

RESEARCH ARTICLE

PERCEPTIONS AND BEHAVIORAL INTENTIONS OF PADDY FARMERS TOWARD DIGITAL EXTENSION TOOLS FOR AGRICULTURAL INFORMATION: A COMPARATIVE STUDY OF LEAFLETS, VOICE RECORDINGS, AND VIDEO UNDER THE *Yaya* PROGRAM

Palihawadana DA^{1*}, De Silva WN², and Silva KN²

¹Department of Agriculture, Southern province, Galle, Sri Lanka

²Department of Agricultural Economics and Agribusiness, Faculty of Agriculture, University of Ruhuna, Sri Lanka

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ABSTRACT

This study assessed paddy farmers' perceptions and behavioral intentions toward digital extension tools: digital leaflets, voice recordings, and videos for agricultural information under the *Yaya* Program in Galle district, Sri Lanka, using a stratified random sample of 1,130 farmers and a pre-tested questionnaire. The analytical approach included descriptive statistics, reliability assessment, repeated-measures ANOVA, and multiple linear regression. Participants rated videos and digital leaflets more effective than voice recordings, with videos being most favored for clarity, engagement, and comprehension. The constructs exhibited excellent internal consistency, with Cronbach's alpha values spanning from 0.857 to 0.978. Regression results indicated that attitudes, output quality, perceived usefulness, perceived ease of use, and subjective norms significantly influenced farmers' behavioral intention to adopt digital extension tools. In contrast, individual innovativeness generally did not significantly predict adoption. The findings highlight the importance of digital extension tools in agricultural extension and suggest that policymakers and extension officers should prioritize video-based digital extension tools, complemented by digital leaflets and voice-recording-based digital extension tools, to maximize adoption and reach among diverse paddy farmer populations in Sri Lanka.

Keywords: Agricultural extension, Digital agriculture, Leaflets, Paddy farmers, Technology adoption Video, Voice

INTRODUCTION

Agricultural extension services in Sri Lanka support farmers by improving knowledge and skills through modern information dissemination. Traditional methods face limitations due to staff shortages and logistics. Therefore, digital communication tools are increasingly essential for enhancing the efficiency, accessibility, and effectiveness of extension services (Walisinghe *et al.*, 2017). Geographic constraints, inadequate transport, weak research-extension linkages, poor technology relevance, and low adoption of digital tools limit extension effectiveness

(Athukorala, 2017; Silva, 2023; Abeysinghe, 2021; Dilrukshi and Muddannayake, 2014; Wanigasundera and Atapattu, 2019). Digital transformation has increasingly influenced agricultural extension through tools such as voice messages, videos, and social media, enabling faster information dissemination, wider reach to remote farmers and cost-effective delivery of agricultural knowledge (Aker, 2011; Walisinghe *et al.*, 2017). Mobile phone and WhatsApp-based advisories have been shown to improve farmers' access to timely market and weather information in multiple countries (Aker & Mbiti, 2010). Information and communication technology

Corresponding author: anushapalihawadana4@gmail.com

offers significant potential for the delivery of agricultural extension (Monikha *et al.*, 2021). Social media is an emerging and increasingly important tool for sharing and communicating agricultural information (Patel *et al.*, 2022), enabling farmers to interact with experts and obtain real-time solutions (Mishra *et al.*, 2022). Despite the increasing use of digital tools in agricultural extension, research on Sri Lankan paddy farmers' perceptions, attitudes, and adoption intentions remains limited, with few studies examining digital communication methods for effective extension strategies (Walisinghe *et al.*, 2017). There is insufficient empirical evidence on key determinants of adoption, including perceived ease of use, output quality, subjective norms, and individual innovativeness, despite their importance for designing effective digital agricultural extension strategies (Venkatesh & Davis, 2000; Rogers, 2003). Although some studies have examined general technology adoption and information access among Sri Lankan farmers, few have investigated the factors influencing farmers' intentions to adopt digital communication platforms for local agricultural information (Premarathne *et al.*, 2021).

