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Improving Farming Activities through Traditional Practices: The Role of Rural Women in Tanzania

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ABSTRACT

This study was carried out to investigate the potential of rural women to bring about agricultural change in Tanzania. Based on the original research, this paper presents findings on improving farming activities through traditional practices in Dodoma City Council and Singida District. Specifically, the paper presents findings on the role of women's traditional practices in improving farming activities and on women's attitudes towards those practices. Utilizing a cross-sectional design, the original research collected data from 382 rural women of varying age, education, and marital status. Data were analyzed using IBM SPSS for ordinal logistic regression and Microsoft Excel to calculate mean scores for each Likert-scale statement. The findings revealed five significant factors ($p < .001$) associated with improved farming activities: knowledge, skills, technology, information systems, and personal characteristics ($p < 0.05$). In contrast, farming materials, sources of funding, farming inputs, and women's attitudes were not found to be statistically significant. Additionally, the study assessed women's attitudes toward traditional farming practices and found both positive and neutral perceptions. Based on these findings, this paper concludes that five key factors significantly influence agricultural practices and the women in the surveyed area hold both positive and neutral attitudes toward traditional farming methods. As a result, the paper recommends that the Ministry of Agriculture, Local Government Authorities (LGAs) in Dodoma and Singida, and non-governmental organizations develop agricultural interventions and capacity-building programs to strengthen weak traditional agricultural practices and reinforce effective ones.

1. Introduction

Agriculture is a dominant sector in most developing countries (Bluwstein *et al.,* 2018). It plays a significant role in development, especially in rural areas (Bluwstein *et al.,* 2018; Engstrom & Hajdu, 2018; West & Haug, 2017). In Tanzania, more than 70% of the workforce is employed in the agriculture sector (NBS, 2015), and 80% of this labour force comprises women (Akram-Lodhi & Komba, 2018; NBS, 2015). Moreover, over 70% of rural women in Tanzania rely on agricultural activities for their livelihoods (NBS, 2015), underscoring the importance of women's role in agriculture (Danquah *et al.,* 2017; Bluwstein *et al.,* 2018). Despite their significant contribution to the sector, it is reported that 70% of the world's poorest people are women (Doss *et al.,* 2018). Following this, the relationship between women and agriculture has been a central topic in rural communities (Hettiarachchi, 2022). This led to using women's experience and knowledge to improve farming activities (Hettiarachchi, 2022), especially given that rural women are the natural custodians of these traditional experiences and knowledge (Ugboma, 2014).

Over the past five decades, there has been a growing focus on the potential role of indigenous knowledge systems (IKSs). IKS is a*n adaptable, dynamic system based on skills, abilities, and problem-solving techniques that change over* time and play a crucial role in sustaining land productivity (Hambati, 2021). Consequently, in the late 1990s, IKS was adopted by developing countries and the international donor community as a major initiative to support agriculture (Hambati, 2021). IKS is a powerful development asset that many developing nations possess (Richey *et al.,* 2021). IKS has proven to be an essential and effective resource for rural African communities (Ugboma, 2014). Rural women possess detailed knowledge of ecosystems, species, plant uses, seed selection, and environmental conservation and management, to mention a few (Ugboma, 2014). They preserve this knowledge in their minds and pass it down orally from the older generation to the younger generation (Ugboma, 2014).

Similarly, the formal knowledge acquired in various institutions, such as schools, universities and research institutes, still heavily influences the thinking about development around the world (Hambati & Yengoh, 2018). As a result, IKS is often considered inferior, non-scientific, and dissimilar to modern knowledge systems, thereby being denied its role in the development process (Bouzarjomehri, 2018). Although, with time, there is a considerably acknowledged relationship between indigenous experience and knowledge systems and scientific knowledge systems (Munyua & Stilwell, 2013), the contemporary indigenous experience and knowledge systems worldwide are progressively frightened by large-scale mechanized agricultural systems, commercialization of agriculture, land-use changes, changing population dynamics and globalization (Hettiarachchi, 2022). Many rural societies still use indigenous experience and knowledge systems in farming practices (Hettiarachchi, 2022), even though these systems have not been appropriately mainstreamed into development projects or given their rightful place in development initiatives.

In Tanzania, rural women play an essential role in agriculture by utilizing valuable traditional knowledge and practices passed down from one generation to another. This traditional knowledge, which is accumulated through experience and learning is important in managing local farming systems and sustaining agricultural productivity. It incorporates a variety of activities, including seed selection, land preparation, pest control, crop management, harvesting, and storage. Women often rely on simple, cost-effective traditional techniques, such as controlled land burning for clearing, manual weeding, and traditional pest control methods (Hettiarachchi, 2022). Local ecological conditions adapt well to these simple traditional practices, which are essential for maintaining agricultural productivity without depleting natural resources.

