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# ICT Adoption and Access Among Small-Scale Tea Growers in Rungwe, Tanzania

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**ABSTRACT**

*Tanzania is known for its high-quality tea production, with Rungwe District being a major producer. Though the sector faces various challenges, including low productivity, limited market access, and poor quality, the adoption of Information and Communication Technology (ICT) is likely to solve these challenges and enhance the overall performance of the tea industry in Rungwe. However, there is a shortage of data on ICT usage in Africa, specifically in Tanzania. This paper intends to explore the extent to which ICT has been adopted among Tanzanian Small-Scale Tea Growers (SSTGs) in Rungwe district and its impact on the tea industry. The study found that SSTGs in Rungwe have been adopting various ICT tools and applications to enhance their tea production processes, access information on market trends and opportunities, and access knowledge and training. These tools include radios, television, mobile apps, the internet (online platforms and YouTube), and sensor-based technologies, which are used to monitor crop growth, soil moisture, and weather conditions. The tools have enabled farmers to make more informed decisions about their crop management and improve their yields. The adoption of ICT in small-scale tea production in Rungwe has had a positive impact on the sector, enhancing productivity and efficiency, improving market access, and increasing the income and livelihoods of SSTGs.*

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## 1. Introduction

The use of Information and Communication Technologies (ICT) has become increasingly important for businesses of all sizes (Apulu, 2012; Magemo, Minga, and Kusyama, 2022); this includes Small-Scale Tea Growers (SSTGs), who can greatly benefit from the adoption of ICT in their operations. A large portion of Tanzania's SSTGs are located in the Rungwe district of the Mbeya Region. This study defines ICT as any software and hardware used to create, capture, manipulate, communicate, exchange, present, and use information in various forms (Ziemba, 2020). Meanwhile, the adoption of ICT is defined as the design, implementation, stabilisation, and continuous improvement of ICT (Mng'ong'ose, Bank Of Tanzania *et al*., 2018; Awan, 2021; Aimable, 2019). ICT adoption includes all activities from when government units decide to adopt ICT to the point when they experience the full benefits of ICT (Ziemba, 2020).

This introduction provides an overview of the extent of ICT adoption among SSTGs in Rungwe. The study's objectives are to identify the degrees of ICT equipment and technology adoption and, finally, to comprehend how these tools and technologies are utilised in the tea-producing process. Additionally, the study aims to identify any barriers or challenges to ICT utilisation among SSTGs in Rungwe.

The way information is shared globally has changed dramatically due to advances in ICT, which have profoundly impacted communities worldwide, which can now communicate and share information in previously impossible ways (Mushi *et al*., 2022; Akinade and College, 2020). The rise of digital technologies has had a profound impact on production processes. ICTs play an increasingly significant role in the development and execution of goals (Dawuda and Ibrahim, 2021; Asenso-OKyere and Mekonnen, 2012; Abedin *et al*., 2022; Consolata, 2017). Since the rapid growth of the internet and its services, production has increased in various sectors, including agriculture (Verdier-chouchane and Karagueuzian, 2016; Trendov, Varas, and Meng, 2019).

As an emerging field, information and communications technology (ICT) plays an increasingly important role in various production sectors (Apulu and O. Ige, 2011; Mng'ong'ose, Bank Of Tanzania, Ndekwa, and Victor, 2018; Trendov, Varas, and Meng, 2019; Ayisi Nyarko and Kozári, 2021; Ntawigaya and Sule, 2022). ICTs play a significant role in agricultural activities in different areas and provide greater user assistance. In many developing countries, agriculture is an important economic sector, particularly in states like Tanzania, Uganda, Kenya, Ghana, and Bangladesh (Ntawigaya and Sule, 2022). Smallholder farmers in rural areas rely on agriculture for their livelihoods. The study asserts that most of the workforce in Tanzania is employed in the agricultural sector, which has remained largely unchanged since the country's independence in 1961. It is estimated that the agricultural sector accounts for 70% of all employment and 90% of employment in rural areas. According to the Tanzanian National Census 2012, 70.4 percent of Tanzanians live in rural areas and are engaged in farming as their main economic activity (Ntawigaya and Sule, 2022). The researchers found that there are almost 10,756 SSTGs in the Rungwe district (Mwami, Sanga, and Nyoni, 2002; Connecting Smallholders to Knowledge, Networks, and Institutions, 2017; Garg, 2018). Poverty is still prominent in rural areas of Tanzania. Farms use ICT in both small and large-scale farming for various reasons (Kansiime *et al*., 2019; Asenso-okyere and Mekonnen, 2012; Mushi *et al*., 2022). The most commonly available and accessible ICTs in Africa are mobile phones, the internet, audio devices, networked computers, YouTube (audio/visual materials used for information and training), and the Radio (Otaala, 2016; Library & Vol., 2019; Sanga *et al*., 2013).

