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The Role of Digital Technology in Fostering Economic Development in Rural Areas in Morogoro Region

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ABSTRACT

This study examined the role of digital technologies in enhancing agricultural productivity and sustainability among smallholder farmers in Morogoro Region, Tanzania. Using a cross-sectional research design, data were collected from 150 randomly selected farmers utilizing digital agricultural tools. Findings indicated significant productivity gains, particularly a notable 64.8% increase in maize yields attributed to mobile weather forecasting applications and precision agriculture tools. Despite these positive outcomes, the broader adoption and effectiveness of digital technologies were hindered by barriers such as high initial investment costs, unreliable internet connectivity, and limited digital literacy. While approximately 56.7% of respondents reported improved market access through digital platforms, inconsistent connectivity and inadequate digital skills limited the sustained realization of these benefits. In addition, the fact that 60% of respondents claimed that digital technologies have not led to a significant reduction in administrative workloads suggests a critical need for increased training and improved technological infrastructure. While switching to digital tools promoted sustainable practices like organic farming and crop rotation, their use to mitigate income volatility was limited by the price vicious cycle of global commodity markets and the unpredictability of the weather. The study calls for targeted investments to enable greater access to the rural digital infrastructure, financial incentives for consumers designed to lower the cost of adoption, and comprehensive digital literacy training programs to be offered to rural consumers.

Keywords: *Digital technologies, agricultural productivity, crop yields, market access, digital literacy*

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1. INTRODUCTION

Especially in rural spaces, digital technology is an important driver of economic advancement globally (Nwaiwu, 2021; Bayene *et al.,* 2024; Kitole *et al.,* 2024). The rise of digitalisation has played a role in streamlining productivity, market access, and service delivery, contributing to economic growth and poverty alleviation (Ayakwah *et al.,* 2021). The need for continued digital transformation for sustainable development is acknowledged in much of Sub-Saharan Africa, such as Tanzania (World Bank, 2024; Ojo *et al.,* 2024). Digital technology has had significant impacts on rural economic development (Myovella *et al.,* 2021). In developed nations such as the United States and the European Union, the agricultural sector has been upgraded by digital agriculture powerfitting precision agriculture, IoT devices, and data analytics, thereby improving its productivity and resource efficiency (Zhong *et al.,* 2024; Magesa *et al.,* 2024). These technologies help farmers to make informed decisions, optimize resource use, and access large markets. Digital platforms, for example, have simplified supply chains and expanded market access for rural producers (Guermazi *et al.,* 2022).

In Africa, digital technologies are transforming rural economies (Ayakwah *et al.,* 2021; Gizachew *et al.,* 2024). In Nigeria, mobile-based financial services have expanded financial inclusion, enabling rural populations to access credit and savings and supporting entrepreneurship and economic growth (Qi & You, 2024; Beyene *et al.,* 2024). Similarly, in Ghana, digital platforms provide farmers with market information and extension services, boosting productivity and income levels (Sarku & Ayamga, 2025). In East Africa, innovations such as mobile money services, including M-Pesa in Kenya and Uganda, have revolutionized financial transactions and economic activities in rural areas (Diouf *et al.,* 2024).

The government of Tanzania has embraced the potential of digital technology in transforming rural economies. To expand connectivity and improve access to digital services, it has been initiated through Digital Tanzania Project (Ismail, 2023). Such measures include improving digital infrastructure, promoting digital literacy, and expanding financial inclusion through the use of mobile money (Myovella *et al.,* 2021; Mwaura, 2024). Despite these advancements, troubles linger. Reliable internet connectivity is not available in many rural areas, while digital literacy programs find it difficult to connect with distant communities. Moreover, the low cost of digital devices and internet services remains a major barrier (World Bank, 2021; Choruma *et al.,* 2024).

Government partnerships with international institutions to enhance broadband connectivity and specialized education initiatives for underprivileged communities have been implemented in response to these challenges (Ismail, 2023). Nevertheless, slow infrastructure rollout, regulatory issues, and inadequate localized digital content that suits the needs of rural communities are posing problems to this evolution (Choruma *et al.,* 2024; Okeleke, 2019; Furuholt & Kristiansen, 2017a). In rural Tanzania, the digital divide limits economic development, including in the Morogoro region. Although earlier research reported on the broad benefits of digital tools and

their transformational impact on agriculture, focused studies on the impact of digital technology on productivity, market access, and service delivery that transcend barriers of poor infrastructure, low digital literacy, and high costs are essential. Tackling these issues will be critical for leveraging the potential of digital technology to drive sustainable economic development in rural Tanzania.

