RESEARCH ARTICLE

Repackaging Agricultural Research Information for Adoption of Improved Farming Practices among Sorghum Farmers in Dodoma Region, Tanzania

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Abstract

Promoting the adoption of improved farming practices hinges on making agricultural research understandable and accessible to smallholder farmers. However, effectively repackaging and disseminating this knowledge remains a global challenge. This study explored how language preference affects adoption, evaluated the quality attributes of repackaged information, and examined these relationships among 399 sorghum farmers in Dodoma, selected through a multi-stage sampling technique. Data were analysed using descriptive statistics to identify key patterns, while Analysis of Variance (ANOVA) assessed variations in perceived quality attributes. Additionally, binary logistic regression estimated the likelihood of adoption based on these attributes. The findings revealed that 91% of farmers preferred Kiswahili, and this language preference significantly affected adoption ($p < 0.001$). Among the quality attributes of repackaged information, language, format, and completeness ranked highest. Regression analysis indicated that language, objectivity, and completeness were crucial in influencing adoption. The study concludes that repackaging agricultural research in accessible language and formats tailored to local preferences can enhance the uptake of improved practices. Recommendations include using visual aids, providing hands-on training, and employing local languages to promote inclusivity. Building trust through community leaders and fostering collaboration among researchers, extension workers, and policymakers can help translate research findings into practical solutions, ultimately benefiting local communities and facilitating the adoption of better farming practices.

Keywords

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Introduction

Information repackaging involves reprocessing and reshaping content to make it more practical and usable for specific audiences. For smallholder farmers, this is particularly important, as they often struggle with the technical language and abstract ideas presented in agricultural research. Given their generally low and diverse levels of formal education, simplifying complex information is essential for effective communication between researchers, extension officers, and farmers (Mushi, Serugendo, & Burgi, 2023; Nugroho, 2021). When research is translated into clear, culturally relevant language and formats, it becomes more relatable and easier for farmers to apply in their daily practices (Azubuike & Aji, 2021; Panda, Kaur, & Kaur, 2023).

While tailoring agricultural information to match farmers' educational and cultural contexts is essential, these efforts are often challenged by Africa's vast linguistic diversity and institutional structures that shape information delivery. Smallholder farmers frequently struggle to adopt improved practices such as timely fertilizer use or effective pest control, due to technical jargon and language barriers (Autio, Johansson, Motaroki, Minoia, & Pellikka, 2021; Deguine et al., 2021). With over 2,300 languages spoken across the continent, research published in English or French often remains inaccessible (Ariom et al., 2022; Hannah, Haddaway, Fuller, & Amano, 2024). These language barriers, combined with weak institutional coordination, limit farmers' access to vital knowledge, undermining their ability to benefit from innovations and improve their farming outcomes.

In Tanzania, decentralization has reshaped how agricultural information is shared by shifting communication and extension responsibilities to local authorities under the Local Government Reform Programme (Masanyiwa, Mdachi, Namwata, & Safari, 2019; Msuya, 2021). This approach holds promise for making agricultural messages more responsive to farmers' realities. However, implementation faces hurdle such as weak coordination, limited funding, and the underuse of local languages in official communication. These challenges hinder efforts to reach all farmers effectively. Addressing them requires stronger institutional linkages, improved local capacity, and communication strategies that embrace farmers' languages and cultural contexts to support meaningful participation and learning.

These communication challenges are especially visible in contexts like sorghum farming in Dodoma, Tanzania, where there is a clear gap between research dissemination and actual on-farm adoption. Sorghum is a key crop for food security and income among smallholder farmers, yet yields remain around one ton per hectare, far below the crop's potential of five tons (Mrema, Shimelis, Laing, & Bucheyeki, 2017; Mundia, Secchi, Akamani, & Wang, 2019). Although institutions like TARI have introduced improved practices, adoption remains low. This suggests that communication strategies have not effectively bridged the gap between research and farmers' needs, leaving many unable to access or apply the information in practice. This situation

highlights the importance of not only making agricultural information available but also ensuring it is communicated in ways that reflect farmers' local realities, languages, and preferences.

While the importance of agricultural communication is increasingly recognized, there are still gaps in how effectively current strategies support the adoption of improved practices. Studies emphasize the need to repackage agricultural research for better clarity and usability (Azubuike & Aji, 2021; Fortner, 2022). However, specific quality attributes like completeness, clarity, relevance, and reliability, which impact communication effectiveness, are often overlooked, particularly in sorghum farming. Additionally, the influence of farmers' language preferences on understanding and applying repackaged content has not been thoroughly explored, especially in linguistically diverse, low-literacy areas like Dodoma. Empirical research is needed to assess how these factors affect farmers' engagement and adoption of improved practices.

