sampling procedure followed by Probability Proportional to Size (PPS) sampling was used to ensure proportional representation of farmers across selected villages. Reliability testing confirmed strong internal consistency, with Cronbach's alpha 0.86 and Split-Half reliability (Spearman-Brown coefficient) 0.89. The validated scale can serve as a useful tool for researchers and extension stakeholders to assess farmer readiness and design more user-centric ICT advisory systems.

INTRODUCTION

Rapid advances in information and communication technologies (ICT) have transformed how agricultural knowledge is created, packaged and delivered to farmers (Singh et al., 2025a). ICT-based agro-advisory services ranging from SMS alerts and call-centres to mobile apps, interactive voice response (IVR), and video-mediated extension promise timely, localized and scalable advisory support that can improve decision-making, productivity and resilience for smallholder farmers (Paliwal & Kumari, 2023). Despite these potential benefits, the effectiveness of ICT interventions depends critically on farmers' attitudes toward the technology and the service models used; attitude shapes uptake, sustained use and the translation of information into practice (Singh et al., 2023; Singh et

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al., 2024a; Khan et al., 2024). Extant literature has examined multiple dimensions of farmer engagement with ICT-based advisories. Some studies report generally positive perceptions of timeliness and usefulness, while others highlight barriers such as limited digital literacy, relevance of content, trust in source and socio-economic constraints that mediate attitudes and behaviour (Paliwal et al., 2025). For example, mobile advisory evaluations have shown improvements in information access but mixed levels of adoption of recommended practices, pointing to the role of attitudes, perceived usefulness and ease of use as mediators. Similarly, video-based and multimedia approaches have demonstrated promise for knowledge transfer but require supportive infrastructure and user confidence (Kumar et al., 2015; Kassem et al., 2021). Research from varied contexts underscores the need for careful measurement of attitude as a construct distinct from knowledge and access. Region-specific surveys and program evaluations (e.g., of Kisan Call Centres, Kisan Mobile Advisory Services, and KVK/extension-led ICT initiatives) indicate heterogeneity in farmer attitudes influenced by age, education, farm size, prior experience with technology, perceived credibility of advisory sources and socio-institutional support (Slathia et al., 2012; Singh et al., 2024b). A focused study published in the Indian Journal of Extension Education reported that while a majority expressed favourable opinions toward digital agricultural communication, mean attitude scores differed across stakeholder groups, suggesting that a single-size-fits-all assessment may obscure important variation (Koshy et al., 2012). Despite an expanding empirical base, gaps remain in standardizing measures for "attitude toward ICT-based agro-advisory services." Many evaluations rely on ad hoc Likert scales or single-item indicators that confound attitude with satisfaction or behavioural intent. The literature review and bibliometric analyses of ICT in extension further call for theoretically grounded, psychometrically validated instruments that capture cognitive (beliefs about usefulness and credibility), affective (liking, comfort) and behavioural-intent dimensions of attitude, while accounting for contextual moderators (infrastructure, social norms, institutional linkages). Such standardization would facilitate cross-study comparisons, meta-analysis and more precise program design (Mukherjee et al., 2025; Barman et al., 2025). This paper, therefore proposes to develop and validate a standardized research instrument to measure farmers' attitudes toward ICT-based agro-advisory services. Building on prior empirical findings and theoretical models (e.g., Technology Acceptance frameworks), the study will (1) operationalize attitude in multi-dimensional terms, (2) pilot and assess reliability and validity across a stratified sample of farmers, and (3) examine how attitude correlates with socio-demographic factors and service uptake. By providing a rigorously tested measure and situating it alongside evidence from different journaled studies and sectoral reports, the research aims to strengthen evidence-based design and evaluation of ICT-enabled advisories for smallholder agriculture (Abate et al., 2023).

METHODOLOGY

The study was conducted in 2025 to develop and standardize a scale measuring farmers' attitudes toward ICT-based agro-advisory services. A mixed-methods research design involving qualitative item generation and quantitative psychometric validation was employed to ensure both content relevance and statistical rigour. Initially, a comprehensive pool of 110 attitude statements was developed based on an extensive review of national and international literature and through consultations with scientists, extension professionals, ICT experts, government officials, NGOs, and progressive farmers. The items covered 11 theoretically grounded dimensions, including Accessibility, Content Relevance, Ease of Use, Credibility, Decision-making Usefulness, Cost-effectiveness, User Support, Feedback Provision, Trust and Privacy, Socio-cultural Compatibility, and Overall Satisfaction. Item wording followed the criteria suggested by Likert (1932) and Edwards (1957) to ensure clarity, evaluative orientation, and simplicity. The draft scale was reviewed by 90 experts in agricultural extension and ICT-based advisory applications. Out of these, 60 experts responded, and their suggestions were incorporated to refine dimensional adequacy, content accuracy, and language suitability. Quantitative content validity was established using Lawshe's Content Validity Ratio (CVR) and the Content Validity Index (CVI).

