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ORIGINAL ARTICLE

The Extent of Integrating ICT into Farming Operations in the Sabaragamuwa Province: A Sri Lankan Perspective

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Abstract

This study explores the integration of Information and Communication Technology (ICT) into farming operations in the Sabaragamuwa Province of Sri Lanka, focusing on methods of adoption, influencing factors, and resultant impacts. Data were collected using a mixed-methods approach, including surveys, interviews, and focus group discussions with 261 farmers. The findings reveal that mobile phones are the most widely used ICT tool. In contrast, advanced technologies like geographic information systems and precision farming are limited to larger, export-oriented farms. Despite high mobile penetration, the adoption of advanced ICT tools like computers and the Internet is limited. Barriers such as inadequate infrastructure, high costs, low digital literacy, and cultural resistance impede widespread ICT integration, especially among older and less educated farmers. Regression analysis highlights age, farm size, and family size as significant factors influencing ICT integration. Despite challenges, ICT integration has shown positive impacts on market access, decision-making, and productivity. The study recommends improving rural infrastructure, providing training programs, developing localized content, and fostering public-private partnerships to enhance ICT integration in Sabaragamuwa Province can boost agricultural contributions to the national economy, promote rural development, and ensure sustainable farming practices.

***Keywords**: Agriculture, Digital divide, ICT integration, Rural development*

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1. Introduction

Agriculture is crucial for both survival and economic stability in many developing nations, including Sri Lanka, where it forms a vital foundation of the economy, contributing 8.75 percent to the GDP and accounting for 25.75 percent of total employment in 2022 (Statista, 2024). The ICT has greatly transformed every sector and has impacted every aspect of human life. After undergoing several revolutionary phases, the agricultural industry is flourishing with ICT's support. In the Sabaragamuwa Province of Sri Lanka, agriculture plays a significant role by contributing to the Gross Domestic Product (GDP) and providing employment to a substantial portion of the population (Central Bank of Sri Lanka, 2013). The integration of ICT into agricultural practices offers a valuable opportunity to significantly enhance these contributions.

Historically, Sri Lanka's agricultural sector has been shaped by traditional farming practices, which rely extensively on human labor and the natural monsoon rains for irrigation. While these methods have sustained agricultural outputs for generations, they are increasingly inadequate to meet the growing demands of population growth, market expansion, and environmental sustainability (Weerasinghe & Jayasinghe-Mudalige, 2010). The adoption of ICT in agriculture, often referred to as e-agriculture, offers transformative potential to overcome these challenges by improving the efficiency, productivity, and sustainability of agricultural practices, products, and services. Its important to note that smart agriculture, a more advanced of e-agriculture, is already being implemented today (Jayathilake et al., 2010; FAO, 2005).

Agricultural ICT incorporation encompasses a broad array of technologies, including mobile communication, geographic information systems (GIS), remote sensing (RS), m-agriculture, cyber extension, mechatronics technologies, and online platforms that facilitate the flow of information and resources among farmers, agricultural advisors, and markets (Bartlett et al. 2015). These technologies help farmers by offering top-notch and timely information, efficient communication, decreasing information access expenses, removing institutional obstacles to information sharing, enhancing agricultural productivity, and providing various possibilities for rural communities (Spielman et al., 2021; FAO, 2017). Additionally, these tools can support multiple facets of farming, ranging from precision agriculture that improves seed placement and nutrient management to market access technologies that allow farmers to directly connect with consumers and increase their profit margins.

Farmers can enhance their productivity by leveraging the advanced information provided by modern technologies. Utilizing digital technologies will lead to a transformation in agriculture and contribute to reducing poverty, according to FAO and the International Telecommunication Union (ITU) in 2023. Further integration of mobile phones in agriculture leads to increase yields, reduce expenses, and improved market access (Aker, 2011). According to the ITU, mobile cellular subscriptions in Sri Lanka have significantly increased, with a penetration rate exceeding 130% by 2023 (ITU, 2023). In recent years, Sri Lanka has achieved considerable advancements in ICT infrastructure and ICT literacy (Table 1). In 2013, the Ministry of Agriculture collaborated with Mobitel Sri Lanka (Pvt) Ltd to launch the Mobitel "6666" Agri Price Information Index, a mobile phone-based service designed to provide market price information for agricultural commodities (HARTI, 2013). Programs such as Dialog Axiata PLC's Govi Mithuru service, which uses a mobile phone platform to deliver real-time agricultural information, have played a vital role in enhancing farmers' productivity and income (GSMA, 2017). Additionally, initiatives like the Permanent Crop Clinic Program (PCCP) have effectively integrated ICT into agriculture, offering plant pest and disease diagnostic services (Pannala et al., 2020).