This study aimed to assess how repackaged agricultural research information influences the adoption of improved sorghum farming practices among farmers in Dodoma, Tanzania. It examined the impact of farmers' language preferences on information accessibility, evaluate quality attributes such as clarity and relevance, and determine how these factors affect understanding and actual adoption behaviour.

Research Objectives

The study was guided by the following objectives:

1) To assess how farmers' language preferences, influence the adoption of improved sorghum farming practices.

2) To evaluate the quality attributes of repackaged agricultural research information, such as clarity, completeness, and format.

3) To determine the relationship between these quality attributes and the adoption of improved sorghum farming practices.

Research Questions

To achieve the above objectives, the study addressed the following research questions:

(1) How does farmers' language preference affect their understanding and adoption of improved sorghum farming practices?

(2) What are the perceived quality attributes of repackaged agricultural research information, and how do these vary among farmers?

(3) To what extent do attributes such as clarity, completeness, and language influence the adoption of improved farming practices?

Theoretical Framework

This study draws on two complementary theoretical frameworks: Diffusion of Innovations Theory Rogers (2003) and the Service Marketing Model (SMM) by Irons (1997). Together, they offer a comprehensive foundation for understanding how communication influences the adoption of improved sorghum farming practices among smallholder farmers. The Diffusion of Innovations Theory explains how new ideas and technologies are communicated and adopted within a social system. It emphasizes that adoption depends not only on the innovation itself but also on how it is communicated, considering factors such as message clarity, language, media choice, and compatibility with existing practices. In this study, language preference is treated as a key element of compatibility, reflecting how well the innovation aligns with farmers' socio-cultural contexts. Similarly, the repackaged information's attributes such as clarity, objectivity, and completeness, relate to DOI's concepts of simplicity and observability, which affect the rate of adoption.

The Service Marketing Model complements DOI by focusing on how agricultural information functions as a service. It highlights that the perceived value of information depends on how well it meets users' needs and expectations. From this perspective, farmers evaluate agricultural information much like consumers evaluate services, considering aspects such as credibility, accessibility, and responsiveness. By integrating these two frameworks, the study offers an understanding of adoption behaviour. While DOI highlights the pathways through which innovations spread, SMM emphasizes the quality of the communication process itself. This dual lens emphasises the importance of user-centred, linguistically appropriate, and clearly structured information in promoting adoption in resource-constrained settings like Dodoma.

Literature Review and Hypothesis Development

Effective communication of agricultural research information is widely recognized as essential for fostering the adoption of improved farming practices, particularly among smallholder farmers in developing regions. A growing body of empirical evidence highlights the significance of language preference in determining farmers' comprehension and application of agricultural innovations. For instance, Waithera (2021) reported that adoption rates significantly increased when agricultural information was delivered in languages preferred by farmers and aligned with their educational levels. This finding highlights the critical role of linguistic alignment in enhancing farmers' engagement with new technologies. Similarly, Gupta, Ponticelli and Tesei (2024) and Sharma, Kamble, Gunasekaran, Kumar and Kumar (2020) found that language barriers inhibited the uptake of modern agricultural technologies, particularly among farmers with limited formal education. These findings suggest that language preference not only facilitates understanding but also promotes a sense of ownership and relevance regarding

agricultural innovations. Further supporting this perspective, Bello, Baiyegunhi and Danso-Abbeam (2021) observed that language challenges significantly undermined the effectiveness of extension services, while Kirui, Ombati and Nkurumwa (2022) demonstrated that localized SMS communication improved the uptake of agronomic recommendations. Collectively, these studies, conducted across diverse African and Asian contexts, highlight that the use of farmers' preferred languages is not a peripheral issue but a fundamental determinant of adoption behaviour. However, it is noteworthy that many of these investigations focus on digital communication platforms or general extension services without specifically examining the interaction between language preference and the repackaging of research-based agricultural information.