The success of implementing such technology depends on the capabilities of individuals and organisations, among other factors (Usman, 2007; Singh *et al.,* 2018; Saidu *et al*., 2017). ICT presents several challenges that arise when selecting and acquiring such technology (Dawuda

and Ibrahim, 2021; Richardson, 2011); thus, the level of ICT usage in Africa is relatively low (Gavai, Musungwini, and Mugoniwa, 2018; Singh *et al.*, 2018), and many small-scale farmers are unaware of the potentiality of ICTs to boost production activities. Other researchers showed that rural communities use ICT for production relatively infrequently (Gavai, Musungwini, and Mugoniwa, 2018; Usman, 2007). The usage and access of ICT in Tanzania's agricultural sector are still low. The possible reasons for this include inadequate alertness, imperfect ICT set-up, financial restrictions, and low information literacy levels. Most farmers and extension staff relied on freely available and open-access ICT services (Gavai *et al.,* 2018).

ICTs significantly improve agriculture in Tanzania by increasing efficiency, productivity, and profitability. Here are some practical applications of ICTs in Tanzanian agriculture:

1. Mobile applications: Farmers in Tanzania can use mobile applications to access information on weather, market prices, pest and disease management, and farming techniques. Some of the most popular mobile apps in Tanzania include Kilimo Salama, Mkulima Young, and Sauti za Wakulima (Anyan and Frempong, 2018).

2. Farm management software: This manages farm operations such as crop planning, inventory management, and financial management. This can help farmers make informed decisions and increase efficiency. Examples of farm management software include Farmforce and Farmbook (Saiz-Rubio, 2020).

3. Precision agriculture involves using technology such as sensors, drones, and GPS to gather data about soil conditions, crop growth, and weather patterns. This data can be used to optimise crop yields and reduce waste. Some companies offering precision agriculture services in Tanzania include Sokoine University of Agriculture and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (Ashokkumar and Naik, 2021; Gupta *et al*., 2021).

4. E-commerce platforms: ICTs can be used to connect farmers with buyers, both locally and internationally. E-commerce platforms such as Kilimo Mart, AgroNigeria, and the Farm to Market Alliance are examples of how technology can facilitate trade and increase access to markets (Goel *et al*., 2021; Pierpaoli *et al*., 2013).

5. Agricultural extension services: ICTs can be used to improve access to agricultural extension services. The Tanzanian government has established a national agricultural extension system that provides farmers with information on farming techniques, inputs, and markets. ICTs such as radio programmes, text messaging services, and online portals support the system (Sanga *et al.*, 2013; Sanga, 2018).

Such mention among many ICTs applied in agriculture marks that ICT is becoming increasingly commonplace in many aspects of daily life, but there is still debate about how best to utilise these tools (Jayathilake, Jayaweera, and Waidyasekera, 2010; Kamarudin *et al.*, 2019; Kyakulumbye and Pather, 2021). There is evidence that agricultural extension services can be extremely helpful for farmers in rural areas who may have inadequate access to these facilities; this is particularly true for production processes, where extension services can provide vital guidance and support (Azadi *et al.*, 2021). The frequency of usage of effective ICT services by small-scale farmers in rural areas is low (Gavai, Musungwini, and Mugoniwa, 2018). Many small-scale farmers are unaware of the benefits of using ICTs such as radio, mobile phones, and the internet to improve their operations and livelihoods (Ayim *et al.*, 2020). Some farmers face challenges when accessing ICT services, particularly partial access and utilisation of some sorts of ICT services that are unlimited (Supplement, 2018). These limited ICT services are only available after