In addition to that, rural women extend their daily farming activities to the preservation of indigenous knowledge systems, which offer insights into the management of local ecosystems and the use of natural resources. They also play a crucial role in passing down this knowledge and ensuring its continued relevance through storytelling, songs, and informal peer interactions (Lwoga et al., 2010). Furthermore, rural women finance agricultural activities, underlining the interconnectedness of farming with household economies using financial practices such as savings, livestock sales, and family support networks (Parlasca et al., 2022).

Empirical studies from various regions highlight the importance of rural women's contributions to agriculture, as well as the challenges they face in accessing resources and modern farming technologies. Research in India and Sri Lanka reveals that women's traditional knowledge is crucial for sustainable farming practices, but it is under threat due to changing societal attitudes toward agriculture and diminishing interest from younger generations (Mohammad & Vibha, 2019; Hettiarachchi, 2022). In Africa, studies such as those by Burke et al. (2018) and Anyoha et al. (2021) emphasise that although women are integral to food production, they face significant barriers, including limited access to land, agricultural inputs, and financial resources. Despite these challenges, integrating traditional knowledge with modern agricultural techniques has the potential to improve sustainability, enhance productivity, and promote food security.

Similar patterns emerge, with women actively involved in small scale farming but facing limitations due to socio-economic and institutional barriers in Tanzania (Akram-Lodhi & Komba, 2018; Mkuna et al., 2023). However, research also points to the potential benefits of combining indigenous farming practices with scientific knowledge, as shown in studies by Rwela (2018) and Hambati (2021), which suggest that such integration can lead to stronger, more productive farming systems. This approach can help women improve their agricultural practices, increase yields, and ultimately empower them. To sum up, while rural women's traditional knowledge and farming practices are fundamental to sustainable agricultural development, they face significant challenges related to their rapid decline and their integration with modern techniques. This strategy could offer a promising pathway to enhance agricultural productivity, preserve biodiversity, and improve the livelihoods of rural women. Empowering women through capacity building, policy support, and resource access is essential to realizing the full potential of these traditional agricultural practices.

There is widespread recognition of rural women's contributions to agricultural practices through traditional knowledge. Despite extensive recognition of rural women's contributions to agricultural practices through the application of traditional knowledge, there remains a limited body of research that deeply explores, evaluates, and documents these practices as distinct systems of agricultural innovation. Most existing research acknowledges the existence and importance of traditional farming knowledge and methods but often treats them as supplementary or inferior to modern knowledge and methods. Consequently, there is a lack of comprehensive as well as local context analysis that assesses the efficacy, adaptability, and ecological sustainability of these practices. Furthermore, the oral and informal nature of knowledge transmission through storytelling, peer learning, and community rituals remains under-researched in terms of its resilience, evolution, and vulnerability to social and generational shifts. In Tanzania, while rural women are central to agricultural productivity, their practices are often overlooked in formal agricultural research, policy making, and extension services. This neglect creates a significant gap in understanding how traditional farming systems, led and sustained by women, contribute to local food security, environmental conservation, and cultural preservation in rural communities.

Scholars have conducted studies examining women's roles in agriculture. Most studies have often focused on productivity and technology adoption pathways as the main missing link in efforts to address low yields among women (Van Tran et al., 2019; Burke et al., 2018). Other studies have focused on women's access to land and inputs as production factors (Mugisha et al., 2019; Van Tran et al., 2019; Ali et al., 2016).

Moreover, studies examining the role of women in the agriculture sector have predominantly focused on identifying challenges and opportunities. However, a study assessing improved farming activities through traditional practices in Tanzania is currently lacking. This study therefore addresses two major research gaps: first, it examines how traditional practices can improve farming; second, it highlights the need for local studies, as most existing research is global and does not account for differences in farming practices across time and place.

Given this, it was high time to carry out a detailed study focusing specifically on the application of traditional farming experiences, skills, and knowledge to women in rural communities in Tanzania. The aim is to answer the key research question: how does the traditional agricultural experience of rural women influence improvements in farming activities? The essence of the research on which this paper is based aligns with Sustainable Development Goal 5, which aims to achieve gender equality with a focus on empowering women and girls. This paper aligns with that goal, as agriculture empowers women. It also incorporates the latest data on progress toward the Sustainable Development Goals (SDGs) from UN Women's 2022 Annual Gender Snapshot Report, which highlights the insufficiency of current efforts to tackle gender inequality.