$$\text{S-CVI/Ave} = \frac{\Sigma \text{I-CVI}}{\text{Total Items}}$$

Item-level CVI (I-CVI) ranged from 0.80 to 0.95 and the Scale-level CVI/Average (S-CVI/Ave) was 0.91, indicating excellent relevance of items. For empirical validation and item analysis, respondents were selected using a multistage sampling procedure followed by Probability Proportional to Size (PPS) sampling to ensure proportional representation of farmers across selected villages. A total of 60 farmers who had been using ICT-based agro-advisory services for at least one year were selected. A five-point Likert continuum ranging from Strongly Agree (5) to Strongly Disagree (1) was used to record responses. Item analysis utilized Edwards' (1957) Critical Ratio method by categorizing respondents into upper and lower 25% groups. Items with a t-value ≥ 1.75 (Bird, 1940), item–total correlation ≥ 0.30, and mean relevance score ≥ 3 were retained. After sequential screening, a total of 48 statements showing strong discrimination ability were included in the final standardized scale. Reliability testing confirmed strong internal consistency with Cronbach's alpha = 0.86, while structural reliability established through a split-half method yielded a Spearman–Brown coefficient = 0.89. The methodological novelty of the scale lies in integrating traditional psychometric testing with emerging ICT-centric behavioural constructs such as digital trust, responsiveness, and privacy perception. Thus, the developed scale is a statistically sound and contemporary assessment tool to measure farmers' attitudinal readiness toward ICT-enabled agro-advisory service ecosystems.

RESULTS

The t-test–based item analysis confirmed that the selected statements were effective in discriminating between respondents with high and low attitudes toward ICT-based agro-advisory services. Out of the initially drafted statements, 48 items yielded t-values above the acceptable threshold of 1.75 (Bird, 1940), indicating that each item significantly contributed to distinguishing

Table 1.

S.No.	Item Statements	t-value
A.	Perceived Usefulness (Cognitive)	
1.	The platform helps me make better agro-advisory decisions	2.83
2.	I find the digital advisory platform to be highly efficient	1.95
3.	It provides valuable insights for my investment strategies	3.42
4.	It helps me save time in managing my agro-advisory	2.95
5.	The platform improves the quality of my agro-advisory planning	3.33
6.	It allows for more informed decision-making	2.93
7.	It assists me in identifying good investment opportunities	3.39
8.	The recommendations from the platform are practical and beneficial	2.46
B.	Trust and Credibility (Affective)	
9.	The platform's reputation influences my trust in it	2.73
10.	The transparency of the platform builds my trust	2.94
C.	Accessibility and Convenience (Cognitive + Affective)	
11.	The platform is easy to navigate	3.01
12.	I can access the platform anytime, anywhere	1.89
13.	It is convenient for managing my agro-advisory on the go	2.68
14.	I find it simple to perform tasks on the platform	3.01
15.	The platform integrates well with my lifestyle	2.77
16.	I feel less stressed using this platform than others	2.32
17.	I appreciate the platform's user-friendly design	4.05
18.	The speed of access makes it more usable for me	3.77
19.	I enjoy using the platform regularly	2.79
20.	It provides a seamless experience across devices	2.94
21.	I rarely encounter technical issues when using it	3.35
D.	Responsiveness and Personalization (Cognitive)	
22.	The platform tailor's advice based on my preferences	2.69
23.	I receive timely responses to my inquiries	3.11
24.	The agro-advisory service recommendations are relevant to me	2.73
25.	The platform understands my unique agro-advisory goals	2.13
26.	It uses my data to personalize content effectively	3.04
27.	I get alerts that are meaningful to me	2.67
28.	It continuously learns from my behaviour	2.22
29.	The advice reflects my agro-advisory history	1.89
30.	It updates me with relevant market insights	2.80
31.	The chatbot/virtual assistant is responsive and helpful	3.41
32.	It offers personalized reports and dashboards	1.94
E.	Adoption Behaviour (Cognitive)	
33.	I intend to continue using this platform	2.72
34.	I frequently log into the platform	3.69
35.	I have recommended this platform to others	3.01
36.	I check the platform at least once a week	1.99
37.	I have shared my positive experience on social media	2.87
38.	I am likely to use advanced features in the future	1.79
F.	Attitude Towards Digital Advisory Platforms(Optional Dimension)	
39.	I have a positive attitude toward digital agriculture advisors	2.93
40.	I believe digital advisory platforms are the future of agriculture	1.95
41.	I enjoy exploring new agro-advisory technologies	3.14
42.	I feel optimistic about using technology in agriculture	2.11
43.	I view these platforms as innovative and modern	2.74
44.	I see digital platforms as a cost-effective solution	3.01
45.	I think digital advisory tools are empowering	2.69
46.	I consider them a legitimate alternative to traditional advice	2.19
47.	I feel confident in their ability to scale with my needs	3.51
48.	I see them as a smart choice for agro-advisory service independence	2.92