purchase (Palmer, 2012). Due to such problems, some farmers, especially large farmers, have decided to purchase a subscription to some ICT services to simplify the production process by accessing and using the services (Bvuma and Marnewick, 2020). Despite abundant studies that have been performed on the relationship between ICT services and agricultural production efficiency, there is still a deficiency of research specifically on how small-scale farmers make use of subscribed ICT services (Hasan, Bao, and Miah, 2021; Bvuma and Marnewick, 2020).

While various pieces of literature evaluate the usage of ICT in the propagation of information to farmers (Ayim *et al.*, 2020; Kyakulumbye and Pather, 2021; and Saidu *et al.*, 2017), However, a little effort has been made to evaluate small-scale farmers' use of ICT on farms (Shemfe, 2018). The study aimed to assess the extent to which SSTGs in Rungwe District have adopted ICT services. The study evaluated the extent of ICT adoption on agricultural practices efficiency among the SSTGs in Rungwe District, Tanzania. The study examined the extent to which ICT has been applied by the SSTTG to respond to the research question, *"To what extent has ICT been applied or adopted by the SSTTG?".* The outcomes of this investigation will have important consequences for policymakers and other stakeholders as they seek to promote the use of ICT in the agriculture sector in Tanzania. It is hoped that the findings of this study will contribute to the development of effective approaches for encouraging ICT implementation among SSTGs in Rungwe and other similar contexts.

## 2. Materials and Methods

### *2.1 Approach*

Altogether, qualitative and quantitative methods were applied in this investigation to recognise the levels of ICT adoption in small-scale tea production. Qualitative methods were used to understand the motivations and barriers to ICT adoption, while quantitative methods were used to measure the level of ICT use. The survey questionnaires and guided interviews were used to gather data from the respondents. The gathered data were analysed using computer software (Statistical Packages for Social Science, SPSS v21). The strategy improved comprehension of the research issue by illuminating the connection between variables, i.e., the level of ICT use and agricultural output performance among SSTGs in Rungwe.

### *2.2 Research Design*

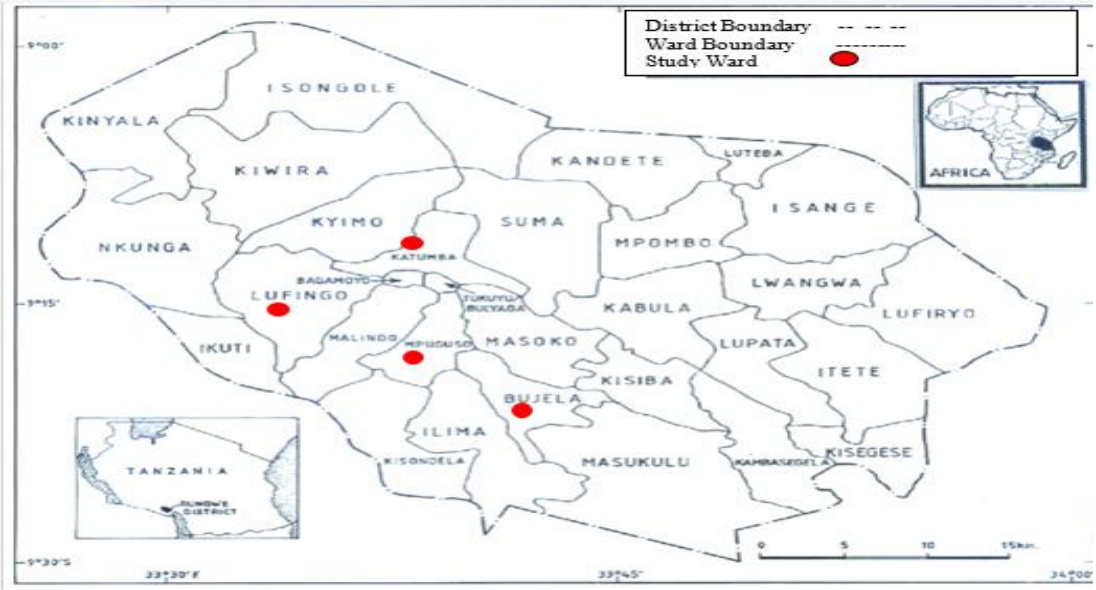
A cross-sectional survey design (a sort of observational exploration that analyses data on variables obtained at one given point across a sample population) was used to focus on individual SSTGs as units of analysis. This approach helped understand the dynamics of the population under study; the design makes it possible to cover a large geographical area (Kansiime *et al.*, 2019; Moyo, 2019; Iram, Tatlah, and Butt, 2020). It measures individual attitudes and characteristics and provides a means of quickly, efficiently, and accurately assessing information about research populations and subscribed ICT services. The *"what"* question of this investigation required a survey approach (Dhraief *et al*., 2019; Mezrlow, 2011; Dawuda and Ibrahim, 2021).