This study seeks to fill the gap in the existing research by examining the impact of digital technology on economic development in the rural areas of the Morogoro Region of Tanzania. In particular, the study evaluates the role impact of digitization on agricultural productivity, market access, and income uplifting of rural farmers in the Morogoro Region, determining the challenges and constraints of rural households in utilizing digital tools including technical, financial, and digital literacy; and, assessing the role of digital technologies as enablers for sustainable agricultural practices and decreasing income variability.

Almost any economic development can be significantly driven by digital technology and the transformation it can cause, as is the case in the region of Morogoro, Tanzania. The use of digital tools and services can improve productivity, service delivery, and create economic opportunities. One of the well-known examples of a country that has taken development digitally is Tanzania, which has made substantial progress in the digital transformation path toward enhancing the e-governance path (Johnston, 2019). It focuses on the government's commitment underpinning its use of digital technologies for socio-economic development, borne out in the National ICT Policy 2016. Recognizing the transformative potential of the digital economy in agriculture, education, and commerce (Okeleke, 2019), this policy creates an enabling environment. Moreover, the 10-year Digital Economy Strategy Framework conceptualised in 2024 solidifies Tanzania's commitment to digital transformation, and foundational pillars such as Jamii Namba (digital ID), Jamii Malipo (digital payments), and Jamii Data Shirikishi (Jamii X-Change) will further bolster this commitment (Jamii Platforms, 2024).

In other regions as well, studies show that this is the positive impact that digitalization has on the revitalization of the rural economy. For instance, Lyu (2024) utilized Hainan Province, China, as a case study to explore the multi-stage effects of the digital economy on rural revitalization based on panel data from 2003 to 2022. The results indicated substantial positive influences of fiscal input and digital currency issuance, respectively, on the amplification of DIGITAL economy development to achieve the RURAL revitalization objectives. Similarly, Rutherford *et al.* (2023) illustrated how technology can contribute to new rural entrepreneurship through educational programs such as Productivity Enhancing Technology Experience Kits (PETE-Kits) in the USA. These initiatives were a testament to the potential of technology-led educational initiatives to foster technical ingenuity and entrepreneurial aspirations in rural communities.

Studies emphasizing the disruptive potential of digital technologies for development in rural Africa. George *et al.* (2024) identify a strong correlation between digital financial inclusion and rural revitalization, which demonstrates that in Tanzania, digital financial services can act as powerful tools to help realize rural economic development. In this paper, Ismail (2023) presents new evidence on the potential of entrepreneurial networks and digital technology to solve the challenge of smallholder farmers' participation in markets. The study also highlighted the potential digital tools hold for developing more inclusive agricultural value chains. Furuholt and Kristiansen (2017) explored the digital divide in Tanzania. They reported that internet access across rural and urban areas was significantly driven by access to technology venues, though patterns of internet usage were more consistent.

Morogoro, as an agricultural hub, has much to gain from digital technologies. The proliferation of mobile phones and internet services has increased access to market information, financial services, and agricultural advisories, helping farmers and entrepreneurs boost their productivity and income. A study of SMEs in the town of Morogoro found that mobile technology facilitates the exchange of business information, which can lead to economic development (Melchioly Saebo, 2010). Nevertheless, challenges remain, especially limited internet, low technology adoption by enterprises, inadequate financing, and a relative lack of IT skills (Mazwane *et al.*, 2024). Smartphones are expensive, and infrastructure is lacking, especially in rural areas, which makes these barriers even worse. These challenges call for targeted strategies to address inequalities and ensure equitable access to digital technologies, and the need to work to mitigate the risks of digital exclusion. As an example, the World Bank (2017) called for appropriate technologies to address the unique challenges of Tanzanian agriculture, which is one of only a few areas where the potential of digitalization can be harnessed as an engine for productivity and growth.

Additionally, several studies highlight the contribution of digital technologies to the three dimensions of sustainability by incorporating all dimensions, including economic, social, and environmental, in the agricultural sector. Economically, digital tools such as mobile money, e-extension services, and market information platforms have been shown to improve farmers' access to inputs, credit, and markets, thereby increasing productivity and income stability (George *et al.*, 2024; Ismail, 2023). These tools reduce transaction costs and enhance decision-making, supporting more resilient rural economies. Socially, digital technologies have expanded access to agricultural knowledge, training, and financial services, particularly benefiting women, youth, and marginalized groups who often face barriers to participation in traditional farming systems (Furuholt & Kristiansen, 2017). This inclusion promotes community empowerment, knowledge sharing, and improved livelihoods. Environmentally, studies demonstrate that digital agriculture supports sustainable resource use through innovations such as remote sensing, climate forecasting, and precision farming, which help minimize input overuse and promote environmentally sound practices (Zhong *et al.*, 2024; Magesa *et al.*, 2024). These practices are essential for protecting soil health, conserving water, and enhancing resilience to climate

variability (Huang & Wang, 2024). Together, the evidence from existing literature reinforces the potential of digital technologies to advance sustainability in agricultural systems, making them particularly significant for regions like Morogoro that face both productivity and sustainability challenges.