attitude levels among farmers. These retained items represented six major dimensions: Perceived Usefulness, Trust and Credibility, Accessibility and Convenience, Responsiveness and Personalization, Adoption Behaviour, and Overall Attitude toward ICT platforms. Perceived usefulness and trust-related statements exhibited the highest discriminatory power, suggesting that these constructs most strongly explain variations in farmers' attitudes.

Validity and reliability testing

Reliability analysis ensured the psychometric strength of the developed instrument. Using the split-half method, the 48 items were divided into odd–even subsets and administered to 60 farmers familiar with ICT advisories. The Pearson product–moment correlation coefficient of 0.82 demonstrated strong inter-item association. The Spearman–Brown reliability estimate of 0.89 further confirmed high stability, consistent with reliability standards in attitude scale research (Shitu et al., 2018; Shelar et al., 2022; Gupta et al., 2022; Vavilala et al., 2024; Singh et al., 2025b). Additionally, the Cronbach's alpha value of 0.86 indicated excellent internal consistency, exceeding the recommended 0.70 threshold for scale acceptance. Content validity was established through expert judgment and theoretical grounding. Sixty domain experts specializing in extension science, ICT applications, and field advisory services reviewed the item pool for relevance, clarity, and dimensional coverage. Their evaluation confirmed that the statements adequately represented the multidimensional construct of farmers' attitudes toward ICT-enabled advisory services. Inputs from experts also ensured contextual alignment with contemporary digital agricultural extension practices.

DISCUSSION

The findings highlighted that the systematically developed scale effectively captured farmers' attitudes toward ICT-based advisory platforms across six major dimensions. Items with high t-values emphasised perceived usefulness and ease of access, indicating that farmers strongly valued ICT services which improved decision-making, saved time, and integrated smoothly into their daily routines. Similar results were reported by Khan (2024), who underscored those timely and credible ICT advisories significantly shaped farmers' trust and adoption levels. High mean scores on the trust and credibility dimension suggested that farmers' willingness to rely on ICT advisories was strongly influenced by perceptions of transparency, reputation, and reliability of the service provider a finding consistent with the observations of Koshy and Kumar (2016), who found that farmer confidence in Kisan Call Centres depended largely on trust in the authenticity of information provided. The responsiveness and personalization dimension exhibited moderate-to-high discriminating power, indicating that farmers appreciated ICT services offering timely responses, customised recommendations, and relevant alerts. Studies by Abate et al. (2023) and Mukherjee et al. (2025) corroborated that personalization in ICT-enabled services enhanced farmer engagement and adoption. Results for adoption behaviour suggested that farmers who perceived ICT services as user-friendly and beneficial were more likely to continue usage, recommend the platforms to peers, and explore advanced features. Finally, the overall high reliability and internal consistency of the developed scale supported its suitability as a standardised instrument for assessing farmers' attitudes toward ICT-based advisory services. As such, the scale can guide policymakers, extension agencies, and service providers in designing more farmer-centric ICT platforms, thereby enhancing adoption and impact.

CONCLUSION

The study developed and validated a standardized attitude scale to measure farmers' perceptions of ICT-based agro-advisory services. The final instrument, comprising 48 items across six major dimensions—Perceived Usefulness, Trust and Credibility, Accessibility and Convenience, Responsiveness and Personalization, Adoption Behaviour, and General Attitude—demonstrated strong reliability (Cronbach's alpha = 0.86) and internal consistency, as well as high content validity verified by domain experts. Results indicate that farmers value timely, relevant, and user-friendly ICT services, with trust and personalization being key determinants of adoption. The scale provides a robust tool for assessing attitudes, enabling policymakers, extension agencies, and service providers to better understand farmer needs, enhance service design, and promote wider adoption of ICT-based advisory platforms. By offering a theoretically grounded and empirically tested measure, this study contributes to evidence-based planning and evaluation of digital agricultural extension interventions.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought during the course of the data collection from the 60 experts who responded, and their suggestions were incorporated to refine dimensional adequacy, content accuracy, and language suitability regarding the study.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The authors declare that during the preparation of this work, they thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

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