In addition to language, the quality of repackaged agricultural information plays a pivotal role in influencing farmers' decisions. Attributes such as clarity, relevance, timeliness, accessibility, and consistency have been consistently identified as essential in shaping the perceived utility of agricultural messages. For example, Ndimbwa, Mwantimwa and Ndumbaro (2022) found that timely and contextually relevant information was positively associated with higher satisfaction levels among farmers. Njenga (2021) emphasized the value of repetition in reinforcing key messages, thereby supporting sustained behavioural change. Dilleen, Claffey, Foley and Doolin (2023) noted that accuracy and contextual appropriateness significantly enhance the effectiveness of technology transfer efforts. Conversely, Sigigaba, Yusuf, Bitso and Popoola (2022) highlighted that delayed or inadequately structured information delivery, particularly through overstretched extension systems, discouraged adoption and eroded farmers' trust in agricultural institutions. Furthermore, although digital media offer new opportunities, their efficacy is inconsistent. Mnzava and Jacobs (2023) observed that while some farmers benefitted from interactive and accessible digital formats, others were constrained by outdated content and overly technical language. These findings collectively emphasize the necessity of tailoring information to the cognitive, linguistic, and technological contexts of target audiences. Nevertheless, most existing studies treat these quality dimensions in isolation, with limited empirical attention devoted to understanding how their combination, particularly within repackaged research materials, affects adoption outcomes in low-resource rural settings. Literature has also illuminated the effectiveness of various repackaging strategies, including visual, digital, and customized formats, in enhancing the comprehensibility and appeal of agricultural information. For instance, Larochelle, Alwang, Travis, Barrera and Dominguez Andrade (2019) reported that personalized SMS messages contributed to increased adoption of pest management practices. Bello, Baiyegunhi and Danso-Abbeam (2021) found that incorporating visual aids such as photographs and illustrations improved comprehension and stimulated interest in new technologies. Van Campenhout, Spielman and Lecoutere (2021) concluded that brief instructional videos were more effective than conventional advice,

particularly for low-literacy audiences. Similarly, Mokhtar, Izhar, Zaini and Hussin (2022) demonstrated that interactive digital platforms were particularly beneficial for literate users when the content was designed to be engaging and accessible. While these studies affirm the value of tailored communication strategies, they tend to generalize across agricultural contexts and crops. Few specifically address the unique challenges of sorghum production in semi-arid regions such as Dodoma, Tanzania, where low literacy levels, infrastructural constraints, and linguistic diversity converge to create significant barriers to information uptake. Thus, there remains a notable gap in the literature concerning the combined influence of language preference and repackaged information quality on the adoption of improved sorghum farming practices.

This study aimed to assess how repackaged agricultural research influences the adoption of improved sorghum farming practices among smallholder farmers in Dodoma. It focused on the impact of language preference on accessibility and assessed qualities like clarity and relevance, aiming to develop more inclusive communication strategies for resource-constrained rural areas. Based on the theoretical framework and reviewed literature, the following null hypotheses were proposed:

H_0: *There is no significant difference in the adoption of improved farming practices among farmers based on their language preference.*

H_0: *There are no statistically significant variations in the quality attributes associated with repackaged agricultural research information*

H_0: *There is no statistically significant relationship between agricultural research information repackaging and the adoption of improved sorghum farming practices.*

Conceptual Framework

This study's conceptual framework explores how farmers' language preferences and the quality of repackaged agricultural research information influence the adoption of improved sorghum farming practices. Key independent variables include language preference and quality attributes like clarity, relevance, and timeliness. The dependent variable focuses on practices such as land preparation, improved seed use, and pest control. The framework suggests that adoption is shaped not just by information availability but also by its effective communication tailored to farmers' socio-cultural and linguistic contexts. By emphasizing the importance of user-centred communication, it highlights that well-adapted, clearly repackaged information enhances understanding and uptake, making agricultural innovations more relevant in rural communities.

Methodology

Study Area

The study was conducted in Dodoma Region, located in Tanzania's semi-arid central zone, where low and erratic rainfall (500–800 mm annually) and high temperatures favour drought-tolerant crops such as sorghum. As a major sorghum-producing area, Dodoma relies heavily on this crop for both food security and smallholder livelihoods. Sorghum's resilience to climate variability and its nutritional and economic value makes it a strategic crop in addressing regional food insecurity (Amede, Konde, Muhinda, & Bigirwa, 2023; Mwamahonje et al., 2021). This context provides a suitable setting to examine how repackaged agricultural research information influences the adoption of improved sorghum farming practices and decision-making.

Research Design

This study used a mixed-methods approach within a cross-sectional survey design to gain a comprehensive view of sorghum farming practices. By combining quantitative and qualitative data collected at one point in time, it aimed to understand how repackaging agricultural research information affects farmers' adoption of improved practices. This method captures measurable trends while offering insights into farmers' experiences and decision-making processes (Clark, 2019). The cross-sectional design also enables efficient data collection and examination of the relationships between communication variables and adoption behaviours (Mugenda & Mugenda, 2003).

Population and Sampling Techniques

The target population for this study comprised smallholder sorghum farmers in Dodoma, Tanzania. To ensure a representative sample, a multi-stage sampling technique was employed. The process began with the random selection of three districts namely, Kongwa, Kondoa, and Bahi, from a total of seven districts in the region. Next, three wards were randomly chosen within each of the selected districts. Following this, three villages were selected at random from each ward. In the final stage, households were identified from lists within the chosen villages, focusing specifically on heads of households, who typically act as the primary decision-makers in farming activities.