Theoretical framework

This research is based on the Technology Acceptance Model (TAM) proposed by Fred D. Davis in 1989 as an extension of the Theory of Reasoned Action (TRA). Davis (1989) developed TAM to account for user acceptance of information systems by (1) enabling prediction of user acceptance, (2) enabling theory building and understanding user acceptance of information systems, and (3) being cyclical, explaining aspects of acceptance. These elements create a strong foundation for understanding technology adoption behaviors. This uses two construct variables assumed to influence the reaction of a user to the technology ie perceived usefulness which is defined as the extent to which they think utilizing some form of technology can help them to do something better, perceived ease of use means — the extent to which the user thinks they can use the technology without effort. These perceptions impact perceptions of technology use, which in turn lead to behavioral intention, which ultimately determines actual usage behavior.

In this work, a systematic application of TAM guides the assessment of the adoption of digital technologies in the Morogoro Region of Tanzania and informs their contribution to economic development. Through exploring residents' perceptions of the usefulness and usability of digital tools, it drags out the drivers and barriers to technology uptake (Spector, 2015). These insights are crucial to understanding challenges like low digital literacy, poor infrastructure, and usability that could hinder the successful adoption of a digital solution.

TAM can also be used to analyze and highlight the need for creating measures to promote digital literacy and better access to technology in the Morogoro Region. By understanding what encourages user acceptance of these tools, policymakers and stakeholders can adapt their initiatives to improve the accessibility, functionality, and relevance of the tools to rural populations. This can help facilitate greater technology utilization, enabling improved productivity, market access, and service delivery. Therefore, by incorporating TAM in this research, the study presents a holistic perspective on how digital technologies can be harnessed to enhance Economic Development in the context of the Morogoro Region. By resolving the barriers to user acceptance, we can help reduce the digital divide and ensure that the transformative potential of digital tools is achieved, thus fostering sustainable growth in rural Tanzania.

2. METHODOLOGY

Research Design

This analysis utilized a cross-sectional research design to study the relationship of digital technologies adopting and its linkage to productivity on underlying farmers in Morogoro Region. This is a correct design because it is suitable for capturing the current activity of using digital technology and its immediate effect on agricultural practices and productivity variables, as well as capturing key variables at a given point in time.

Data Source and Sampling Technique

Primary data were collected directly from farmers of the Morogoro Region through structured surveys and interviews. In this way, information about the use of digital technology, agricultural practices, and productivity outcomes can be obtained directly. It is important for the study area to have unique and locally relevant basic data and the current regional conditions based on local knowledge. Also, simple random sampling was used in selecting 150 respondents from a population of 240 registered farmers from the study area. This is determined using Yamane's formula with a margin of error of 5% (0.05).

$$n = \frac{N}{1 + N(e^2)} = \frac{240}{1 + 240(0.05^2)} \approx 150$$

Analytical Modeling

Descriptive statistics were computerized to characterize the data collected. - This initiated mean, percentage, and standard deviation calculations to grasp variables' distribution, frequency, and central values, such as crop yield per hectare, input costs, and income levels. Descriptive analysis is a basic technique used in agricultural research to summarize the data and identify trends. IBM-SPSS was applied for data analysis because it can manage more complicated datasets and conduct several sorts of statistical analyses. These tools are commonly used for data analysis and visualization in agricultural research. In addition, Table 1 provides an explanation of the variables used in this study.

Table 1: Description of Variables used in the study

Variable	Description
Crop Yield per Hectare	Average quantity of crops harvested per unit area before and after digital technology adoption.
Input Cost Reduction	Percentage decrease in expenses related to seeds, fertilizers, pesticides, and other inputs due to digital tools that optimize resource use.
Market Access Frequency	The number of new markets or buyers accessed by farmers through digital platforms indicates expanded market reach.
Time Spent on Administrative Tasks	Reduction in hours dedicated to tasks such as record-keeping, inventory management, and financial tracking, facilitated by digital solutions.
Income Variability	Consistency of farmers' income levels over time, identifying any stabilization resulting from digital technology adoption.