2. Materials and Methods

2.1. Area of Study

This study was conducted in Dodoma City Council and Singida District, Tanzania, where agriculture is the primary livelihood and source of food security (Otieno et al., 2018). These areas fall within semi-humid to semi-arid agroecological zones and are part of the CGIAR Climate Change, Agriculture, and Food Security (CCAFS) program's focus in East Africa. Both regions are characterized by high poverty, climate vulnerability, and distinct socio-environmental conditions relevant to this research (Otieno et al., 2021). Hombolo in Dodoma receives 550–600 mm of unimodal rainfall annually, primarily between December and April, and is marked by sparse vegetation, including shrubs, grasses, baobab, and acacia trees (Gayo, 2021). Singida District has a similar semi-arid climate with 600–700 mm of rainfall and two seasons: a dry season (April–November) and a rainy season (December–March) (Lema et al., 2024). Mixed farming is widely practiced among smallholder households (Otieno et al., 2021). Field observations indicate the active participation of women, particularly young women, in agriculture, applying both indigenous and scientific practices. However, empirical studies on the contribution of women's traditional knowledge to agricultural improvement in these regions remain limited.

2.2. Study Design

The study adopted a cross-sectional design to collect data. This design enabled the researchers to collect both qualitative and quantitative data from multiple sources across the two selected districts. The design was preferred, firstly, because of its broad scope, which enabled the inclusion of many variables of interest to the study, and secondly, because it could determine relationships among these variables.

2.3. Unit of Analysis and Sample Size

The unit of analysis for this study was all women engaged in agricultural activities in both Dodoma Municipality and Singida District, specifically those engaged in traditional agricultural practices. A cross-sectional study was conducted in both areas. A cross-sectional study is important because it provides a quick, cost-effective snapshot of a population at one point in time. It helps measure prevalence and identify associations, which can guide policy and future research. Primary data was collected from the sample households using questionnaires, interviews and Focus Group Discussions (FGDs). The sample size for this study's quantitative data is 382 respondents. The size was determined using Cochran's formula (1977), as cited by Bartlett et al. (2001), when the population is unknown. The formula is:

$$n = \frac{z^2 * p\,(1 - p)}{d^2} \text{ (Cochran, 1977,)…(i)}$$

where:

n = sample size;

z = a value on the abscissa of a standard normal distribution (from an assumption that the sample elements are normally distributed), which is 1.96 or approximately 2.0 and corresponds to a 95% confidence interval;

p = estimated variance in the population from which the sample is drawn, which is normally 0.5 for a population whose size is not known; and

d = acceptable margin of error (or precision), whereby the general rule is that in social research projects, d should be 5% for categorical data and 3% for continuous data (Krejcie & Morgan, 1970, cited by Bartlett *et al*., 2001). The research used 5% since the study collected substantial categorical data.

Using a z-value of 2.0, a p-value of 0.5, a q-value of 0.5, and a d-value of 5% (which is equivalent to 0.05), the sample size (n) was determined to be 400, i.e.

$$n = \frac{2^2 * 0.5\,(1 - 0.5)}{} = (4 \times 0.25)/0.0025 = 1/0.0025 = 400.$$

2.6 Data Collection Methods and Tools

Successful farming in Tanzania requires a clear understanding of traditional practices, particularly those of rural women, who play a central role in agricultural production. To explore this relationship, both quantitative and qualitative data were collected. Quantitative data were collected through a structured questionnaire that captured women's views on traditional farming methods and their relevance to improving agricultural productivity. Complementary qualitative data were gathered through key informant interviews and Focus Group Discussions (FGDs), using checklists to explore the specific roles and knowledge that rural women bring to traditional farming systems.

2.7 Validity of Instruments

A panel of experts from the Directorate of Research and Consultancy at the Institute of Rural Development Planning validated the instruments used in the study. As part of the institute's standard procedure, the instruments were also reviewed by its official review committee, which ensures methodological rigor and relevance. The expert team conducted a thorough evaluation and provided constructive suggestions for improvement, which were incorporated into the final version of the instruments. Additionally, the tools were pre-tested through a pilot study conducted in Chamwimo District, which has characteristics similar to those of the anticipated study area.

2.7 Reliability Confirmation

The reliability of an instrument is defined as its consistency in picking the needed information. Reliability (Internal consistency and stability) of the instruments was tested using Cronbach's Alpha (α) coefficients (Cronbach, 1946). The researcher tested inter-item consistency reliability to ensure that respondents' answers to all items in the measure were consistent. The coefficient is above 0.70, indicating that the scales used to measure these variables were consistent and, consequently, reliable (Cronbach and Shavelson, 2004). Table 1 summarises the analysis of the predicted model's findings, showing that the ordinal logistic regression indicates a relationship between the explanatory and dependent variables.