### *2.3 Area of Study*

The study was conducted in the Rungwe district of the Mbeya region, as shown in Figure 2. The area is generally mountainous, with an elevation ranging from 772 metres to 2981 metres above sea level (Tilumanywa, 2021). The district was chosen based on its high potential for agricultural production, especially tea (Mwakaje, 2010).

The study focused on tea production due to its popularity and long history (Zed *et al*., 2003). The study was conducted on private small-scale farms producing tea in Rungwe, Tanzania. The study area covers four (4) wards around the Rungwe district: Katumba, Mpuguso, Lufingo, and Bujela. The mentioned wards are prominent in tea production (Mwami *et al*., 2002).

Fig 1
*The Map of Rungwe District Showing Locations of the Study*




*2.4 Units of Analysis*

The targeted group for this investigation was Rungwe's small-scale tea producers. The units of analysis were individual SSTGs. The research team was supplemented with key administrative staff members (Ward Extension Officers). The SSTGs face the problem of not being able to afford the subscription for ICT services that are required for production processes in the tea sector, like television and internet bundles (Georgia August University, 2016). Keeping in mind that A subscribed service is a service that a user pays for on a regular basis, usually monthly or annually. This could be a service provided by a company or an individual, and it could be anything from a streaming service to a software application. This type of service in agriculture may be among the ones highlighted in Section 1 (Introduction) of this paper. By subscribing to these services, farmers can improve their farming operations and increase their profitability, but the farmer or user typically signs up for a subscription plan, which involves agreeing to pay a recurring fee for the service. The user may be required to make available payment details, like credit card or bank account details, and may also need to agree to terms and conditions for the service.

*2.5 Sample Size, Sampling Techniques, and Procedures*

The study invoked the stratified random sampling technique as it provides an equivalent opportunity to select individual units of the population under study (Azam, 2014; Akinfolarin and Rufui, 2017; Ponguane and Mucavele, 2018). Purposively, the population was sampled, including the Ward Extension Officers. This method allowed the researcher to select such specific respondents based on their position in using ICT services and labour productivity (Iram *et al*., 2020; Musungwini, n.d.; Ogola *et al*., 2021). These Extension Officers were expected to have general details concerning the ICT services and production performance. A sample of four wards (Katumba, Mpuguso, Lufingo, and Bujela) were purposefully chosen due to their potentiality in tea production as suggested by works of literature stated in Section 2.3 above (Area of the Study). In another phase, a sample of plaintiffs (SSTGs) within the nominated ward was attained using Cochran's formula, and each ward's sample size was determined using the stratified sampling method, a technique that splits the inhabitants into different subdivisions called strata and randomly picks the elements proportionately from the different strata, allowing them to be incorporated into the sample (Ponguane and Mucavele, 2018). The sample size was estimated at 100, obtained by

injecting a confidence level of 80% and a margin error of 5% into Cochran's formula, deemed ideal in circumstances with huge populations (Iram *et al*., 2020; Ogola *et al*., 2021). A sample of a given size provides more information about a smaller population than a larger one. Therefore, Cochran's formula considers this by providing a "correction" factor (Tilumanywa, 2021), which can be condensed if the population is comparatively minor. The Cochran formula is given as follows:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where:

- $n_o$ is the required sample size,
- e is the anticipated degree of precision (i.e., the boundary of error),
- p is the (projected) percentage of the population that has the feature in query (as shown in Section 2.5 above),
- q is 1 – p.
- The Z-value is stated in a Z table.