The study utilized an integrated framework that combines the Technology Acceptance Model, the Theory of Planned Behavior, and the Diffusion of Innovations theory. Perceived ease of use and usefulness reflect value-based evaluations; attitude and behavioral intention indicate psychological assessment; output

quality shows information clarity; subjective norms capture social influence, while individual innovativeness reflects willingness to adopt technologies. (Ajzen, 1991; Rogers, 2003; Venkatesh and Davis, 2000). Behavioral intention to use digital extension tools: digital leaflets, video, and voice records was considered as the dependent variable. Perceived usefulness, perceived ease of use, attitude toward using content quality, individual innovativeness, and subjective norms were considered as independent predictor constructs. This study examined paddy farmers' perceptions and behavioral intentions toward three digital extension tools: digital leaflets, voice recordings, and videos used under the *Yaya* Program in Galle District, Sri Lanka. The findings aim to inform policymakers and extension officers in designing and implementing effective digital extension strategies and to contribute to the broader adoption of technology-driven extension in Sri Lanka.

METHODOLOGY

The study was conducted in the Galle District of Sri Lanka. The sample size for paddy farmers was determined using Yamane's (1967) formula based on the total paddy farmer population, resulting in a final sample of 1,130 respondents from the thirty-three Agrarian service areas of Galle district, presented in Table 1. A stratified random sampling technique was employed to ensure proportional representation across the identified strata.

Table 1: Population and sample size of paddy farmers survey

ADA Zone Eastern			ADA Zone Western			ADA Zone Central		
ASA	PFP	PFSS	ASA	PFP	PFSS	ASA	PFP	PFSS
Labuduwa	1015	71	Pahalagamhaya	1077	49	Pinkanda	251	16
Walahanduwa	1109	78	Gonagalapura	521	24	Rathgama	950	61
Ahangama	1191	83	Elpitiya	5059	234	Baddegama	1899	112
Pilana	771	54	Batapola	824	38	Nagoda	1606	104
Paragoda	1249	87	Aluthwala	801	37	Keradewala	1113	72
Total	5335	373	Total	8282	382	Total	5819	375

ADA : Assistant Director of Agriculture , ASA : Agrarian Service Area , PFP : Paddy Farmer Population , and PFSS : Paddy Farmer Sample Size
Source: Survey data (2024)

Data were collected through a pre-tested structured questionnaire administered in paper-based format. Data were analyzed using

SPSS version 28 to examine paddy farmers' perceptions and behavioral intentions toward digital communication platforms (leaflets,

voice recordings, and video) under the *Yaya* Program.

Descriptive statistics were computed for all constructs to determine mean values and standard deviations, providing an overview of output quality, perceived ease of use, individual innovativeness, perceived usefulness and subjective norms of three digital tools. Reliability analysis was conducted using Cronbach's alpha to assess the internal consistency of the measurement scales; items with low corrected item-total correlations were removed or reverse-coded, as necessary, to improve reliability. Multiple linear regression analyses were performed to identify predictors of behavioral intention for each digital extension tool, with the constructs attitude, perceived usefulness, content quality, ease of use, individual innovativeness, and subjective norms entered as independent variables. The robustness of the regression models was verified by assessing assumptions, including multicollinearity using tolerance and variance inflation factor (VIF) measures. Means and standard deviations were calculated for each communication tool to summarize respondents' perceived effectiveness. To determine whether perceived effectiveness differed across the three formats, a repeated-

measures ANOVA was employed, as the same participants evaluated all three digital extension tools. Mauchly's test was used to assess the assumption of sphericity, and where violations occurred, Greenhouse-Geisser corrections were employed to adjust the degrees of freedom. The magnitude of differences among formats was assessed using partial eta squared (η^2). Post hoc pairwise comparisons were conducted using Bonferroni adjustments to identify which specific formats differed significantly. Statistical analyses used a threshold of $p < 0.05$, and all computations were conducted across the full sample of 1,130 paddy farmers to generate reliable estimates of comparative effectiveness.

RESULTS

Among 1,130 respondents, leaflets ($M = 5.26$) and videos ($M = 4.93$) were rated more effective than voice recordings ($M = 3.64$); repeated-measures ANOVA was used to test for significance. Table 2 presents descriptive statistics and the internal consistency of the voice-recorded digital extension tool constructs. All scales demonstrated acceptable to excellent reliability (Cronbach's $\alpha = 0.932$ – 0.972), indicating that ease of use, usefulness, attitudes, behavioral intention, output quality, innovativeness, and subjective norms are reliable and supportive of adoption.