The sample size was calculated using Cochran's formula, as shown in equation 1, which recommends a minimum of 384 respondents. However, to account for possible non-responses, incomplete questionnaires, and data inconsistencies, common occurrences in field-based research, the final sample was slightly increased to 399 sorghum farmers. This adjustment is consistent with methodological guidance provided by Mugenda and Mugenda (2003) and

Saunders, Lewis and Thornhill (2003), who emphasize the importance of anticipating and mitigating such limitations during data collection. Furthermore, as Bryman (2016) asserts, increasing the sample size enhances statistical power and improves the reliability of subgroup analyses. Increasing sample size contributes to the robustness, reliability, and overall validity of the study's findings.

$$n_o = \frac{Z^2 pq}{e^2} \qquad\qquad \textbf{1}$$

$$n_o = \frac{(1.96^2 \times 0.5 \times 0.5)}{0.05^2} = 384$$

Data Collection Methods

Quantitative data were collected using a structured questionnaire administered by the researcher. This instrument captured key variables such as language preference, perceptions of information repackaging, including clarity, simplicity, and completeness, and indicators of adoption of improved sorghum farming practices. To enhance reliability and validity, the questionnaire was pre-tested with 38 respondents. This pretest sample size aligns with recommendations for instrument validation (Gunawan, Marzilli, & Aungsuroch, 2021). Complementing the quantitative data, qualitative insights were obtained through interviews with 15 key informants, including nine extension officers from nine wards and six agricultural experts from TARI, enriching the understanding of participants' knowledge and experiences.

Variables and Measurement

This study measured adoption of improved sorghum farming practices such as land preparation, fertilizer use, weed and pest control, and post-harvest handling as the dependent variable. These practices represent key stages in sorghum production. Independent variables included language preference (the language respondents best understood agricultural information in), repackaging attributes (clarity, format, completeness), and perceived information quality, all of which reflect how effectively the content was tailored to meet farmers' communication needs. These variables are described in Table 1.

Table 1. Variables and Measurement Methods

Variable	Type	Definition/ Description	Measurement Method
Adoption of Improved Sorghum Farming Practices	Dependent	Adoption status or level of improved sorghum farming techniques	Binary (0 = not adopted, 1 = adopted); also measured as an index for ANOVA analysis
Language Preference	Independent	Language in which the farmer best understands agricultural information	Categorical (e.g., Kiswahili, local language, English); analysed using ANOVA
Information Repackaging Attributes	Independent	Perceived quality of information based on multiple communication attributes	Likert scale (1–5) for each of 10 attributes: clarity, completeness, relevance, etc.
Information Quality Index	Intermediate	Composite measure reflecting the perceived quality of repackaged agricultural information	Computed using average scores across ten attributes; analysed with two-way ANOVA

Data Analysis

The analysis employed both quantitative and qualitative methods to explore how language preference and the quality of repackaged agricultural research information influence the adoption of improved sorghum farming practices. Descriptive statistics, such as frequencies and percentages, summarized farmers' language preferences, while means and standard deviations highlighted variations in their perceptions of information attributes. A one-way ANOVA assessed whether adoption levels differed based on language preferences and perceived quality. Additionally, binary logistic regression identified key factors affecting adoption likelihood. Qualitative data from interviews were thematically analysed, revealing insights into communication strategies, language use, and barriers to adoption, enriching our understanding of farmers' preferences and behaviours.

Language Preference and Adoption of Improved Farming Practices

ANOVA model was employed to evaluate differences in the adoption of improved farming practices among farmers, categorized by their language preference. This allowed for the comparison of means across multiple groups (in this case, different language preferences) to determine if there were statistically significant differences in adoption. The formulation of the model is presented in equation 2.

$$Y_{ij} = \mu + \tau_i + \varepsilon_{ij} \quad \begin{cases} i=1,2,3 \\ j=1,2,...,399 \end{cases} \qquad 2$$

where:

Y_{ij} is the dependent variable (the adoption index), μ is an overall mean, τ_i is the effect of the language preference, and ε_{ij} is the random error term which is normally identically distributed (0, σ^2). A Turkey's HSD (Honestly Significant Difference) test was performed after an ANOVA model with the aim of identifying groups (language preference) that were significantly different from each other in terms of adoption.

To validate the ANOVA model used, a diagnostic test was conducted. Normality of residuals was evaluated using the Shapiro-Wilk Test while Levene's test was performed to assess homogeneity of variances, with results indicating no significant violation of these assumptions (p > 0.05).