Adoption Rate of Digital Tools	Percentage of farmers utilizing specific digital technologies, such as mobile apps for weather forecasting or online marketplaces.
Training Hours Received	The number of hours farmers engage in training programs related to digital tool usage reflects capacity-building efforts.
Sustainability Practices Adoption	Proportion of farmers implementing sustainable agricultural practices promoted through digital platforms.

3. RESULTS

Crop Yield per Hectare

The output presented in Figure 1 gives information and understanding about the parameters with the highest percentage increase, which is more towards crop production in Morogoro over the years. A backstory and figures for the patterns seen in rice, maize, and cotton yields from the data. The data show that there is an upward trend from 2014/2015 to 2023/2024, beginning with rice yield. The rice yield per hectare was 266 kg/hectare in 2014/2015. In 2023/2024, this figure reached 337 kg/hectare, representing a 26.7% increase over the decade. The continuous upward trend of rice production indicated better farming practices or facilities that improved the rice yield in Morogoro.

Maize yield, however, increased considerably. It amounted to 162 kg/hectare only in 2014/2015, but in the following year it began to fluctuate (the lowest recorded value was at 213 kg/hectare in 2019/2020), until the highest level in the table showed a maize yield at 267 kg/hectare in the year 2023/2024. This is a 64.8% increase in maize yield over that time period, making maize the crop with the greatest increase in the dataset. The large increase observed in the MJM in recent years can be explained by improved management on the field, selection of more adapted maize varieties, or better climate conditions in Morogoro. The results showed that the cotton yield also improved, but not as much as maize. The yield of cotton in 2014/2015 was 169 kg/hectare, and the yield in 2023/2024 is 220 kg/hectare. This is an increase of approximately 30.2% over the decade. While cotton production did not achieve the same explosive growth maize, its gradual increase indicates that the agricultural practices or access to resources provided for cotton were favorable to increased productivity.

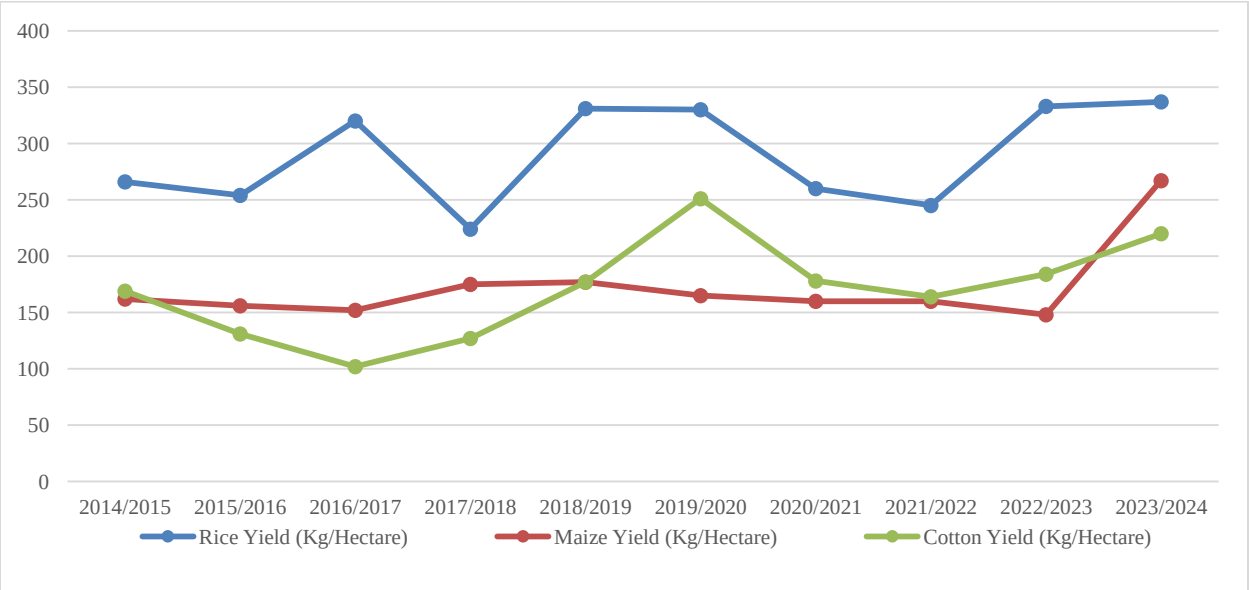

Figure 1: Trend of crop productivity in Morogoro 2014/15 – 2023/24

Input Cost Reduction

The results in table 2 which assesses whether digital technology reduces input costs, 53.30% of respondents stated that digital technology does not reduce input costs. In contrast, 46.70% of the respondents agreed that digital technology does contribute to cost reduction.