Table 1: Reliability Statistics

Cronbach's Alpha	No. of Items
.74	9

2.8 Data Processing and Analysis

Likert scale data on women's attitudes towards traditional farming practices were analyzed using mean scores for each Likert statement. Total scores on the Likert scale were first calculated by multiplying each response option's frequency by its corresponding Likert score.

$$\text{Total scores} = \Sigma(f_i \times \text{Likert scale Score}) \quad \text{..(ii)}$$

Where:
f_i = frequency of each Likert scale score (number of respondents)
i = Likert Scale Score

The range of interpreting the Likert scale mean score was given as follows: 1.0-2.4 (Negative attitude), 2.5-3.4 (Neutral attitude), and 3.5-5.0 (Positive attitude).

Qualitative responses from interviews and focus group discussions were analyzed using a qualitative content analysis process. The study also sought to determine the influence of women's traditional farming practices in improving farming activities using the ordinal logistic regression model because the dependent variable was ordered (ranked). The independent variable included variables that needed to be measured at the continuous and categorical levels using IBM SPSS Statistical Software (Agresti & Finlay, 2009).

The study employed a data analysis technique known as ordinal logistic regression to analyze the respondent's data. The data were divided into two sections: basic information about respondents and their level of satisfaction with each of the nine variables. A five-level Likert scale was used in this section. Points were awarded for each response, with scores of 2, 1, and 0, respectively. Several studies have shown that women can enhance farming activities through the application of different traditional practices such as knowledge (production, marketing, post-harvesting), skills (storage, land use, planting, weeding and harvesting), technology (hand hoe, bush knife, axes), attitude (effectiveness, time, alternatives, practices, satisfaction, ambitions and enjoyment), demographic characteristics (age, education, experience, plot size and sex), farming materials (manual, non-chemicals, natural fertilizer), source of funds (self-saving, help, selling assets) and inputs (seeds, manure, machines). The ordinal logistic regression model was applied because the dependent variable was ordered (ranked) and the independent variables included both continuous and categorical variables (Agresti & Finlay, 2009). The dependent variable (Y) was categorised into three levels (low, moderate, and high) based on individual scores. The independent variables included a mix of factors contributing to the improvement of farming activities through traditional practices, including knowledge, skills, technology, information systems, attitudes, personal characteristics, farming materials, sources of funds, and inputs. The ordinal logistic regression model used took the following form:

$$P(y) = \frac{e^{\alpha + \beta 1x1 + \ldots \beta kxk + E}}{1^{+} e^{\alpha + \beta 1x1 + \beta kxk}} \quad \text{(Agresti and Finlay, 2009)..(iii)}$$

where:

P (y) = the probability of the success of the tercile alternative occurring
e = the natural log
α = the intercept of the equation
β_1 to β_k = coefficients of the predictor variables
x_1 to x_9 = predictor variables entered in the ordinal regression model

Specifically, in the research:

P (y) = the probability of rural women being grouped at a high level of bringing rapid change in agriculture.
α = the intercept of the equation
$\beta_1 \ldots \beta_9$ = Regression coefficients
x_1= Knowledge, x_2= Skills, x_3 = Technology, x_4= Information system, x_5= Attitude,
x_6= Background characteristics, x_7= Farming material, x_8 = Sources of funds, x_9= Inputs,
E =Error term representing a proportion of the variance in the dependent variable that will be unexplained by the regression equation.

3.0 Results and Discussion

3.1 Results

3.1.1 Characteristics of Respondents

According to the initial data, a significant proportion of the participants' ages, approximately 251 (65.7%), fell within the age group of 31-45 years, followed by 90 (23.6%) participants who were above 45 years, and 40 (10.5%) who were aged between 21and 30 years. Out of 382 respondents, 294 (77%) had completed primary school, 61 (16%) had attained secondary school education, and 27 (7.1%) had informal education. In terms of marital status, 290 (75.9%) were married, 35 (9.2%) were divorced, 34 (8.9%) were single, and 23 (6%) were widowed.

Table 2 Demographic characteristics of respondents

Type of Demographic characteristic	Category	Frequency	Percent (%)
Age (yrs)	20	1	.3
	21-30	40	10.5
	31-45	251	65.7
	>45	90	23.6
	Total	382	100.0
Level of education	informal education	27	7.1
	completed primary	294	77.0
	Secondary	61	16.0
	Total	382	100.0
Marital status	Single	34	8.9
	Married	290	75.9
	Divorced	35	9.2
	Widowed	23	6.0
	Total	382	100.0

3.1.2. Improving Farming Activities through Traditional Practices

3.1.2.1. Model Fitting Information

The model-fitting information provides empirical support for the ordinal logistic regression model. Specifically, the comparison between the intercept-only model and the full model (with predictors) shows a significant improvement in model fit. The -2 Log Likelihood of the model decreases from 288.221 (intercept-only) to 165.288 (final model), resulting in a Chi-square statistic of 122.933 with 18 degrees of freedom ($p < .001$). This statistically significant result ($p \leq .001$) indicates that the independent variables contribute meaningfully to predicting the dependent variable, confirming a significant association. Thus, this output represents an empirical finding, namely, evidence supporting the model's explanatory power rather than merely descriptive or primary data.