Table 1. Telecommunication use statistics and performance of Sri Lanka in 2023

ICT use statistics	Percentage
Fixed line phones	11.64*
Mobile subscriptions	130.68
Mobile broadband subscriptions	72.3
Computer owned household	20.2
Household Internet usage	48.3*
Household email usage	17.6*
Performance indicators	
Computer literacy	39.0 (two out of five persons aged 5-69)
ICT Development Index (IDI)	69.9

** 2022 statistics*

Source: Department of Census and Statistics Sri Lanka (2023); ITU (2023); Statista (2023)

Despite its potential benefits, the implementation of ICT in the Sabaragamuwa Province has been reported to be very low (Henegedara, 2015). And also, several studies indicate that while mobile phone penetration in rural areas is high, the use of more sophisticated ICT tools such as computers and internet connectivity is significantly lower than in urban areas in Sri Lanka (Mahindarathne, 2022; Jayathilake et al., 2017; Department of Census and Statistics, 2023; Jayathilake et al., 2010). Many rural areas in the Sabaragamuwa Province face challenges such as limited access to electricity, unreliable internet connectivity, poor mobile signal coverage, high costs of ICT devices, and low ICT literacy. This digital divide hinders rural farmers from fully benefiting from advanced ICT tools and solutions.

Several authors have examined the factors that contribute to the digital divide on a global scale. Firstly, the availability of essential physical infrastructure, such as electricity, internet connectivity, and mobile signal coverage. These factors are prerequisites for most modern ICT applications, according to Lin et al. (2017). Second, there is a significant gap in ICT literacy among farmers, many of whom have limited formal education and, thus, struggle to adopt new technologies (Nikkilä et al., 2010). Furthermore, the initial cost of acquiring and maintaining ICT equipment can be unaffordable for small-scale farmers (Mahant et al., 2012).

Bridging the digital divide in the Sabaragamuwa Province could greatly improve the integration of ICT into agricultural practices, thereby increasing the agriculture sector's contributions to the national economy. This paper examines the integration of ICT in farming operations within the region, assessing the current state of technology adoption and identifying potential barriers to its expansion.

2. Materials and Methods

2.1 Study Area

Sabaragamuwa Province, encompassing the Kegalle and Ratnapura districts, is characterized by diverse agroecological features. The region experiences an annual rainfall between 2500 and 3360 mm, with temperatures ranging from 9 to 33 degrees Celsius. Based on the yearly precipitation levels, it can be categorized into dry, moderate, and wet zones, while in terms of elevation, it encompasses lowland, midland, and highland areas. Considering the land use in the province, Sabaragamuwa covers a total area of 496,800 hectares. This region, predominantly consisting of farms and plantations, cultivates rice—the major crop—on 36,970 hectares, vegetables on 5,733 hectares, fruits on 7,624 hectares, and other food and miscellaneous crops on 3,441 hectares, using rain-fed, Mahavari, and Sublivari settings for paddy cultivation (Ministry of Agriculture, 2024). Human life in Sabaragamuwa region is shaped by a predominantly Sinhalese Buddhist population, a mix of economic activities such as tea cultivation and gem mining, and a vibrant cultural heritage marked by historical landmarks and religious traditions. According to the 2019 Household Income and Expenditure Survey, the region recorded an average monthly household income of Rs. 76,414 and an average monthly expenditure of Rs. 63,130, indicating a modest income–expenditure gap (Department of Census and Statistics, Sri Lanka, 2020).