Variation in Repackaged Agricultural Research Information Attributes

A two-way analysis of variance was conducted to assess variations in the quality of repackaged agricultural information. This quality was measured using a 1-5 Likert scale, where respondents rated various attributes based on specific criteria. Higher scores indicated better quality. The independent variable included attributes like objectivity, relevance, reliability, and accessibility, chosen for their importance in enhancing agricultural communication effectiveness. The Model formulation is as presented in equation 3.

$$Y_{ij} = \mu + \tau_i + \beta_j + \varepsilon_{ij} \left\{ \begin{matrix} i=1,2,3 \\ j=1,2,\ldots,399 \end{matrix} \right. \qquad 3$$

where:

Y_{ij} is the dependent variable (information quality index), μ is an overall mean, τ_i is the attribute effect, β_j is the jth individual farmer perception effect and ε_{ij} is the random error term which is normally identically distributed (0, σ^2).

Information Repackaging and Adoption of Improved Farming Practices

A binary logistic regression model was employed to examine the influence of repackaging agricultural information on the adoption of improved farming practices. The dependent variable represented the adoption status, measured as a binary outcome (0 for no adoption, 1 for adoption). The ten attributes related to repackaging (measured in a scale from 1 to 5, the higher the value implying higher level of attribute) were treated as independent variables within the model formulation as shown in the equation 4:

$$\text{logit}(\pi(x)) = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5$$
$$+ \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} \qquad 4$$

Where;
x_1 = Objectivity, x_2 = Relevancy, x_3 = Reliability, x_4 = Accessibility,
x_5 = Completeness, x_6 = Language, x_7 = Timeliness, x_8 = Format,
x_9 = Media Choice, x_{10} = Currency

Model Specification, Robustness Checks, and Goodness of Fit

As part of model specification, socio-demographic variables such as gender, age, marital status, education level, farm size, and household size were examined to assess their role as control variables. However, none significantly influenced the relationship between repackaging attributes and adoption, leading to their exclusion to maintain model parsimony. Robustness checks confirmed model stability, with all repackaging variables showing Variance Inflation Factor (VIF) values below 2.9, indicating no multicollinearity concerns. Additionally, the model's predictive accuracy was evaluated using the Area Under the ROC Curve (AUC), which yielded a value of 0.78, demonstrating strong discriminative power in identifying adoption behaviour.

Findings

Language Preference and Adoption of Improved Sorghum Farming Practices

The study findings revealed that 91% of respondents preferred accessing agricultural information in Kiswahili, while only 6% favoured local languages (Table 2). This indicates a strong preference for Kiswahili as a means of communicating agricultural research information.

Table 2. Farmers' Language Preference (n = 399)

Language Preference	Frequency (n)	Percentage (%)
Local languages	24	6.0
Kiswahili	363	91.0
Both Kiswahili and Local Language	12	3.0

ANOVA analysis (Table 3) demonstrated a significant relationship between language preference and the adoption of improved farming practices, with a p-value less than 0.001. Thus, the null hypothesis, that there is no significant difference in the adoption of improved farming practices among farmers based on their language preference, was rejected. This suggests a clear connection between the language in which agricultural information is communicated and its subsequent adoption by farmers.

Table 3. Association between Language Preference and Adoption of Improved Farming Practices

Source of Variation	Sum of Squares	DF	Mean Square	F-statistic	P-value
Language preference	7.7849	2	3.8924	14.04	<0.001
Residual	109.7993	396	0.2773		
Total	117.5841	398			

The ANOVA results revealed significant differences in how farmers adopt improved practices based on their language preferences for agricultural information. According to Table 4, farmers who preferred Kiswahili had an adoption level 0.5797 units higher than those favouring local languages, with a t-statistic of 5.22 and a p-value under 0.001, indicating a highly significant difference. This supports rejecting the null hypothesis that no differences exist. Furthermore, farmers using both Kiswahili and local languages showed even greater adoption, increasing by 0.681 units compared to those preferring only local languages. However, the comparison between those favouring both languages and only Kiswahili was less clear, showing no significant difference.

Table 4. Comparison of Adoption for Improved Farming Practices Based on Language Preference

Language preference	Contrast	T	P>|t|	95% Confidence Interval
Kiswahili vs Local language	0.5797	5.22	<0.001	0.3186, 0.8408
Both Kiswahili and Local language vs Local language	0.681	3.66	<0.001	0.2430, 1.1189
Both Kiswahili and Local language vs Kiswahili	0.1012	0.66	0.789	-0.2622, 0.4647

Agricultural Research Information Repackaging Quality Attributes

The analysis of repackaged agricultural research information attributes showed that language emerged as the most critical factor, receiving a mean score of 2.97. The format of the information followed, with a mean score of 2.83, emphasizing the need for user-friendly presentation. Completeness ranked third, with a mean score of 2.66. The ANOVA results revealed significant differences in how farmers adopt improved practices based on their language preferences for agricultural information. According to Table 4, farmers who preferred Kiswahili had an adoption level 0.5797 units higher than those favouring local languages, with a t-statistic of 5.22 and a p-value under 0.001, indicating a highly significant difference. This supports