Table 2: Digital technology reduces input costs

Response	Frequency	Percentage
Yes	70	46.70
No	80	53.30
Total	150	100

The results in table 3, which identifies factors preventing the reduction of input costs through digital technology, the high initial investment emerges as the most significant barrier, with 56.30% of respondents citing it as a challenge. The second-highest factor preventing input cost reduction is a lack of trust in digital platforms, with 50% of respondents identifying this as a key barrier. Other factors contributing to the lack of input cost reduction include inadequate support services (43.80%) and limited availability of digital tools (37.50%).

Table 3: Factors preventing the reduction of input costs through digital technology

	Frequency	Percentage
High initial investment	45	56.30%
Lack of trust in digital platforms	40	50%
Inadequate support services	35	43.80%
Limited availability of digital tools	30	37.50%

Market Access Frequency

Table 4 results show, thus the majority of respondents (56.6%) agreed that digital technology improved access of markets to them while significant minority (43.4%) disagree. In other words, the response suggests that for most of the respondents digital technology enables market access, but a significant share is also skeptical or does not see these benefits, indicating areas of potential further improvements or targeted interventions.

Table 4: Digital technology increased access to markets

	Frequency	**Percentage**
Yes	85	56.6%
No	65	43.4%
Total	**150**	**100%**

Results in Figure 2, which examines the frequency of market access through digital platforms among those who reported increased access, the most common response is daily, with 40% of respondents indicating they access markets every day. The most common response is weekly, with 33.3% of respondents accessing markets every week. Smaller proportions of respondents reported accessing markets monthly (20%) or rarely (6.7%) through digital platforms, indicating that while digital technology does help some individuals access markets regularly, it does not have the same frequency of use for all users.

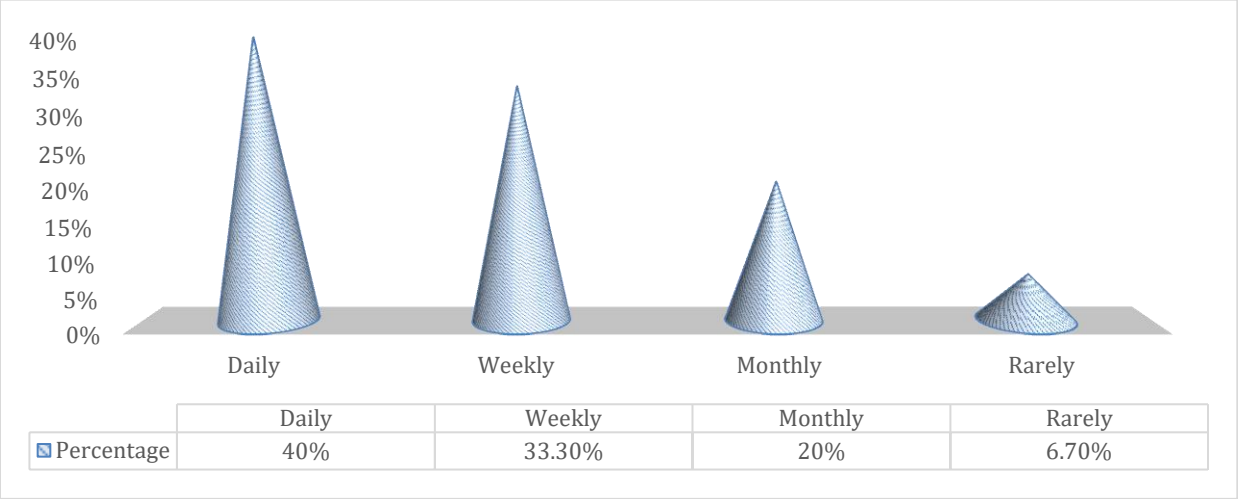

Figure 2: Access markets through digital platforms

Time Spent on Administrative Tasks

As shown in Figure 3, the majority of respondents (60%) disagreed that digital technology reduced the time spent on administrative tasks, while 40% of them agreed with that statement. It is indicative of the fact that although part of the respondents listed digital technology as an enabler to reduce the administrative burden, it appears that a majority of the sample respondents

did not witness a time-saving effect. Challenges in the digital use of tools in administrative management.