Using the Cochran formula**,** the sample size calculated was 100; the sample size comprises 96 SSTGs and 4 Ward Agricultural Extension Officers obtained by equal distribution of the obtained sample size from Cochran's formula into the four wards.

*2.6 Data Collection Methods*

Questionnaires and guided interviews were primarily used to collect data for this study. The questionnaires were used as they seem to be the least time-consuming tools, thus helping extract data from the chief research respondents (SSTGs). Questionnaires gave plaintiffs enough time to provide thoroughly worked-out responses in their own time (Bonev and Alexandrov, 1993; Mugobi and Mlozi, 2021). The purpose of the guided interviews was to find out what the plaintiffs who were chosen through purposeful sampling thought about the use of ICTs in tea production in their wards. The researcher spoke to the participants by telephone or in person. This allowed the researcher to explain the purpose of the study in detail and helped build the report. The interview questions were divided into five sections. Section A focused on the participants' demographic data (their age and level of education). Section B investigated their perceptions of ICT adoption and ICT access. Section C looked at the types of ICT being used by the SSTGs and what they were used for. Section D looked at how the participants were using ICT, and Section E collected any critical comments.

The researcher used thematic analysis to look for patterns in the qualitative data. This method helps identify themes, which can then be reported (Eze *et al*., 2019).

*2.7 Measurement of Variables*

This study looked at how production performance and ICT service adoption vary across study wards in Rungwe. It used a five-point Likert scale to measure how much adoption each type of ICT service had, with 1 meaning very little adoption and 5 meaning very widespread adoption.

*2.8 Data Analysis Methods*

To achieve objective one, "To investigate the extent to which the SSTTGs have utilized ICTs," the data collected were analyzed using descriptive statistics to compute frequencies and percentage distributions, and SPSS was used for all operations.

## 3. Results and Discussion

*3.1 Descriptive Statistics*

The SSTGs in both genders were remarkable in the surveyed wards. The gender distribution among the SSTGs surveyed is shown in Table 1. Eighty-three (83) percent of respondents were male, and Seventeen (17) percent were female. Most of the surveyed SSTGs were male, implying that the male gender is still leading in tea cultivation compared to females. Regarding the age of the respondents, they ranged in age from 25 to 40 years and older. The survey results showed that 10.0% of SSTGs were aged 25 to 29, 20.0% from 30 to 34, 40.0% from 35 to 39, and 30.0% of SSTGs were 40 years of age or older, as shown in Table 1. Most of the SSTGs were between 35 and 39 years old, with the majority (62%) having primary education. The SSTGs were asked to identify the particular wards in Rungwe, Tanzania, where they were pursuing

their production activities. As revealed in Table 1, the wards had an equal number of respondents.

Tab 1

*Descriptive Statistics*

| Item | Scale | Frequency | Percent |
|---|---|---|---|
| Sex | 1. Male | 17 | 17.0% |
| | 2. Female | 83 | 83.0% |
| | **Total** | **100** | **100.0%** |
| Age | 1. 25-29 years | 10 | 10.0% |
| | 2. 30-34 years | 20 | 20.0% |
| | 3. 35-39 years | 40 | 40.0% |
| | 4. 40andabove years | 30 | 30.0% |
| | **Total** | **100** | **100.0%** |
| Education Level | 1. Primary | 62 | 62.0% |
| | 2. Secondary | 26 | 26.0% |
| | 3. Higher Education | 12 | 12.0% |
| | **Total** | 100 | 100.0% |
| Wards | 1. Lufingo | 25 | 25.0% |
| | 2. Bujela | 25 | 25.0% |
| | 3. Mpuguso | 25 | 25.0% |
| | 4. Katumba | 25 | 25.0% |
| | **Total** | **100** | **100.0%** |