Table 2: Reliability and descriptive statistics of constructs for voice record -based extension tool

Construct	NI	Cronbach's α	Mean	SD
Perceived Ease of Use voice records digital extension tool (VEU)	2	0.956	3.60	0.667
Perceived Usefulness voice records digital extension tool (VPU)	3	0.962	3.62	0.675
Attitude towards voice records digital extension tool (VA)	2	0.937	3.64	0.703
Behavioral Intention to use the voice records digital extension tool (VBI)	3	0.946	3.67	0.685
Output Quality of voice records digital extension tool (VOQ)	3	0.951	3.69	0.705
Individual Innovativeness for voice records digital extension tool (VII)	4	0.932	3.61	0.709
Subjective Norms for voice records digital extension tool (VSN)	3	0.972	3.65	0.697

NI : No of Items , SD: Standard deviation

Note: VOEU3 was removed from the EU scale due to poor item-total correlation.

All constructs demonstrate acceptable to excellent internal consistency (Cronbach's $\alpha > 0.90$). N = 1,130 respondents.

Table 3 presents a regression analysis predicting behavioral intention to use the

voice-record digital extension tool. The model was significant [F (6, 1123) = 1974.33] ($p < .001$, $R^2 = 0.913$). Output quality ($\beta = 0.356$) and attitudes ($\beta = 0.319$) were the strongest predictors, with other factors contributing positively as well. Collinearity was acceptable (VIF = 3.26–7.85).

Table 3: Regression analysis predicting behavioral intention to use the voice records-based digital extension tool

Independent variable	UC (B)	SE	β	t	P value	T	VIF
Constant	0.053	0.035	—	1.535	0.125	—	—
Perceived Ease of Use voice records digital extension tool (VOEU)	0.065	0.016	0.065	4.101	< .001	0.307	3.260
Perceived Usefulness of the voice records digital extension tool (VOPU)	0.075	0.020	0.075	3.682	< .001	0.187	5.361
Attitudes towards the voice records digital extension tool (VOA)	0.305	0.019	0.319	16.10	< .001	0.196	5.097
Output Quality of the voice records digital extension tool (VQO)	0.344	0.024	0.356	14.45	< .001	0.127	7.852
Individual Innovativeness for voice records digital extension tool (VOII)	0.087	0.023	0.086	3.718	< .001	0.143	7.008
Subjective Norms for voice records digital extension tool (VOSN)	0.113	0.022	0.117	5.189	< .001	0.151	6.621

UC : Unstandardized Coefficient(B) , SE: Standard Error , T : Tolerance, and VIF: Variance Inflation Factor
Note: Dependent Variable: Behavioral Intention to Use voice records digital extension tool; N = 1,130.
Source: Survey data (2024)

Table 4 presents descriptive statistics and the reliability of the constructs of the digital leaflet-based extension tool. After removing item LEU3R, Cronbach's alpha ranged from

0.857 to 0.974. High mean scores for ease of use, usefulness, attitudes, behavioral intention, content quality, innovativeness, and subjective norms suggest the tool is useful and acceptable.

Table 4: Reliability and descriptive statistics of the construct for the digital leaflets-based extension tool

Construct	NI	Cronbach's α	Mean	SD
Perceived Ease of Use of the digital leaflets-based extension tool (LEU)	2	0.954	4.07	0.772
Perceived Usefulness of digital leaflets-based extension tool (LPU)	3	0.974	4.01	0.782
Attitudes towards the digital leaflet-based extension tool (LA)	2	0.945	4.02	0.794
Behavioral Intention to use the digital leaflets-based extension tool (LBI)	3	0.949	4.03	0.782
Content Quality of the digital leaflets-based extension tool (LCQ)	3	0.952	4.05	0.782
Individual Innovativeness of digital leaflets-based extension tool (LII)	4	0.933	3.97	0.910
Subjective Norms for digital leaflets-based extension tool (SN)	3	0.857	4.12	0.762

NI : Number of items, SD : Standard deviation
Note: LEU3R was removed due to poor item–total correlation. All scales show acceptable to excellent reliability (Cronbach's $\alpha > 0.85$). N = 1,130 respondents.
Source: Survey data (2024)

Regression analysis of constructs for the digital leaflets-based digital extension tool is shown in Table 5. Multiple regression was used to examine the influence of digital leaflet-based constructs on farmers' intention to use the digital extension tool. The model

was significant ($F(6, 1123) = 2195.96$, $p < .001$, $R^2 = 0.921$). Content quality ($\beta = 0.447$) and attitudes ($\beta = 0.332$) were the strongest predictors; individual innovativeness was not significant.