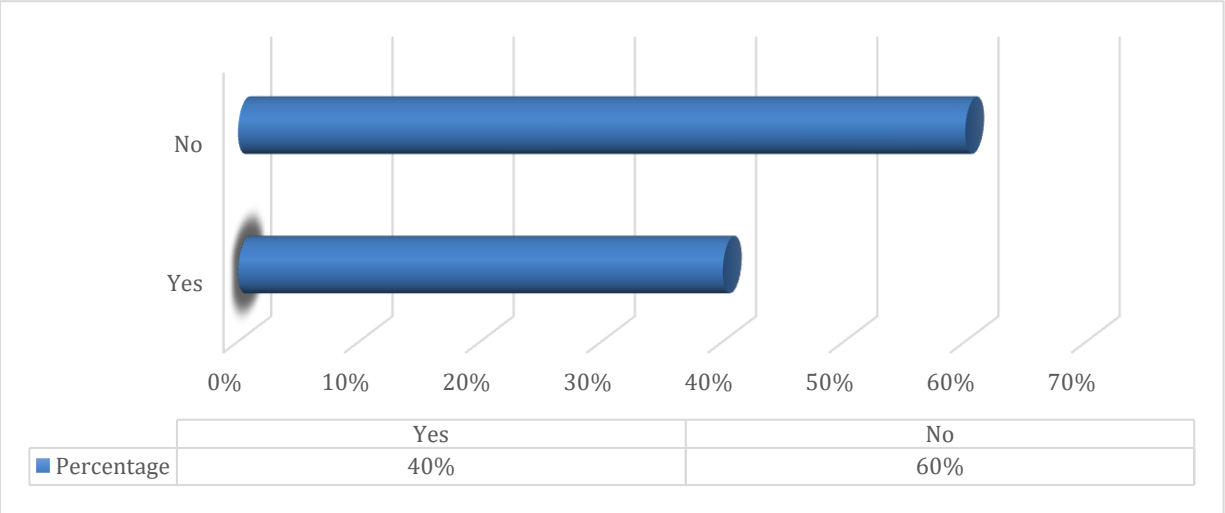

Figure 3: Digital technology reduced the time spent on administrative tasks

As reported in Table 5, the major barrier to reducing administrative time using digital technology, as indicated by respondents, was the lack of access to technology (30.0%), closely followed by the high costs of digital tools (26.7%). Limited digital literacy was also acknowledged by 23.3%, and almost a fifth of respondents (20.1%) highlighted limited internet connectivity. These results could be attributed to several interdependent barriers that further prevent the effective use and implementation of available digital tools, suggesting improvements in technological access, affordability, digital skills training, and internet infrastructure that could support productivity in administrative tasks.

Table 5: Challenges faced in reducing administrative time through digital technology

Challenge	Frequency	Percentage
Lack of access to technology	45	30%
High costs of digital tools	40	26.7%
Limited digital literacy	35	23.3%
Unreliable internet connectivity	30	20%

Income Variability

As shown in Table 6, most of the respondents (56.7%) disagreed with the statement, compared to 43.3% who agreed, that digital technology lowered income variability. Despite the potential advantages of moving to the digital economy, the income risk remains considerable for many of them, showing that there's still engagement needed, be it targeted interventions or improved digital solutions to stabilize agricultural incomes.

Table 6: Digital technology reduced the variability in income

Response	Frequency	Percentage
Yes	65	43.30%
No	85	56.70%
Total	150	100.00%

As shown in Table 7, the main factor that respondents provided for the variability in income, even after adopting digital technologies, was the price changes in the market (33.3%). Another 30% reported seasonal demand variations. Difficult weather conditions were 26.7%, and little market access was 10%. This indicates that outside of external market and environmental influences, which have consistently contributed to income variability, the application of digital technology in isolation will likely not be sufficient to reduce some key aspects of ongoing agricultural uncertainties in the future without some further supportive strategic measures.

Table 7: Factors contributing to income variability despite digital technology adoption

Factor	Frequency	Percentage
Market price fluctuations	50	33.3%
Seasonal demand variations	45	30%
Unpredictable weather patterns	40	26.7%
Limited market access	35	10%

Adoption Rate of Digital Tools

This finding indicates, for example, that the tables on the Adoption Rate of Digital Tools feature considerable information on the extent to which digital tools are utilized for agricultural practices and which digital tools are employed. Table 8: Evaluating the adoption of the tools in agrarian practices, 66.70% of the respondents stated that digital tools have been adopted, while 33.30% stated that they have not. This shows a beneficial step toward digitization in agriculture from the respondents, but still provides ground for further expedience in adoption to facilitate the hindrances or limitations to agricultural digitalization faced by the small population who are still not implementing these tools in their agricultural practices.