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Table 5. Ranking of Repackaged Agricultural Research Information Attributes by Farmers

Attributes	Mean	Std. dev	Rank
Objectivity	2.63	0.75	7
Relevancy	2.66	0.82	4
Reliability	2.63	0.82	6
Accessibility	2.41	0.84	10
Completeness	2.66	0.83	3
Language	2.97	0.94	1
Timeliness	2.59	0.88	9
Format	2.83	0.87	2
Media choice	2.64	0.82	5
Currency	2.62	0.82	8

The two-way ANOVA results (Table 6) indicated significant differences in farmers' perceptions of these attributes, with an F-statistic of 27.36 and a p-value less than 0.001. Consequently, the null hypothesis stating that there are no statistically significant variations in the quality attributes associated with repackaged agricultural research information was also rejected. This variability highlights the importance of optimizing communication strategies to address diverse farmer needs effectively.

Table 6. Analysis of Variance for Agricultural Research Information Repackaging Quality Attributes

Source of Variation	Sum of Squares	DF	Mean Square	F-statistic	P-value
Information Attributes	79.037845	9	8.7820	27.36	<0.001
Farmers	1660.0877	398	4.1711	12.99	<0.001
Residual	1149.8622	3582	0.3210		
Total	2888.9877	3989			

Table 7 illustrates the impact of various information repackaging attributes on the adoption of improved farming practices. The results indicate that language, format, and accessibility are significantly more influential than other factors. Language emerged as the strongest predictor, with notable differences compared to attributes like objectivity and reliability (p < 0.001). In contrast, aspects such as completeness and currency showed minimal variation.

Overall, clear language and accessibility are vital for encouraging adoption, surpassing other attributes.

Table 7. Comparison of Adoption for Improved Farming Practices Based on Information Repackaging Quality Attributes

Information Repackaging Quality Attributes	Contrast	SD	T	P>|t|
Relevancy vs Objectivity	0.0301	0.0595	0.51	1.000
Reliability vs Objectivity	0.0025	0.0595	0.04	1.000
Accessibility vs Objectivity	-0.218	0.0595	-3.67	0.009
Completeness vs Objectivity	0.0351	0.0595	0.59	1.000
Language vs Objectivity	0.3434	0.0595	5.77	<0.001
Timeliness vs Objectivity	-0.0426	0.0595	-0.72	0.999
Format vs Objectivity	0.203	0.0595	3.41	0.023
Variate media vs Objectivity	0.015	0.0595	0.25	1.000
Currency vs Objectivity	-0.01	0.0595	-0.17	1.000
Reliability vs Relevancy	-0.0276	0.0595	-0.46	1.000
Accessibility vs Relevancy	-0.2481	0.0595	-4.17	0.001
Completeness vs Relevancy	0.005	0.0595	0.08	1.000
Language vs Relevancy	0.3133	0.0595	5.27	<0.001
Timeliness vs Relevancy	-0.0727	0.0595	-1.22	0.969
Format vs Relevancy	0.1729	0.0595	2.91	0.104
Variate media vs Relevancy	-0.015	0.0595	-0.25	1.000
Currency vs Relevancy	-0.0401	0.0595	-0.67	1.000
Accessibility vs Reliability	-0.2206	0.0595	-3.71	0.008
Completeness vs Reliability	0.0326	0.0595	0.55	1.000
Language vs Reliability	0.3409	0.0595	5.73	<0.001
Timeliness vs Reliability	-0.0451	0.0595	-0.76	0.999
Format vs Reliability	0.2005	0.0595	3.37	0.026
Variate media vs Reliability	0.0125	0.0595	0.21	1.000
Currency vs Reliability	-0.0125	0.0595	-0.21	1.000
Completeness vs Accessibility	0.2531	0.0595	4.26	0.001
Language vs Accessibility	0.5614	0.0595	9.44	<0.001
Timeliness vs Accessibility	0.1754	0.0595	2.95	0.093
Format vs Accessibility	0.4211	0.0595	7.08	<0.001
Variate media vs Accessibility	0.2331	0.0595	3.92	0.004
Currency vs Accessibility	0.208	0.0595	3.5	0.017
Language vs Completeness	0.3083	0.0595	5.18	<0.001
Timeliness vs Completeness	-0.0777	0.0595	-1.31	0.953
Format vs Completeness	0.1679	0.0595	2.82	0.129
Variate media vs Completeness	-0.0201	0.0595	-0.34	1.000
Currency vs Completeness	-0.0451	0.0595	-0.76	0.999

Table 8. Comparison of Adoption for Improved Farming Practices Based on Information Repackaging Quality Attributes (Cont.)