2.2 Data Collection

This study uses a mixed-methods approach to examine the integration of ICT into farming operations in the Sabaragamuwa Province of Sri Lanka. The methodology aims to collect both quantitative and qualitative data to provide a comprehensive understanding of the current level of ICT integration, the benefits achieved, and the challenges encountered by farmers.

The study's quantitative component consists of a survey that was given to a sample of farmers in the districts of Kegalle and Ratnapura. According to preliminary research conducted in the province of Sabaragamuwa, these two districts were chosen because of their significant agricultural activity and varying levels of ICT adoptions (Department of Census and Statistics, 2012). The survey includes both closed and open-ended questions that cover various aspects of ICT usage in farming practices, such as the types of technologies used (e.g., mobile phones, internet, GIS), the purposes for which they are used (e.g., market access, weather forecasting, agricultural advice), and the perceived benefits and challenges associated with their use. A stratified sampling technique is used to ensure a representative sample. Farmers are stratified based on several criteria, including farm size, primary crop, and existing level of ICT integration. Stratum sizes were allocated proportionally to farmer population; within strata, participants were selected via simple random sampling. The survey data were collected via face-to-face interviews supported by a pre-tested structured questionnaire with 261 farmers from Ayagama (n=18), Balangoda (n=15), Dehiovita (n=20), Deraniyagala (n=18), Eheliyagoda (n=18), Embilipitiya (n=26), Galigamuwa (n=22), Kegalle (n=10), Kuruwita (n=24), Mawanella (n=15), Rambukkana (n=20), Rathnapura (n=15), Ruwanwella (n=16), and Warakapola (n=24) divisional secretariats. This approach helps to ensure that the sample accurately reflects the diverse farming practices and levels of ICT integration within the region.

The qualitative component of the study involves semi-structured interviews and focus group discussions with key stakeholders, including farmers, ICT providers, agricultural extension workers, and local government officials. These interactions were designed to gather deeper insights into the contextual factors influencing ICT integration and the practical challenges faced by stakeholders. Interviews and focus groups are conducted in the local language to ensure that participants can express their views freely and in detail. Each interview and focus groups were recorded (with participant consent), transcribed, and translated into English for analysis. Employing qualitative data analysis software, such as NVivo, aids in conducting thematic analysis of transcripts to detect recurring themes and patterns in ICT usage within agriculture. (Silver & Lewins, 2014).

Table 2. Summarization of the methodology

Component	Data source	Method	Focus	Expected outcome
Quantitative	261 farmers (14 DS divisions)	Stratified survey (structured questionnaire)	ICT types, usage, benefits, challenges	Statistical patterns of ICT integration

Qualitative	Farmers, ICT providers, extension officers, local govt. officials	Semi-structured interviews, FGDs	Contextual factors, challenges, perceptions	Thematic insights into ICT integration
Integration	Both datasets	Triangulation (mixed-methods)	Cross-validation & complementarity	Holistic understanding of ICT in farming

2.2 Data Analysis

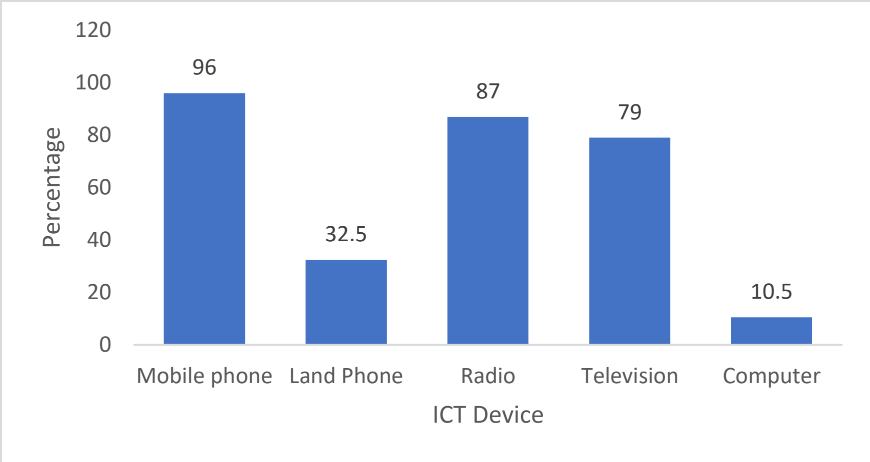
The quantitative data was analyzed using Statistical Package for the Social Sciences (SPSS) V26 statistical software packages. Descriptive statistics provide an overview of the ICT tools used by farmers and the frequency of their use. Regression analysis was used to examine the relationships between farmer demographics (e.g., age, education level, farm size, etc.) and ICT integration. For qualitative data, a thematic analysis approach is adopted. This involves coding the data into themes that emerge from the interviews and focus groups. These themes help to explain the complexities of ICT integration in agricultural practices, including the social, economic, and technical factors that influence farmers' decisions to adopt ICT solutions.