Table 8: Adopted digital tools in agricultural practices

Response	Frequency	Percentage
Yes	100	66.70%
No	50	33.30%
Total	150	100

Results in Table 9 reveal that mobile applications for weather forecasting were the most commonly adopted digital tool, utilized by 33.3% of respondents. This was followed by online marketplaces at 26.7% and digital payment systems at 23.3%. Precision agriculture tools had the lowest adoption rate among the listed technologies, at 16.7%. These findings suggest a preference for tools offering immediate practical benefits, such as weather forecasting and market access, while more sophisticated technologies like precision agriculture have lower adoption, potentially due to complexity, cost, or accessibility barriers.

Table 9: Digital tools adopted

Digital Tool	Frequency	Percentage
Mobile applications for weather forecasting	50	33.3%
Online marketplaces	40	26.7%
Digital payment systems	35	23.3%
Precision agriculture tools	25	16.7%

Training Hours Received

This outcome helps illustrate the extent of digital training on technologically driven innovations in agriculture, found in situational analysis and tables in Training Hours Received on.' As shown in Figure 4, when the respondents were asked whether they had been trained on digital tools of the farming practices or not, 53.30% of them were trained, while 46.70% were not trained on digital agricultural tools. It indicates that just over 50% of participants have the opportunity to be digitally trained, but there is still a significant number who are not trained, and this can be a potential opportunity for outreach.

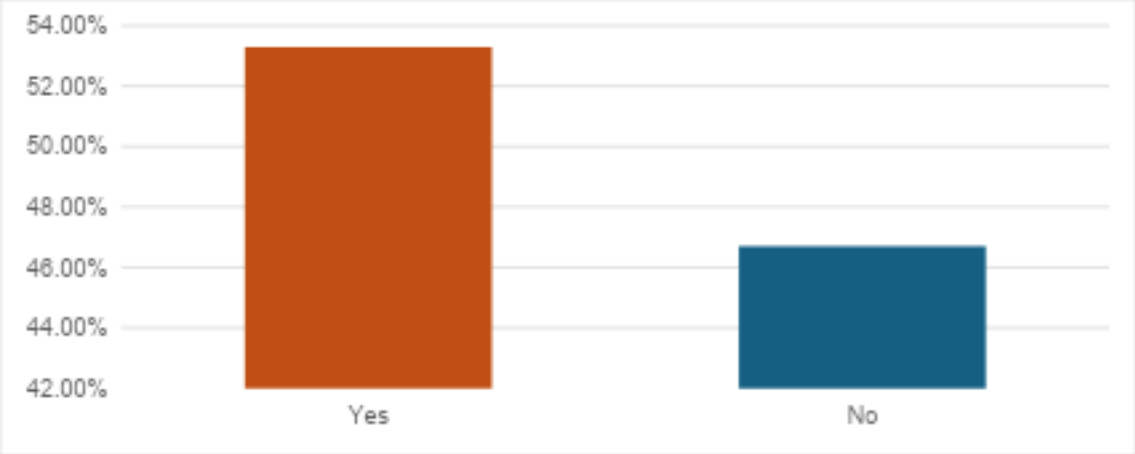

Figure 4: Training on digital tools for agricultural practices

Results in **Table 10** show that government agencies were the primary providers of training in digital agricultural tools, supporting 53.3% of respondents. NGOs were the second-largest training providers, serving 26.7% of respondents, while private companies accounted for 20%.

These findings highlight the prominent role of government initiatives, complemented by meaningful contributions from NGOs and private sector organizations in delivering digital technology training to farmers.

Table 10: Training Provider

Training Provider	Frequency	Percentage
Government agencies	80	53.3%
NGOs	40	26.7%
Private companies	30	20%

Sustainability Practices Adoption

In Table 11, which evaluates whether respondents have adopted sustainability practices in their agricultural activities, 60% indicated that they have, while 40% have not. This suggests a positive trend towards sustainability in agriculture among respondents, though there remains considerable potential to encourage broader adoption of these practices across the farming community

Table 11: Adopted sustainability practices in agricultural activities

Response	Frequency	Percentage
Yes	90	60%
No	60	40%
Total	150	100%

Table 12 lists practices adopted for sustainability, with organic farming being the most frequently adopted practice, where 40% of respondents confirm its usage. That indicates a strong preference for organic farms, which they might find more eco-friendly, or consumers are demanding organic produce. The second-most popular practice is crop rotation, and was another method used by 26.7% of respondents. Integrated pest management is used by 20% of respondents, indicating that this practice is also widespread, though less so than organic farming and crop rotation. Lastly, water conservation techniques are adopted by 13.3% of respondents, making it the least commonly used practice among the options provided. These results highlight a clear preference for organic methods and crop rotation among farmers, though integrated pest management and water conservation techniques also represent significant areas of adoption. The data underline opportunities to further promote less widely adopted practices to enhance overall agricultural sustainability.