Information Repackaging Quality Attributes	Contrast	SD	T	P>|t|
Timeliness vs Language	-0.386	0.0595	-6.49	<0.001
Format vs Language	-0.1404	0.0595	-2.36	0.351
Variate media vs Language	-0.3283	0.0595	-5.52	<0.001
Currency vs Language	-0.3534	0.0595	-5.94	<0.001
Format vs Timeliness	0.2456	0.0595	4.13	0.002
Variate media vs Timeliness	0.0576	0.0595	0.97	0.994
Currency vs Timeliness	0.0326	0.0595	0.55	1.000
Variate media vs Format	-0.188	0.0595	-3.16	0.051
Currency vs Format	-0.213	0.0595	-3.58	0.013
Currency vs Variate media	-0.0251	0.0595	-0.42	1.000

Agricultural Information Repackaging on Adoption of Improved Farming Practices

Binary logistic regression analysis in Table 9 revealed a strong link between the quality of repackaged information and the adoption of improved farming practices. Key attributes like language (OR = 2.93, p < 0.001), objectivity (OR = 2.64, p = 0.001), and completeness (OR = 2.10, p = 0.009) significantly increased the likelihood of adoption. The model demonstrated good discriminatory power, with an area under the curve (AUC) of 0.727. This evidence led to rejecting the null hypothesis of no significant relationship between information repackaging and improved sorghum farming practices.

Table 9. The influence of Agricultural Research Information Repackaging on Adoption of Improved Farming Practices

ARI Attribute	Odds Ratio	Std. error	Z	P>|z|	95% conf. Interval
Objectivity	2.6395	0.7607	3.37	0.001*	1.5003, 4.6435
Relevancy	1.5615	0.4424	1.57	0.116	0.8962, 2.7209
Reliability	1.8132	0.5157	2.09	0.036*	1.0383, 3.1664
Accessibility	1.2809	0.3723	0.85	0.394	0.7247, 2.2642
Completeness	2.1022	0.5994	2.61	0.009*	1.2022, 3.6759
Language	2.9309	0.8557	3.68	<0.001*	1.6539, 5.1941
Timeliness	1.6214	0.4644	1.69	0.092	0.9249, 2.8424
Format	2.2243	0.6359	2.80	0.005*	1.2701, 3.8954
Media Choice	2.4972	0.7223	3.16	0.002*	1.4165, 4.4022
Currency	2.1609	0.6205	2.68	0.007*	1.2308, 3.7937

* Indicates significant results

Discussion

The findings of this study reveal the vital role that language preference plays in adopting improved sorghum farming practices. An impressive 91% of respondents indicated that Kiswahili was their preferred language for receiving agricultural information. This preference highlights the importance of linguistic accessibility, ensuring that messages are not only delivered but also understood and acted upon effectively. Research by Ojo and Koledoye (2022) supports this idea, emphasizing that agricultural communication is most impactful when conveyed in a language familiar to the audience. Similarly, Abubakar (2024) pointed out that communication in a shared language enhances both comprehension and farmers' confidence, particularly in areas with varying levels of educational attainment.

The significant relationship between language preference and the adoption of improved practices was confirmed by ANOVA results ($p < 0.001$). This indicates that language functions not just as a means of communication but also as a critical factor in establishing clarity and trust. According to Rogers' Diffusion of Innovations Theory, the likelihood of adopting innovations increases when they are communicated in ways that resonate with the cultural and social contexts of potential adopters (Rogers, 2003). Therefore, agricultural research institutions and extension agents should prioritize Kiswahili in their communication efforts to enhance message reception and adoption rates among smallholder farmers. A key informant reinforced this finding, noting that messages delivered in English were often overlooked due to limited comprehension. In contrast, those delivered in Kiswahili led to significantly better participation in training and follow-up activities. This suggests that using an accessible language not only fosters inclusivity but also boosts farmers' confidence in the information, enhancing their willingness to adopt new practices. Thus, grounding agricultural communication in suitable linguistic frameworks is essential for meaningful farmer engagement.

The study also revealed that farmers who received information in both Kiswahili and local dialects exhibited higher adoption rates than those exposed to messages in only one language. This finding aligns with Arshad (2024), who highlighted the advantages of integrating national and indigenous languages to broaden the reach and relevance of agricultural information. Interestingly, while previous research often focused on local languages, this study found Kiswahili to be perceived as more authoritative and suitable for technical content, while local languages enhanced contextual understanding. This indicates that bilingual approaches can effectively bridge scientific content with local realities, improving communication effectiveness. Extension systems should, therefore, utilize both Kiswahili and local dialects to enhance comprehension and cultural relevance.