3. Results and Discussion

3.1 Overview of the ICT Integration

The demographic analysis of the respondent farmers reveals that 79% of the sample comprises male farmers, indicating a significant gender disparity in the agricultural sector. The mean age of respondents was 48 years, with the majority falling within the 40–55-year age group. Regarding income levels, 65% of the farmers belong to the lowest annual income category, earning less than Rs. 200,000 per annum. Educational attainment among respondents shows varied levels: Around 1.5% (4 respondents) are illiterate or have no formal schooling, 14% have completed education up to grade 8, approximately 52% have finished Ordinary Levels (OLs), and 32.5% have achieved Advanced Levels (ALs) or higher qualifications. This demographic profile highlights the economic and educational challenges faced by a substantial portion of the farming community.

Based on the survey findings in the following Figure 1, the ICT tools availability among the surveyed population reveals significant variations. Mobile phones are the most widely available ICT tool, with an impressive 96% of respondents reporting availability. Traditional media such as radios (87%) and televisions (79%) also exhibit widespread availability, reflecting their continued importance in providing agricultural updates and educational content. These tools remain particularly valuable in reaching farmers who may not yet be familiar with or have access to digital technologies. In contrast, land phones show a markedly lower availability, with only 32.5% of respondents reporting availability. This trend indicates a shift away from traditional fixed-line telephony, likely due to the increasing dominance of mobile phones. Computers have the lowest availability at just 10.5%, underscoring significant barriers to advanced ICT integration, such as high costs, limited technical literacy, and inadequate infrastructure in rural settings.



Source: field survey data

Figure 1. Availability and use frequency of ICT tools among surveyed farmers (n=261)

Further, this study evaluates the utilization of existing ICT tools and their features for farming-related information searches and access. The analysis focuses on the extent of ICT usage and the complementarities between various ICT tools/features employed by farmers, using a weighted mean score (WMS) to quantify and interpret their usage patterns.

$$WMS = \frac{\sum_{i=1}^{n}(w_i * x_i)}{\sum_{i=1}^{n} x_i}$$

Where,
x_i: the percentage or proportion of usage in each category
w_i: the weight assigned to each category (e.g., 0 for "Not available", 3 for "Using daily", etc)
n: The total number of categories

Table 3 displays the outcome of the weighted mean score analysis. It shows that mobile phones, radio, and television are the most frequently utilized ICT tools among farmers. Mobile phones emerged as the most utilized ICT tool among the selected farmers (94% of users report daily usage), achieving the highest WMS of 2.94, ranking first in the analysis. This high score is a reflection of the pervasive use of mobile phones, which transcends economic, gender, and educational boundaries. Their accessibility and user-friendly design are major factors in their popularity, since they make them simple to use even for those with low or no literacy. Their widespread adoption also aligns with global trends in ICT, where mobile-based solutions dominate rural communication due to their affordability and reach (Prasad & Pradhan, 2019). Radio and television follow closely, with WMS values of 2.66 and 2.54, respectively. The fact that 82% of people use radios on a daily basis shows how important they are as a conventional but efficient way to disseminate agricultural information. Radios are cost-effective, require minimal infrastructure, and are accessible to older and less digitally literate farmers, making them a reliable tool for information dissemination. Similarly, televisions (75% daily usage) play a significant role in delivering educational and market-related updates, particularly for those who rely on visual content. This high penetration rate of basic ICT tools aligns with national trends observed in other developing regions, where mobile technology has become a pivotal part of agricultural development due to its affordability and ease of use (Prasad & Pradhan, 2019; Aker & Mbiti, 2010).