Table 12: Sustainability agricultural practices adopted

Sustainability Practice	Frequency	Percentage
Organic farming	60	40%
Crop rotation	40	26.7%
Integrated pest management	30	20%
Water conservation techniques	20	13.3%

4. DISCUSSION

The significant increase in rice production, cotton, and maize in Morogoro underlines the potential impact of digital technologies on agricultural productivity. Mobile applications for weather forecasting and precision agriculture tools have empowered farmers to make more informed decisions about crop management and resource allocation, mirroring findings from similar studies in Hainan Province, China (Lyu, 2024). This aligns with broader research emphasizing how digital tools improve access to agricultural advisories and market information, transforming productivity in regions like Morogoro (Melchioly & Saebo, 2010). However, barriers such as inadequate infrastructure and limited access to digital technologies continue to impede the full realization of these benefits, consistent with challenges in other rural areas (Mazwane *et al.,* 2024).

The study identified both positive and mixed results in input cost reduction, with over half (53.3%) of respondents stating there was not a change in input costs since implementing water and irrigation technology; however, high initial investment costs were a key hindrance to adoption (matching findings of George et al., 2021). (2024). Correspondingly, 50% of the respondents stated that they did not trust digital platforms, mirroring the digital divide obstacles indicated by Furuholt and Kristiansen (2017). Making these digital tools more mainstream relies on creating transparency and trust through enhanced digital literacy, infrastructure development, and new financing models.

Improvements in market access are consistent with findings around the world where digital financial inclusion is leading to rural economic development (George et al., 2024). Yet disparities in market access frequency show issues like irregular connectivity and lack of digital skills, indicating uneven advantages from digital platforms among users (Mazwane et al., 2024). Moreover, digital technologies have not really reduced time spent on administrative tasks for 60% of the respondents, indicating the crucial importance of digital literacy along with reliable infrastructure to gain efficiency (Ismail, 2023).

Finally, the limited effect of digital initiatives on income variability indicates broader economic factors, such as market price changes and weather risks, that continue to be formidable challenges. The high adoption rate of digital tools (66.7%) and their role in promoting sustainability practices, including organic farming (55.6%), are an encouraging trend. By focusing on upskilling and harnessing advanced digital tools, as part of the ICT policy framework of the government and initiatives like the Digital Economy Strategy Framework, productivity, sustainability, and economic resilience improvements can be realized in Morogoro and throughout similar regions.

5. CONCLUSION

This study aimed to examine how such technologies affect agricultural productivity in Morogoro, Tanzania, giving particular attention to crop yield, input cost, market access, efficiency in administrative roles, income volatility, rate of adoption, training, and sustainability

practices. Using digital tools to reduce harvest loss has been identified as a major driver of improved crop yields and increased market access, methods that include everything from weather forecasting applications to smart marketplace pricing and communication. But, despite the potential, broader adoption and effectiveness remain constrained by high initial investment costs, limited trust in digital platforms, and a lack of plumbing. These have restricted the ability of these tools to address the reduction of input costs, to increase the efficiency of administrative-type processes, and to help frame income variability.

The impact of digital technologies in agriculture can be transformative, but barriers to adoption still need to be addressed in order for the agriculture sector to reap its benefits. Government initiatives in improving digital literacy, making space for rural infrastructure, and building trust in digital platforms will be critical for addressing these challenges. Targeted incentives, like low-interest loans or subsidies to adopt digital technology, may mitigate the high start-up costs. At the same time, public-private partnerships can also foster the development and dissemination of advanced agricultural technologies like precision agriculture, which are not widely used.
The impact of the digital gap in farmer literacy has also been emphasised in the study, which calls for tailor-made training programmes to increase their digital literacy. However, the low inclination toward more advanced technologies reveals a major gap, while the high adoption of basic tech tools shows a positive trend. Combined approaches between the government, NGOs, and the private sector to create comprehensive training strategies. And these programs go on and also build confidence in those digital tools to be used by farmers to their full capacity.
Ecosystem-conscious practices, like organic farming and crop rotation, are gaining ground as people embrace more environmentally friendly alternatives. Support for these practices through digital tools can improve resource management and agricultural sustainability in the long run. But more effort is needed to explore how digital technologies can better help solve sustainability problems like climate change and resource constraints. They should also take into consideration the self-reported data and the study's regional limitation to obtain a better overall picture of how the use of digital technologies in agriculture influences productivity and sustainability over the long term across different contexts.

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