Table 3: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	288.221			
Final	165.288	122.933	18	.000

Link function: Logit.

3.1.2.2 Goodness-of-Fit

To determine whether all independent variables influence the dependent variable, researchers conducted a goodness-of-fit test using Pearson's Chi-Square and the deviance statistic. As shown in Table 4, the Pearson Chi-Square statistic is 244.661 with 371 degrees of freedom and a p-value of 1.000. Since the p-value is greater than 0.05, we fail to reject the null hypothesis (H_0), indicating that the model fits the data well and accurately represents the relationship between independent and dependent variables.

Table 4: Goodness-of-Fit

	Chi-Square	Df	Sig.
Pearson	244.661	371	1.000
Deviance	150.893	371	1.000

Link function: Logit.

3.1.2.3. Pseudo R-Square

The logistic regression model, based on responses from 382 participants and 9 predictor variables, yielded a Nagelkerke R-squared value of 0.692. This indicates that approximately 69% of the variance in improved farming activities is accounted for by the model, suggesting a strong overall fit given the sample size and number of predictors. However, while Pseudo R-squared values provide insight into the model's explanatory power, they are not, in themselves, empirical findings. For the results to be considered empirically robust, further validation is necessary, including testing the statistical significance of individual predictors using Wald tests, assessing overall model significance using likelihood ratio tests, and evaluating predictive performance using independent or cross-validated datasets. These additional steps are essential to confirm that the model's explanatory power holds true beyond the current sample.

Table 5: Pseudo R-Square

Cox and Snell	.420
Negelkerke	.692
McFadden	.583

Link function: Logit.

3.1.3. Parameter Estimates of Ordinal Logistic Regression

The survey responses were collected using a series of Likert-scale items assessing various factors such as knowledge, skills, technology access, attitudes, and more. These responses were transformed into ordinal variables reflecting increasing levels of agreement or capacity (e.g., low, moderate, high). The coded ordinal variables were then used as predictors in an ordinal regression analysis to estimate their effects on key agricultural decisions, including what, where, and how to cultivate. This approach allowed for the modeling of ordered outcomes while preserving the ranked nature of the data. The Parameter Estimates Table displays the regression coefficients, their standard errors, Wald test statistics with associated p-values (Sig.), and 95% confidence intervals for each coefficient. The thresholds shown at the top of the output indicate the cut-off points on the latent variable used to classify the data into three observed groups.

The analysis identified five factors that significantly improve farming activities: knowledge ($p = 0.0001 < 0.05$), skills ($p = 0.020 < 0.05$), technology ($p = 0.0001 < 0.05$), information systems ($p = 0.0001 < 0.05$), and personal characteristics ($p = 0.001 < 0.05$). As the p-values for these variables are all less than or equal to 0.05, the null hypothesis is rejected in each case. This indicates that the regression coefficients for these five predictors are statistically different from zero, suggesting they have a meaningful influence on the outcome when considered alongside other variables in the model. On the other hand, farming materials, sources of funds, farming inputs, and women's attitudes were not found to be statistically significant, implying that their contributions to the model are not substantial at the 0.05 significance level. Traditional crop rotation, local seed use, and organic fertilization remain widely practiced due to their perceived reliability and low cost. Indigenous pest control methods and traditional irrigation techniques are among the least utilized, often replaced by modern chemical and mechanized solutions.