Table 3. Weighted mean scores of different ICT tools/features used as a source of information by farmers (N=261)

ICT Tools/Features	Not available	Using Fortnite	Using weekly	Using daily	Weighted Mean Score (WMS)
Mobile phone	4.0	0.0	2.0	94.0	2.94
Landline Phone	67.5	0.0	11.5	21.0	0.86
Radio	13.0	0.0	5.0	82.0	2.66
Television	21.0	0.0	4.0	75.0	2.54
Computer	89.5	1.7	6.8	2.0	0.15
Internet	45.0	12.0	20.5	22.5	1.23
Email	60.5	14.0	7.5	18.0	0.83
SMS	12.0	38.0	32.0	18.0	1.44
Social media	38.0	8.0	18.0	36.0	1.76
m-services	48.0	10.0	27.0	15.0	1.09

Internet usage (WMS: 1.23) is moderate, with a mix of daily (22.5%) and weekly (20.5%) users. This highlights an emerging digital shift, but barriers such as cost, infrastructure limitations, and digital literacy still constrain widespread adoption. With better connectivity and training, the internet has the potential to transform access to agricultural knowledge, marketing platforms, and digital marketplaces. SMS is moderately used, with a significant percentage (32%) accessing it weekly, indicating its utility for specific updates such as weather alerts or crop management tips. An interesting aspect of the utilization of social media, as reflected in its WMS of 1.76, is the ability of farmers to access and share content in local languages, particularly through platforms like WhatsApp. This functionality enables farmers to easily communicate, exchange ideas, and disseminate information. Notably, many progressive farmers have joined WhatsApp groups, where they actively share and learn about best management practices, making these groups valuable hubs for agricultural knowledge and collaboration. This trend underscores the role of social media in fostering peer-to-peer learning and promoting innovative farming techniques (Burbi & Hartless, 2016). These tools are indicative of a gradual digital transition, especially among younger and more tech-savvy farmers. M-services (WMS: 1.09), which include mobile-based platforms for banking, market access, and advisory services, show emerging adoption. Their usage is primarily limited to weekly or fortnightly, indicating the need for increased awareness and streamlined services to enhance their appeal.

Tools like land phones (WMS: 0.86) and email (WMS: 0.83) exhibit significantly lower usage, largely due to their lack of portability, slower response times, and limited utility compared to mobile phones and instant messaging. Land phones are becoming obsolete in rural areas, while email is less intuitive and not widely integrated into farming activities. Computers rank the lowest in utilization, with only 2% of respondents using them daily. This reflects significant barriers such as high costs, infrastructure challenges, and the impracticality of desktops or laptops for on-the-go agricultural activities. Their use is likely restricted to larger farms or businesses with advanced operational needs. According to Rathnachandra and Malkanthi (2022), this limited adoption is attributed to factors such as inadequate infrastructure and low digital literacy rates. Advanced technologies like GIS, and precision farming were reported among farmers involved in export-oriented crops like tea and spices compared to staple crops like rice. This disparity in ICT adoption can be attributed to several factors, including infrastructure limitations, lack of technical skills, and the high cost of advanced technologies (Jensen, 2007). Despite the widespread availability of mobile phones, the lack of reliable internet connectivity and electricity in rural areas remains a significant barrier to utilizing the full spectrum of ICT solutions (Foster & Rosenzweig, 2010).

A multiple regression model analyzed the relationships between farmer demographics and the ICT integration level. The dependent variable, ICT integration Score, represents the level of ICT integration. The independent variables in the model are age, education, farm size, family size, income level, experience, and occupation. These variables were selected based on their potential impact on ICT integration, and the model is specified as follows:

$$\textit{ICT integration Score} = \beta 0 + \beta 1(\textit{Age}) + \beta 2(\textit{Education}) + \beta 3(\textit{Farm Size}) + \beta 4(\textit{Family Size}) + \beta 5(\textit{Income Level}) + \beta 6(\textit{Experience}) + \beta 7(\textit{Occupation}) + \epsilon$$

Where:

$\beta 0$ - intercept.