### *3.2 Awareness Level of the SSTGs on Available ICT Services*

Among the objectives of this study was to discover the degree of awareness of SSTGs about available ICT services. The results in Table 2, which are visualised in Figure 2 above, show that 12%, 63%, 74%, and 28% of SSTGs had low levels of awareness about Radio, television, the internet, and Mobile phones, respectively, while 60%, 29%, 22%, and 12% of the SSTGs had moderate levels of awareness about radio and television. On the other hand, 28%, 08%, 04%, and 12% of SSTGs had low levels of awareness about radio, television, the internet, and mobile phones, respectively, suggesting that a majority of SSTGs are not aware enough about ICT services, as an average of 44.25% shows low awareness of ICTs, 42.75% had moderate awareness of the same, and only 13.00% evidenced high awareness of ICTs, which is minor. All results show that an average of 44.25% of the interviewed SSTGs have a low level of awareness about available ICT services. Furthermore, the study found that several factors affect the awareness levels of SSTGs about ICT services, which include education level (as shown in Table 1), geographic location, access to technology, and socio-economic status. The study considers the implications of the awareness level of SSTGs on the adoption of ICT services in tea farming activities and identifies additional awareness campaigns that may be needed to promote the adoption of ICT services among SSTGs.

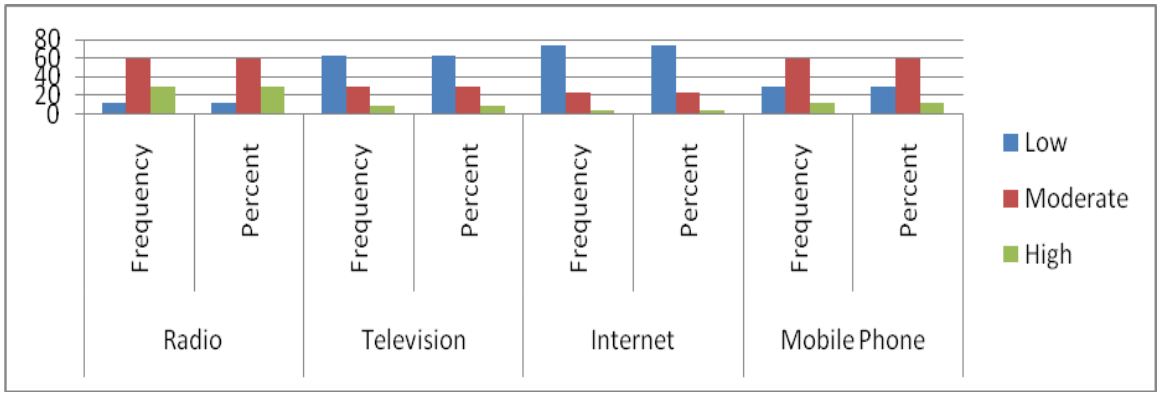
Tab 2

*Awareness Level of the SSTGs on Available ICT Services*

| Scale | Radio | | Television | | Internet | | Mobile Phone | | Average Percentage |
|---|---|---|---|---|---|---|---|---|---|
| Level | Frequency | Percent | Frequency | Percent | Frequency | Percent | Frequency | Percent | |
| Low | 12 | 12 | 63 | 63 | 74 | 74 | 28 | 28 | 44.25 |
| Moderate | 60 | 60 | 29 | 29 | 22 | 22 | 60 | 60 | 42.75 |
| High | 28 | 28 | 08 | 08 | 04 | 04 | 12 | 12 | 13.00 |
| Total | 100 | 100.0 | 100 | 100.0 | 100 | 100.0 | 100 | 100.0 | 100.0 |

Fig 1

*The Awareness Level for Available ICT Services*




### *3.3 Types of ICT Services Available within the Investigation Wards*

The section's aim was to explore how often SSTGs utilise adopted ICT services.