Table 6: Parameter Estimates

Measures for influence of agricultural change in terms of decision about what, where and how to cultivate							**95% Confidence Interval**	
		Estimate	**Std. Error**	**Wald**	**Df**	**Sig.**	**Lower Bound**	**Upper Bound**
Threshold	Traditional Potentialities = 1]	20.920	2312.565	.000	1	.993	-4511.625	4553.465
Location	[Knowledge=1]	-2.293	.553	17.170	1	.000	-3.377	-1.208
	[Knowledge=2]	-.783	.554	1.998	1	.158	-1.870	.303
	[Knowledge=3]	0[a]	.	.	0	.	.	.
	[Skills=1]	1.724	1.074	2.576	1	.108	-.381	3.828
	[Skills=2]	2.502	1.071	5.452	1	.020	.402	4.602
	[Skills=3]	0[a]	.	.	0	.	.	.
	[Technology=1]	-2.303	.520	19.591	1	.000	-3.323	-1.283
	[Technology=2]	-1.704	.686	6.167	1	.013	-3.049	-.359
	[Technology=3]	0[a]	.	.	0	.	.	.
	[Information system=1]	-15.693	4715.367	.000	1	.997	-9257.643	9226.258
	[Information system=2]	1.944	.510	14.538	1	.000	.945	2.944
	[Information system=3]	0[a]	.	.	0	.	.	.
	[Attitude=1]	1.839	.916	4.036	1	.045	.045	3.634
	[Attitude=2]	-.385	.592	.424	1	.515	-1.546	.775
	[Attitude=3]	0[a]	.	.	0	.	.	.
	[Personal characteristics=1]	1.258	.000	.	1	.	1.258	1.258
	[Personal characteristics=2]	4.053	.883	21.042	1	.000	2.321	5.784
	[Personal characteristics=3]	0[a]	.	.	0	.	.	.
	[Farming material=1]	16.810	2312.565	.000	1	.994	-4515.734	4549.354
	[Farming material=2]	17.423	2312.565	.000	1	.994	-4515.121	4549.967
	[Farming material=3]	0[a]	.	.	0	.	.	.
	[Sources of funds=1]	1.466	1.025	2.048	1	.152	-.542	3.475
	[Sources of funds=2]	.568	1.087	.273	1	.601	-1.562	2.698
	[Sources of funds=3]	0[a]	.	.	0	.	.	.
	[Farming inputs=1]	1.118	.829	1.821	1	.177	-.506	2.743
	[Farming inputs=2]	1.234	.909	1.842	1	.175	-.548	3.015
	[Farming inputs=3]	0[a]	.	.	0	.	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant

3.1.4. Women's attitude towards traditional farming practices

The findings showed that although women held a neutral attitude toward the use of agroforestry to improve water retention (3.09), flood protection (2.57), wind protection (3.09%) and shelter protection (3.02), they held a negative attitude towards soil organic matter (2.4.9). Similarly, it was found that women had a neutral attitude towards the use of crop cover to improve soil health (2.67), nutrient cycling (3.01), water retention (2.98), weed control (2.99), and pest control (3.08) (Table 7). Both interviews and focus group discussions yielded similar findings, indicating difficulties in using agroforestry and crop cover to enhance farming practices. For example, key informants' in-depth interviews in Dodoma reported that *"…the issue of agroforestry is difficult in our area because the climate does not favour vegetation growth…"* Additionally, a respondent said, *"…you have eyes, and you can watch and see…we do not even have trees to protect us from the sun."* Others also noted, *"…our environment does not support agroforestry…"*

Respondents from Singida expressed similar concerns. One said, *"…the issue of agroforestry is new to me because for years we have been surviving without enough rain…"* Another mentioned, *"…our weather does not support agroforestry, so it is not applicable to us."* Both focus group discussions in Dodoma and Singida highlighted difficulties in implementing agroforestry due to several factors, including weather conditions, limited knowledge, prolonged drought, and negative perceptions. Regarding crop cover, the FGD respondents expressed challenges with its practicality due to factors such as strong winds, intense sunlight, and the nature of the soil. In-depth interview respondents mentioned, *"…even grasses to cover our land are not available….", "…expected grasses to cover farms normally perish early…the remaining are used for grazing our domestic animals."*

Regarding intercropping, while women had a neutral attitude towards its ability to address climate-related crop failure (2.69), they had a positive attitude towards its use to improve land nutrients (3.56) (Table 7). The interviewees from Dodoma and Singida provided the following responses: "…*intercropping provides increased diversity that facilitates better biological control of pests and reduces soil erosion…"* Another respondent claimed that *"…different plants in one area can help to reduce competition from weeds..."* Additionally, a respondent noted, *"…when you plant a single crop, it will always be possible to make the farm a home for pests and diseases for such a particular crop; however, when you plant different crops, you might disturb the life cycle of those diseases and pests by depriving them of proper food."*

As for crop rotation, women owned a positive attitude towards crop rotation to improve farming activities through enhancing soil health (3.70), nutrient cycling (3.99), water retention (3.85), weed and pest control (3.85), soil erosion prevention (3.75), and nutrient loss prevention (3.51) (Table 7). This was also corroborated by key informants who said: *"…crop rotation is useful in preventing soil erosion." "…to minimize soil erosion, a strategic approach includes rotating high-residue plants like maize and sunflower. These crops leave behind residue that functions as a protective barrier, effectively preventing the erosion of topsoil."* Others added that "…*crop rotation benefits weed management and disrupts the life cycle of weeds that thrive on specific crop"; "…crop rotation increases soil health by increasing organic matter contents in the soil"; "…crop rotation can lead to an increment in water holding capacity"; "…it is possible to carry out farming without using fertilizers if we apply crop rotation."*