Additionally, the study examined farmers' perceptions of the repackaging of agricultural information, specifically its clarity, format, and completeness. Statistically significant differences

in perceptions (ANOVA F = 27.36, p < 0.001) suggest that farmers actively evaluate the quality of the information they receive. This aligns with the Service Marketing Model, which posits that users assess services, including information, based on expectations and perceived value. Information that is clearly presented, well-structured, and complete is more likely to be trusted and acted upon. Conversely, overly technical or poorly organized messages can hinder comprehension and limit utility. A key informant noted that repackaging messages into visual formats, narratives, or simple dialogues, especially in Kiswahili, greatly improved engagement. Farmers found this type of content more relatable and easier to understand. These findings affirm the work of Ellefson (2023), who found that repackaged messages reflecting real-life contexts are more likely to influence behavioural change. This highlights the necessity for communication strategies that extend beyond mere translation to ensure cognitive and experiential alignment with farmers' realities.

Logistic regression analysis further validated the importance of specific repackaging attributes. Language (Odds Ratio = 2.93), objectivity (OR = 2.64), and completeness (OR = 2.10) emerged as strong predictors of adoption. These elements not only influence usability but also the credibility of agricultural information. This supports the assertions of Thomas, O'Hare and Coyle (2023), who emphasized that the credibility and completeness of information are vital for acceptance, particularly in agriculture where decisions can have significant implications. A key informant corroborated that farmers are more responsive to messages perceived as factual, unbiased, and complete.

Therefore, the adoption of improved sorghum farming practices in Dodoma is greatly influenced by how agricultural information is communicated and repackaged. Kiswahili acts as a crucial medium for clarity and engagement, while the quality of repackaging, especially in terms of language, objectivity, and completeness, significantly affects farmers' decisions to adopt innovations. These findings support the principles of Diffusion of Innovations Theory and the Service Marketing Model, highlighting the need for linguistically appropriate and user-centred communication strategies to drive agricultural transformation in semi-arid regions like Dodoma and beyond.

Conclusion and Recommendations

Conclusion

The findings of this study highlight the vital importance of language preference and the quality of repackaged agricultural information in promoting improved sorghum farming practices among farmers in Dodoma, Tanzania. With 91% of respondents preferring Kiswahili, using a familiar language significantly enhances communication. Statistical analyses reveal a strong link between language choice and the adoption of innovative practices. Key attributes

like objectivity and completeness help build trust among farmers, encouraging them to embrace new methods. These results align with Rogers' Diffusion of Innovations Theory, emphasizing the need for communication strategies tailored to farmers' linguistic and cultural contexts. By focusing on clear language and user-friendly formats, agricultural extension services can engage farmers more effectively, fostering the adoption of improved practices and promoting inclusive development in semi-arid regions like Dodoma and beyond.

Recommendations

Based on the study findings, it's recommended that extension workers communicate agricultural research in Kiswahili. Incorporating visual aids like charts, videos, and illustrated guides can enhance clarity and help farmers adopt new practices more easily. TARI should present information in relatable formats for smallholder farmers. Collaborating with extension workers ensures vital content is available in Kiswahili and local dialects, catering to diverse needs. NGOs can fund training programs to help agricultural officers simplify complex concepts. Partnering with media organizations for engaging campaigns can also reach fewer literate farmers. Additionally, organizing peer-to-peer training can strengthen community ties, allowing farmers to share experiences in a comfortable language, which fosters a supportive learning environment and improves farming outcomes.

Implications, Limitations, and Future Studies

Practical Implication

This paper evidences the critical role of making agricultural research more accessible to smallholder farmers by simplifying technical messages. Tailored information for their level of understanding would enhance the adoption of better farming practices that drive broader agricultural transformations through improved communication and application of innovative techniques.

Policy Implications

The study suggests that agricultural policy should prioritize Kiswahili and local languages in communication to improve understanding and adoption of better farming practices. Policies should promote farmer-centered strategies in extension programs, focusing on clear, complete, and objective information tailored to farmers' backgrounds. Additionally, training for extension officers on effective communication and resources for multilingual materials will strengthen the connection between research and practice, enhancing productivity and resilience among smallholder farmers.

Theoretical Implications

This study enhances the use of Diffusion of Innovations Theory and the Service Marketing Model in agricultural communication. It highlights that compatibility, particularly in linguistic and cultural contexts, is crucial for adoption. Farmers' preference for Kiswahili and effective information repackaging improves their decision-making. Smallholder farmers assess agricultural messages based on clarity, completeness, and objectivity, which fosters trust and influences their actions. These insights highlight the need for user-centered communication and pave the way for further research on tailored messaging strategies to support rural agricultural innovation.

Limitations of the Study and Future Research

This study offers valuable insights but has limitations. It focused solely on smallholder farmers in Dodoma, which may not represent other regions. Self-reported data could introduce bias, and the study did not consider factors like market access or extension support. Future research should expand geographically and use longitudinal methods to better understand how communication influences the adoption of improved farming practices.

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