Table 5: Regression analysis predicting behavioral intention to use a digital leaflet-based digital extension tool

Independent variable	UC(B)	SE	β	t	P value	T	VIF
Constant	-0.043	0.039	—	-1.085	0.278	—	—
Perceived Ease of Use digital leaflets based digital extension tool (LEU)	0.042	0.018	0.043	2.336	0.020	0.207	4.837
Perceived Usefulness of digital leaflets based digital extension tool (LPU)	0.065	0.023	0.067	2.864	0.004	0.128	7.794
Attitudes towards the digital leaflet-based digital extension tool (LA)	0.319	0.020	0.332	15.71	< .001	0.157	6.367
Content Quality of digital leaflets based on the digital extension tool (LCO)	0.446	0.022	0.447	20.32	< .001	0.144	6.922
Individual Innovativeness for the digital leaflets-based digital extension tool (LII)	0.008	0.006	0.026	1.305	0.192	0.179	5.583
Subjective Norms for the digital leaflets-based digital extension tool (LSN)	0.108	0.020	0.098	5.365	< .001	0.211	4.732

UC : Unstandardized Coefficient(B) , SE: Standard Error , T : Tolerance , and VIF: Variance Inflation Factor
Source: Survey data (2024)

Table 6 presents descriptive statistics and reliability of video-based digital extension tool constructs. All constructs showed excellent internal consistency (Cronbach's $\alpha = 0.934$ – 0.978). High ratings for usefulness,

attitudes, behavioral intention, content quality, subjective norms, and ease of use indicate these tools are effective, user-friendly, and impactful.

Table 6: Descriptive statistics and reliability of constructs for video-based digital extension tools

Construct	NI	Cronbach's α	Mean	SD
Perceived Usefulness of Video-Based Digital Extension Tools (VPU)	3	0.968	4.15	0.836
Attitudes towards Video-Based Digital Extension Tools (VA)	2	0.963	4.16	0.839
Behavioral Intention to Use Video-Based Digital Extension Tools (VBI)	3	0.959	4.16	0.821
Content Quality of Video-Based Digital Extension Tools (VCQ)	3	0.963	4.16	0.825
Individual Innovativeness of Video-Based Digital Extension Tools (VII)	4	0.934	4.04	0.857
Subjective Norms for Video-Based Digital Extension Tools (VSN)	3	0.978	4.09	0.817
Perceived Ease of Use for Video-Based Digital Extension Tools (VEU)	2	0.966	4.20	1.598

NI : Number of items, SD : Standard deviation
Source: Survey data (2024)

Multiple regression was used to examine the effects of perceived ease of use, perceived usefulness, attitudes, content quality, individual innovativeness, and subjective norms on farmers' intention to use video-based digital extension tools. The model was significant [$F(6, 1123) = 3546.25, p < .001, R^2 = .95$]. Attitudes ($\beta = .348$) and content quality ($\beta = .418$) were the strongest; individual innovativeness was not significant, and VIF values indicated acceptable collinearity.

Mauchly's test indicated a violation of sphericity [$\chi^2(2) = 76.02, p < .001$]; therefore,

the Greenhouse–Geisser correction was applied. The repeated-measures ANOVA revealed that digital extension tools had a statistically significant and large effect on perceived effectiveness [$F(1.88, 2119.84) = 3612.35, p < .001, \text{partial } \eta^2 = .132$].

Videos were rated significantly higher than voice recordings and digital leaflets in Bonferroni-adjusted comparisons. At the same time, voice recordings also exceeded leaflets, confirming that video is the most effective digital extension tool, as shown in Table 7.

Table 7: Bonferroni pairwise comparisons

Comparison	MD (I–J)	SE	p-value	95% CI (LB)	95% CI (UB)
Leaflet vs Voice	-0.335	0.017	< .001	-0.377	-0.293
Leaflet vs Videos	1.289	0.021	< .001	1.237	1.340
Voice vs Leaflet	0.335	0.017	< .001	0.293	0.377
Voice vs Videos	1.624	0.021	< .001	1.573	1.675
Videos vs Leaflet	-1.289	0.021	< .001	-1.340	-1.237
Videos vs Voice	-1.624	0.021	< .001	-1.675	-1.573

MD : Mean Difference , SE: Standard Error , CI : Confidence Interval , LB : Lower Bound, and UB : Upper Bound
Note: Adjustment for multiple comparisons: Bonferroni. The mean differences are significant at $p < .05$.
Source: Survey data, 2024