Regarding crop cover, most respondents were neutral regarding its use to improve soil health (2.67), nutrient cycling (3.01), water retention (2.98), weed control (2.99), and pest control (3.08) (Table 7). In-depth interviewees gave different reasons for supporting crop covers. For instance, *"…preserving vegetation cover on agricultural fields in the off-season can lead to large reductions in runoff and nitrogen leakage into streams and groundwater, reduce soil erosion, and minimize the need for weed control chemicals…"* Another respondent emphasized that *"…the biggest challenge faced by farmers is likely unpredictable weather. Farmers face droughts and floods, which could be reduced by crop covers…"*

Regarding the use of organic composition, women had a positive attitude towards its capacity to improve farming activities, including soil fertility (3.57), soil erosion (3.91), and soil moisture (3.70) (Table 7). Similar findings were also reported in interviews: *"…using organic composition…maintains the health of the soils and reduces the number of pests that threaten the farm's crops"; "…when I started using organic composition, I managed to minimize soil erosion and improve soil fertility"; "…the soil remained moist when I started using organic composition compared to when I was using fertilizers."*

Finally, the findings showed that women held a neutral attitude toward the use of integrated crop- animal farming to increase soil fertility (3.39) and biodiversity conservation (3.26) (Table 7). During the interview and FGD, respondents stated that *"…animals can increase soil fertility through manure and urine deposition…"; "…animals can be used as power for farm operations and transport..."; "…crop-livestock systems promote soil fertility and regulate both pests and diseases…"; "…the leftover products of one component function as a resource for the other. For instance, manure can be used to improve crop production; crop residues and by-products feed the animals, supplementing often inadequate feed supplies, thus contributing to improved animal nutrition and productivity;* and *"…animal power is used for tilling the land…"*

Table 7: Women's attitude towards traditional farming practices

Statements	SD	D	N	A	SA	Total Scores	Mean scores	Attitude
Agroforestry improves:								
Soil organic matter	94	108	591	100	60	953	2.49	Negative
Water retention	14	96	705	244	120	1179	3.09	Neutral
Flood protection	57	194	567	124	40	982	2.57	Neutral
Wind protection	17	70	741	256	95	1179	3.09	Neutral
Shelter protection	19	140	606	260	130	1155	3.02	Neutral
Intercropping improves:								
Climate crop failure	49	144	657	128	50	1028	2.69	Neutral
Land nutrients	16	128	111	880	225	1360	3.56	Positive
Use of crop rotation improve:								
Soil health	62	0	96	740	515	1413	3.70	Positive
Nutrients cycle	13	56	111	700	645	1525	3.99	Positive
Water retention	21	58	123	748	520	1470	3.85	Positive
Weed and pest control	16	72	150	676	555	1469	3.85	Positive
Soil erosion prevention	26	78	135	664	530	1433	3.75	Positive
Nutrients lost prevention	17	76	0	784	465	1342	3.51	Positive
Use of crop cover to improve:								
Soil health	67	154	528	160	110	1019	2.67	Neutral
Nutrients cycle	15	150	648	176	160	1149	3.01	Neutral
Water retention	23	138	582	236	160	1139	2.98	Neutral
Weed control	27	130	585	240	160	1142	2.99	Neutral
Pest control	21	96	660	260	140	1177	3.08	Neutral
Use of organic composition improve:								
Soil fertility	62	50	96	640	515	1363	3.57	Positive
Soil erosion	5	62	171	756	500	1494	3.91	Positive
Soil moisture	16	100	147	740	410	1413	3.70	Positive
Use of integrated crop animal farming Improve:								
Soil fertility	25	164	66	900	140	1295	3.39	Neutral
Climatic change mitigation	20	138	165	820	165	1308	3.42	Neutral
Biodiversity conservation	1	108	630	308	200	1247	3.26	Neutral

1.0-2.4 (Negative attitude), 2.5-3.4 (Neutral attitude), and 3.5-5.0 (Positive attitude).
SD=Strong Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strong Agree

3.2. Discussion

The findings of this paper highlight the significant traditional attributes held by rural women, such as traditional knowledge, skills, access to technology, information systems, and personal characteristics, that improve farming activities. These attributes align with the existing literature that emphasises the importance of indigenous knowledge and local expertise in enhancing agricultural practices. Knowledge, particularly indigenous farming techniques, was found to be the most significant predictor ($p = 0.0001$), similar to the work of Hettiarachchi (2022), who highlighted the potential of traditional knowledge to form sustainable farming systems by enabling rural women to adapt to local environmental conditions. Skills like seed sorting and soil management were also statistically significant ($p = 0.020$), reinforcing the findings of Mkuna et al. (2023), who note that women's indigenous skills, although often simple and affordable, are key to farm management. However, they might be limited by access to modern technologies.