$\beta 1, \beta 2, \beta 3, \beta 4, \beta 5, \beta 6, \beta 7$ - coefficients for Age, Education, Farm Size, Family Size, Income Level, Experience, and Occupation, respectively.

ϵ - error term

Regression analysis results are depicted in Table 4. This indicates that the predictors included in the model explain approximately 64.4% of the variation in ICT integration scores. The coefficient for Age is -0.2304, indicating a negative relationship between age and ICT integration Score. It suggests that older individuals are less likely to adopt ICT. This statistically significant relationship (p-value = 0.025) highlights the potential barriers older farmers may face in adopting new technologies, such as lack of familiarity with ICT, lower levels of digital literacy, or resistance to change, as identified in focused group discussions. This finding aligns with previous research indicating that younger individuals are generally more open to adopting new technologies. Prasad & Pradhan (2019), emphasized that older people often have a more traditional perspective and are less open to change. They frequently think that their current knowledge is adequate and are less willing to adopt new learning situations. Therefore, targeted interventions, such as training programs and user-friendly technology designs, could be beneficial in increasing ICT integration among older farmers.

Table 4. Regression model statistics and coefficients

Statistic	Value	P-Value
R-squared	0.644	
Adjusted R-squared	0.562	
F-statistic	40.03	0.05
Intercept	13.6729	<0.001
Age	-0.2304	0.03
Education Level	0.3406	0.80
Farm Size	0.2551	0.04
Family Size	-0.1451	0.04
Income Level	0.1903	0.68
Experience	0.2818	0.27
Occupation	0.0713	0.47

The coefficient for education level is 0.3406, with a p-value of 0.80, indicating that it is not statistically significant. This suggests that education level does not have a meaningful impact on the ICT integration Score in this model. This result may suggest that other factors, such as practical experience or access to resources, play a more critical role in ICT integration than formal education. The coefficient for FarmSize is 0.2551, with a p-value of 0.04, indicating that it is a statistically significant relationship. This positive relationship suggests that larger farms are more likely to adopt ICT tools and technologies. These findings are consistent with Sigdel et al. (2022), who found that larger farms often have more resources and capacity to invest in new technologies. Further, our studies have shown that larger farms are more likely to adopt computers and other ICT tools due to their greater financial resources and operational needs. Additionally, larger farms may benefit from economies of scale, making the adoption of ICT more feasible and cost-effective. However, it is important to consider the context and potential limitations of this finding. While farm size is a significant predictor of ICT integration, other factors such as access to training, financial resources, and support services also play crucial roles. Future research could explore these additional factors to provide a more comprehensive understanding of ICT integration in agriculture.

The regression analysis revealed a statistically significant negative relationship between family size and ICT integration among farmers (FamilySize is -0.1451, p-value 0.04). Oki and Agbeyangi (2024) reported a similar finding in South Africa. They identified several constraints faced by farmers with larger families. For instance, studies have shown that larger families often experience greater financial pressures and time constraints, which can limit their ability to invest in and utilize ICT tools effectively. The negative and statistically significant relationship between family size and ICT integration underscores the need for targeted interventions to support farmers with larger families. Policymakers and stakeholders should consider providing financial assistance, training programs, and other resources to help these farmers overcome the barriers to ICT integration.

The coefficient for income level is 0.1903, and the p-value is 0.68. This suggests that income level does not significantly affect ICT integration in this model. The coefficient for farming experience is 0.2818 with a p-value of 0.27, suggesting that the number of years of farming experience does not have a significant impact on ICT integration in this model. The coefficient for occupation is 0.1904 with a p-value of 0.47, suggesting that the type of occupation does not significantly affect ICT integration in this model. These findings are consistent with Saidu et al. (2017), who demonstrated that while income may enable access to ICT, it is not always a determining factor in its adoption. Similarly, experience alone does not necessarily lead to higher ICT integration rates. Instead, a willingness to embrace new technologies and the presence of support systems play a more significant role.