DISCUSSION

The findings indicate that paddy farmers exhibited more favorable perceptions and stronger behavioral intentions toward video- and digital leaflet-based extension tools than toward voice recordings. The superior performance of video-based extension tools may be attributed to their ability to combine visual and auditory information, thereby enhancing comprehension, engagement, and knowledge retention among farmers. This finding is consistent with previous studies that reported audiovisual content to be more effective than text-only or audio-only formats in agricultural extension because videos can demonstrate farming practices, technologies, and innovations more clearly and realistically (Davis, 1989; Aker, 2011; Bentley *et al.*, 2019). Similarly, the relatively high acceptance of digital leaflets suggests that concise visual information remains an effective medium for delivering agricultural recommendations, particularly when farmers

require reference materials they can revisit at their convenience.

The regression results further revealed that attitude, perceived usefulness, content quality, ease of use, and subjective norms significantly influenced farmers' behavioral intentions to use digital extension tools. These findings are consistent with the Technology Acceptance Model (TAM), which emphasizes that perceived usefulness and positive attitudes are key determinants of technology adoption (Davis, 1989). The strong influence of content quality, particularly for video-based extension tools, highlights the importance of providing accurate, relevant, and understandable agricultural information. This finding aligns with studies indicating that the quality and credibility of information significantly affect users' willingness to adopt digital agricultural services (Venkatesh *et al.*, 2003; Mittal and Mehar, 2016).

The significant effect of subjective norms suggests that social influence from fellow farmers, extension officers, and community networks plays an important role in shaping technology adoption decisions. This observation supports the Theory of Planned Behavior, which posits that individuals are more likely to adopt innovations when influential people in their social environment endorse them (Ajzen, 1991). In rural agricultural contexts, peer learning and recommendations from extension personnel often contribute to the diffusion of new technologies and practices.

In contrast, individual innovativeness was not a significant predictor of behavioral intention for most digital extension tools. This result suggests that farmers' adoption decisions are driven more by the perceived benefits, usability, and social acceptance of the technology than by their inherent tendency to experiment with innovations. Similar findings have been reported in agricultural technology adoption studies, where practical value and external support mechanisms were found to outweigh personal innovativeness in influencing adoption behavior (Tey and Brindal, 2012; Rogers, 2003).

Overall, the findings suggest that video-based extension tools offer the greatest potential for enhancing agricultural information dissemination among paddy farmers. However, digital leaflets and voice recordings remain valuable complementary channels that can accommodate varying literacy levels, technological access, and learning preferences. Therefore, agricultural extension programs should adopt a multimodal digital communication strategy that integrates videos, digital leaflets, and voice-based content to maximize outreach and effectiveness among diverse farming communities.

CONCLUSIONS

This study showed that digital extension tools improve the dissemination of agricultural information to paddy farmers, with video-based tools being most effective in enhancing comprehension, engagement, and intention to

use. Higher ratings for video- and leaflet-based digital extension tools, compared with voice-recording-based tools, suggest that visual and multimedia elements foster clearer understanding and positive attitudes. Significant differences found via repeated measures ANOVA and the predictive influence of attitudes towards using digital communication tools, content quality of digital communication tools, perceived usefulness of digital communication tools, perceived ease of use of digital communication tools and subjective norms for digital communication tools indicate adoption is driven by perceived value and content effectiveness rather than innovativeness. The findings have important policy implications for agricultural extension services. Given the strong preference for video-based digital extension tools, policymakers should prioritize developing and disseminating high-quality agricultural video content as a core component of national extension strategies. Investment should be directed toward strengthening digital infrastructure in rural areas, improving farmers' access to smartphones and internet connectivity, and enhancing the digital competencies of both farmers and extension officers. Furthermore, the Department of Agriculture should adopt a multimodal communication policy that integrates videos, digital leaflets, and audio messages to accommodate farmers with different literacy levels, technological capacities, and information needs. Establishing institutional guidelines for production, quality assurance, and regular updating of digital extension content would further enhance the effectiveness and credibility of digital advisory services. Such policy measures can contribute to more inclusive, accessible, and sustainable agricultural extension systems while supporting the broader digital transformation of the agricultural sector.

AUTHOR CONTRIBUTION

DAP contributed to the conceptualization, methodology, conduct of the study, data collection, data analysis, and drafting of the manuscript, while WNDS and KNS provided

supervision, methodological guidance, and critically reviewed the manuscript.

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