The paper also emphasizes the role of technology in improving farming practices ($p = 0.0001$), supporting research by FAO (2018), which argues that access to modern agricultural technologies, like irrigation systems, fertilizses the role of technology in improving farming practices ($p = 0.0001$), supporting the FAO (2018), which argues that access to modern agricultural technologies, such as irrigation systems, fertilizers, and improved seeds, is crucial for increasing productivity and mitigating the challenges of climate variability. Similarly, information systems and access to market information were significant ($p = 0.0001$), reinforcing DeAngelis's (2013) findings that timely access to information enables farmers to make informed decisions that improve both yield and market outcomes. Moreover, personal characteristics, including resilience and an entrepreneurial mindset ($p = 0.001$), align with the work of Akinyemi et al. (2020), who argue that women farmers' ability to adapt to changing conditions is critical to their success, especially in areas prone to environmental and economic shocks.

In contrast, farming materials, sources of funds, farming inputs, and attitudes were found to be statistically insignificant, which challenges the assumption that economic factors alone are decisive in agricultural outcomes. These results align with Mohammad and Vibha (2019), who suggest that while financial access is important, knowledge and skills often take precedence in shaping agricultural practices in resource-constrained settings. This indicates that while improving access to funds and inputs is critical, the effective application of traditional knowledge and skills is often a more immediate and reliable driver of agricultural improvement.

Ultimately, these findings reinforce the importance of integrating traditional knowledge with modern technologies and information systems to empower rural women. Enhancing skills development, increasing access to technology, and improving information flows should be central to interventions aimed at boosting the productivity and sustainability of women-led farming systems. This approach could also help address the socio-economic barriers that limit the broader adoption of these practices, as pointed out by Mkuna et al. (2023) and Hettiarachchi (2022). Generally, while factors like funding and attitudes remain relevant, the study highlights that knowledge, skills, and access to technology are the primary drivers of agricultural success among rural women.

The second part of this discussion focuses on the attitude of women's traditional practices towards improving farming activities. The findings show that while women usually support sustainable traditional agricultural practices such as crop rotation and organic composting because of their benefits for soil health, nutrient cycling, and moisture retention, they exhibit negative attitudes toward soil organic matter, mainly due to climatic challenges, soil conditions, and a lack of local resources. Intercropping is viewed positively for improving biodiversity and pest control, but its effectiveness in addressing climate related crop failure remains uncertain. Integrated crop-animal farming is appreciated for its synergies, especially in soil fertility and farm productivity, though its broader ecological benefits are less recognised. Overall, while women acknowledge the potential of these practices, practical barriers and environmental constraints significantly influence their adoption, underscoring the need for context specific interventions, training, and resources to enhance their implementation. This observation aligns with that of Vandebroek *et al.* (2011), emphasizing the importance of accumulating local knowledge and experience in a specific geographical location.

3.2.2. Conclusion and Recommendations

The ordinal regression analysis conducted using coded Likert scale responses revealed that five key factors known as knowledge, skills, technology access, information systems, and personal characteristics, significantly influence agricultural decision making, including choices regarding what, where, and how to cultivate. These factors were found to have statistically significant effects, as indicated by their respective p-values (all ≤ 0.05), supporting the rejection of the null hypothesis. Conversely, variables such as farming materials, sources of funds, farming inputs, and women's attitudes did not show a statistically significant effect on farming decisions in this context. Furthermore, the analysis of women's attitudes towards traditional farming practices demonstrates that farmers' decision-making is shaped by inherent knowledge-based factors, such as traditional knowledge, skills, access to technology, information systems, and personal characteristics. These factors have accelerated women's measurable, positive agricultural choices, underscoring their critical role in improving farming effectiveness. The absence of statistical significance in external factors like funding sources and material inputs suggests that by increasing resource availability alone may not be sufficient without concurrently addressing farmers' capacity and access to actionable knowledge

Based on these findings, it is recommended that the Ministry of Agriculture through the Tanzania Agricultural Research Institute (TARI) should develop agriculture programs and policy interventions that prioritize the enhancement of farmers' knowledge and skills, improve access to relevant technologies, strengthen information systems, and consider individual farmer characteristics in planning and support services. Investment in these areas is likely to yield more impactful outcomes in guiding effective and sustainable agricultural practices. Dodoma City Council and Singida District should take steps to improve agricultural productivity by moving beyond material provision and focusing on empowering farmers through targeted capacity-building initiatives. Programs should prioritise farmers' education, skill development, and personalised extension services that take into account individual characteristics. Non-Governmental Organisations working in Dodoma City Council and Singida District in the relevant field need to design interventions that strengthen these core drivers while reassessing the role and delivery of traditional support inputs that do not show significant impact. Further research should investigate the contextual reasons why some expected variables lacked significance, potentially refining how support is structured across diverse farming communities, as well as explore why certain expected factors, such as funding and input availability, were not significant and assess whether these areas require different measurement approaches or targeted strategies in specific contexts.

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