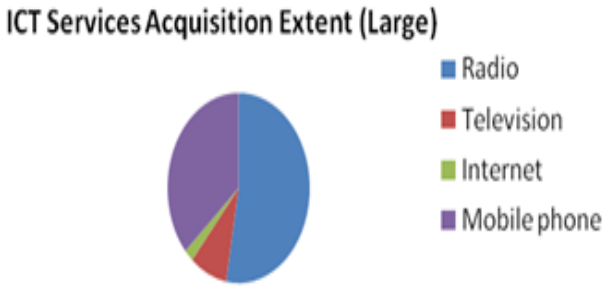
Table 3

*Types of ICT Services Used by the SSTG*

| Scale | ICT Service | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Radio | | Television | | Internet | | Mobile phone | |
| Acquisition Extent | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Small | 6 | 6 | 58 | 58 | 75 | 75 | 11 | 11 |
| Neutral | 20 | 20 | 30 | 30 | 22 | 22 | 38 | 38 |
| Large | 74 | 74 | 12 | 12 | 3 | 3 | 51 | 51 |
| **Total** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |

Fig 3

*Available ICT Services*




The results in Table 3, which are visualised in Figure 3, show that the SSTGs in Rungwe can access a variety of ICT services, depending on location and level of education, but some of the most commonly available services include mobile phones, radio and television programmes, and the internet. In addition, some Agri-tech companies have arisen in Tanzania that provide farmers with access to agricultural information, weather forecasts, market prices, and crop management

advice, like WeChat. The study found that the use of ICT services such as Radio, television, mobile phones, and the internet is to a very limited extent, with 6%, 58%, 66%, and 68%, respectively. On the other hand, a substantial percentage of SSTGs interviewed were neutral on the extent to which they utilised available ICT services, as stated earlier. They said that they just run business as usual, even though they regularly buy ICT gadgets like radios and mobile phones. This implies that most of the surveyed SSTGs applied available ICT services in a limited way, with radio being the most used service and other services being very limited. However, there is a need for further investment in ICT infrastructure and services to ensure that all tea growers in Rungwe can take advantage of these tools.

Table 4
*Briefing of Regression Results*

| Item | B | T | Sig. |
|---|---|---|---|
| **(Constant)** | .107 | 2.187 | .024 |
| Radio | .096 | 12.897 | <.001 |
| Television | .067 | 2.317 | .023 |
| Mobile phones | .073 | 2.212 | .018 |
| Internet | .065 | 2.212 | .018 |
| Multiple R | .542[a] | | |
| R Square | .311 | | |
| Adjusted R | .312 | | |
| ANOVA (F, SIG.) | 31.121(<.001) | | |

The investigation employed the adjusted R Square to assess the extent of the variance in production performance was clarified by the model with the available ICT services. The value found was .311, meaning that the model clarified 31.1% of the variance in production performance, as shown in Table 4.

The calculated F data had a realistic significance level of 0.000 and a computed F value of 31.121 to examine how well the regression model fit the data. As demonstrated in Table 4, the models attained statistical significance at the p0.01 level. The study found that ICT services were positively related to production efficiency among SSTGs. The regression analysis shows that the results are significant.

The results of the study indicate that radio (whose extent levels of awareness are: 44.25% show that they are of low awareness of ICTs, and 42.75% have moderate awareness of the same, while only 13.00% evidenced high awareness of ICTs, which is minor) had a statistical significance and constructive relationship with production performance (Beta =.096, t = 12.897, p<0.001). These results suggest that SSTGs with greater access to and use of Radio perform better in production. Similar findings were found in the research by Sethy and Mukhopadhyay (2020).

The findings of this study suggest that SSTGs in Tanzania who have access to and use Radio are more likely to have higher production performance. These statistically significant results suggest that Radio can be a valuable tool for SSTGs in Tanzania. The reason behind this is that radio can be a powerful tool to help small-scale Tanzanian tea growers improve their production performance in several ways by providing them with timely and relevant information, education, training, and communication channels related to effective farming.

*3.4. Findings and Discussions*

The outcomes in Table 1 generally show that most of the surveyed SSTGs had little awareness of available ICT services like radio, television, mobile phones, and the internet. The study

results imply that the SSTGs are moderately aware of ICT services but unfamiliar with sector-specific services; this is evident as there is a solid correlation between education level and ICT adoption in agriculture (Theng and Chia, 2008).