3.2 Impact of ICT on Farming Practices

Farmers who adopted ICT reported improvements in several areas of their agricultural operations. The most commonly cited benefits included better access to market information, improved communication with suppliers and customers, and enhanced ability to make informed decisions regarding crop management based on weather forecasts and agricultural advisories. These findings are consistent with studies in other agricultural settings, which have demonstrated that access to ICT can lead to higher productivity and increased income through better market access and reduced transaction costs (Dissanayake et al., 2022; De Silva & Ratnadiwakara, 2008).

However, the impact of ICT was not uniformly positive across all participants. Some farmers expressed concerns about the reliability of the information obtained through ICT, particularly from online sources, which can sometimes be inaccurate or not tailored to the local context (Aker, 2011). This highlights the need for localized content and verification mechanisms to ensure the reliability and applicability of online agricultural information.

3.3 Barriers to Further ICT Integration

Although the benefits are evident, the adoption of advanced ICT tools remains limited. The survey and focus group discussions identified several barriers to further ICT integration:

1. **Infrastructure Challenges:** Inadequate infrastructure, such as intermittent electricity supply and poor internet connectivity, severely limits the use of advanced ICT tools. Therefore, without reliable electricity and internet services, ICT solutions cannot be effectively implemented. This finding supports research by Torero and von Braun (2006), who emphasized the critical role of infrastructure in enabling effective ICT adoption in rural areas. The Sri Lankan government has recognized this and has launched several initiatives aimed at improving rural infrastructure, but progress has been uneven, and many areas still lack the necessary facilities (Central Bank of Sri Lanka, 2013).

2. **Cost Issues:** The high cost of devices and data plans is prohibitive for many smallholder farmers. Subsidies or financing schemes could alleviate this barrier subsidies or financing

options could be made available to help farmers overcome the initial cost barriers associated with adopting new technologies, as suggested by Qiang et al. (2012), who argue for government intervention to reduce the financial burden of ICT adoption on the rural poor.

3. **Skill Gaps:** There is a significant gap in ICT literacy among farmers, particularly older and less educated individuals. Training programs that focus on building ICT skills in rural communities could help bridge this gap (Jensen, 2007).

4. **Cultural and Perceptual Barriers:** Some farmers are skeptical about the benefits of ICT, often due to past experiences with technologies that did not meet their expectations. As Rogers (2003) noted, cultural perceptions and previous experiences significantly influence technology adoption decisions.

3.4 Strategies for Enhancing ICT integration

To overcome these barriers and enhance the integration of ICT in agriculture, several strategies are recommended:

1. **Infrastructure Development:** Investments in rural infrastructure, including electricity and broadband connectivity, are essential to enable the effective use of ICT (Torero & von Braun, 2006).

2. **Capacity Building:** Continuous education and training programs are crucial to improve farmers' ICT skills and awareness of the potential benefits of ICT integration in agriculture (Foster & Rosenzweig, 2010). Their peers influence farmers. If neighboring farmers successfully adopt ICT, others are more likely to follow suit.

3. **Localized Content:** Developing localized ICT applications that provide reliable and relevant agricultural content can help increase the utility and adoption of ICT among farmers (Aker, 2011).

4. **Public-Private Partnerships:** Encouraging collaborations between governments, NGOs, and private sector stakeholders can lead to innovative solutions that address the specific needs of rural farmers (Qiang et al., 2012).

4. Conclusions

This study shows that ICT integration in Sabaragamuwa farming is uneven: mobile access is near-universal, but advanced services and computer use remain limited. Integration is higher among larger farms and younger farmers, indicating capability and affordability gaps. The main barriers are connectivity, costs, and digital skills. Our contribution is a province-level, mixed-methods measure of integration (WMS + outcome indicators) and an empirical profile of who benefits. Policy implications are clear: (i) extend reliable rural broadband and power to underserved DS divisions; (ii) target digital-skills training—especially for older and smallholder farmers; (iii) localize advisory content and market information via low-cost mobile channels; and (iv) incentivize public–private partnerships for farmer-centric platforms. Future research should track integration longitudinally and link digital use to measured productivity and income outcomes.

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