Studies like Pillay (2016) show that farmers who have more education have an added advantage when using technology in their farming endeavours. This is due to the fact that they have the skills and knowledge needed to understand and use these tools effectively. Higher education levels also mean that farmers have more access to information and resources, which can help them learn about and use new technologies. However, some farmers may face barriers to using technology in their farming practices, such as a lack of knowledge or access to technology and resources. It is important to note, however, that education level is not the only factor that influences ICT adoption in agriculture (Hopestone, 2014). Other factors, such as age, gender, and access to technology and resources, also play a crucial role. Additionally, the availability of ICT infrastructure and support services can also be a crucial determinant of the level of ICT adoption in agriculture.

According to this survey, SSTGs only occasionally utilised the Internet, frequently used radios, and seldom used any other services. The study by Akinade & College (2020) also shows that Tanzania and other countries in Africa do not use ICT services at high rates. These results imply that SSTGs continue to use and apply ICT services sparingly.

The SSTGs' low awareness of ICT services that are beneficial to the sector demonstrates that, despite their widespread use, ICT services are not directly involved in the production of tea. The study's findings are consistent with those of cocoa producers in Ondo State (Nigeria) and Asuogyaman (Ghana) (Anyan and Frempong, 2018). The use and access of ICT services in Tanzania among processes is still relatively low, potentially due to inadequate awareness, insufficient ICT set-up, financial restrictions, and little information literacy. In the study, most of the farmers and extension staff who were interviewed just relied on freely available and open-access ICT services (Ninsiima, 2015).

Additionally, all the available ICT services, like radio, significantly and positively influence production performance among the SSTGs. Though the users (SSTGs) were found unaware, they use the ICT services to a small extent. The above outcomes are likewise backed up by Mwakaje (2010) and Tilumanywa (2021), who found that ICT services contribute positively to performance in various production sectors, including agriculture, in different localities. Radio has been found to be the key ICT service in boosting production performance as it enhances information dissemination, provides education and training, shares market insights, and engages communities. This makes radio a tool to improve the profitability and sustainability of SSTGs. This can lead to increased participation and investment in tea production, as well as support for policies and initiatives that benefit small-scale tea producers. For this reason, the ICT services need to be used by the SSTGs for many reasons, including fulfilling the day-to-day production necessities.

## 4. Conclusion and Recommendations

Based on the available information on the extent of ICT adoption among SSTGs in Rungwe, it can be concluded that there is a low level of ICT adoption in the sector. While some growers have access to mobile phones and basic communication technologies like radios, the adoption of more advanced technologies such as mobile applications, online platforms, and precision farming tools remains low.

There are several reasons for this, including the lack of awareness and knowledge of these technologies, the high cost of acquiring and maintaining them, and the limited availability of reliable internet connectivity in rural areas.

To address this, sector stakeholders, including governments, the private sector, and development partners, are encouraged to prioritise initiatives aimed at promoting ICT

adoption among the Rungwe SSTG. Specific recommendations include the following:

i. Improving alertness: This will boost awareness among SSTGs on the merits of adopting ICTs. This can be attained through workshops, training programmes, and other outreach activities.

ii. Access to funding: The high cost of acquiring and maintaining ICTs is a significant barrier to adoption. There is a need for innovative financing mechanisms to make these technologies more accessible to SSTGs.

iii. Infrastructure development: Reliable internet connectivity is essential for the adoption of advanced ICTs. There is a need to invest in the enhancement of ICT setup in rural areas, including the expansion of broadband internet coverage.

iv. Collaboration and partnerships: Collaboration among stakeholders, including the government, private sector, and development partners, is critical for promoting the adoption of ICTs. Partnerships can facilitate the sharing of knowledge and resources, leading to more effective and efficient implementation of ICT initiatives.

v. Capacity building: Building the capacity of small-scale tea growers to effectively use and maintain ICTs is critical for the successful adoption of these technologies. This can be achieved through training programmes and other capacity-building initiatives.

Overall, promoting the adoption of ICTs among small-scale tea growers in Rungwe has the potential to boost productivity, increase access to markets, and enhance the overall efficiency of the sector.

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