Investigation on the Impact of Mobile Phones and Mobile Apps in Paddy Cultivation in Ampara District

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Abstract

This study investigates the impact of mobile phones and mobile applications on paddy cultivation in the coastal divisions of Ampara District, Sri Lanka specifically Akkaraipattu, Ninthavur, and Addalaichenai. Although Information and Communication Technology (ICT) is widely recognised as a transformative force in agriculture, empirical evidence from Sri Lanka's leading paddy producing region remains limited. To address this gap, the study adopted a quantitative research design and employed Structural Equation Modelling (SEM) to test the relationships between mobile phone usage (PU), mobile application usage (UOMA), and paddy production and the socio-economic level of farmers (PPSELOF). Primary data were collected from 388 paddy farmers through a structured questionnaire and analysed using SPSS and AMOS. Confirmatory Factor Analysis confirmed acceptable model fit (Normed $\chi^2 = 3.485$, CFI = 0.981, RMSEA = 0.080). Path analysis revealed that both mobile phone usage ($\beta = 0.366$, $p < 0.001$) and mobile application usage ($\beta = 0.289$, $p < 0.001$) exerted statistically significant and positive effects on PPSELOF, supporting both hypotheses. The findings demonstrate that mobile technologies act as essential enablers of improved productivity, informed decision-making, and socio-economic advancement among rural paddy farmers. The study contributes context-specific empirical evidence to the discourse on digital agriculture in South Asia and offers practical implications for policymakers, extension officers, and technology developers seeking to design farmer-centred ICT interventions in Sri Lanka.

Keywords: ICT in agriculture; mobile phones; mobile applications; paddy cultivation; Structural Equation Modelling; Ampara District; Sri Lanka.

1.Introduction

Agriculture has long been recognized as one of the most important sectors for sustaining livelihoods, ensuring food security, and supporting economic development. In recent decades, the role of Information and Communication Technology (ICT) in transforming agriculture has become increasingly evident. ICT has provided new methods, techniques, and ideas to improve access to knowledge, minimize information gaps, and strengthen decision-making processes, particularly in rural areas of developing countries. Among the various ICT tools, mobile phones and mobile applications have emerged as essential platforms for farmers to obtain timely information related to weather, market prices, and cultivation practices, thereby enabling them to improve productivity and

profitability. This study is grounded in the ICT-agriculture nexus and focuses on paddy farming communities in Sri Lanka.

In Sri Lanka, agriculture contributes nearly 8 percent to the national GDP (Statistical Department, 2020) and remains a central component of rural livelihoods. Ampara District plays a pivotal role in this sector, contributing approximately 22 percent of the country's paddy production, with about 330,000 acres cultivated during the Yala and Maha seasons (Ministry of Agriculture, n.d.). Within Ampara, coastal areas such as Akkaraipattu, Ninthavur, and Addalaichenai are particularly significant for paddy cultivation. Despite its importance, the integration of ICT into agricultural production and marketing systems in Sri Lanka remains at an early stage. Farmers in these areas still face challenges in accessing accurate and timely information that can enhance their productivity and socioeconomic well-being. Accordingly, examining farmers' ICT use in these coastal divisions is both contextual and policy-relevant.

This research problem arises from the gap in the use of ICT, especially mobile technologies, in Sri Lankan agriculture. While studies in other contexts have shown the positive influence of mobile phones on farmers' access to market and weather information such for example Chhachhar and Memon (2019) in Pakistan and Mittal and Tripathi (2014) in India the extent to which similar benefits are realised by paddy farmers in Sri Lanka remains underexplored. Evidence from Batticaloa suggests that more than 90 percent of farmers use mobile phones for daily information exchange, regardless of their education or household income levels (Jayathilake et al., n.d.), which points to the potential of mobile communication in bridging knowledge gaps. However, no focused research has yet been conducted on the coastal areas of the Ampara district, despite its central role in national paddy production. This unanswered question motivated the present investigation.

Therefore, this study was designed to address this research gap by examining the use of mobile phones and mobile applications in agriculture in the Ampara district. The objectives of the study were threefold: (1) to investigate the use of mobile phones to acquire agricultural information by paddy farmers, (2) to evaluate the usage of agriculture-based mobile applications by these farmers, and (3) to assess the impact of mobile phones and mobile applications on paddy production and the socio-economic development of farmers in the region. These objectives directly operationalise the stated problem and guide the empirical analyses reported in this work.

The significance of this study lies in its contribution to understanding how mobile technologies influence agricultural practices and rural development in Sri Lanka. At the theoretical level, this study extends the existing knowledge on ICT adoption in agriculture by providing empirical evidence from a major paddy-producing district that has not yet been systematically investigated. At the practical level, the findings will inform policymakers, agricultural extension officers, and technology developers in designing effective farmer-centred ICT interventions. Ultimately, by focusing on the specific context of Ampara's coastal farming communities, this study will not only highlight the opportunities and challenges of ICT adoption but also contribute to strategies for enhancing productivity and improving

the socio-economic conditions of paddy farmers in Sri Lanka. In doing so, it adds context-specific insights to the broader discourse on digital transformation in agriculture.

2.Literature Review

2.1 Information and Communication Technology (ICT) in Agriculture

Information and Communication Technology (ICT) plays a vital role in advancing agriculture through various ICT tools. Prior work indicates that improving market activities, gaining profit, conducting research, and planning economic growth are key benefits of ICT in agriculture. However, constraints persist, including lack of personnel, inadequate infrastructure, farmer's perception, unreliable power supply, and lack of ICT facilities which limit ICT-enabled agricultural growth (Saidu et al., 2017).

Mahant et al. (2012) outline critical agricultural stages water management, food quality, fertilizer application, processing/packaging, food safety, and marketing emphasizing that effective management requires timely knowledge and information. They argued that systems must deliver information cost-effectively, be user-friendly and accessible, and ensure appropriate protection from unauthorised access, highlighting the enabling role of ICT.

ICT introduces new methods and techniques to increase access to knowledge across regions and sectors. The term ICT includes mobile phones, the Internet, television, computers, and radio. ICT reduces the digital divide between different regions. Notably, rural ICT utilisation has been associated with productivity gains in agriculture (Warren, 2002).

2.2 Mobile Phones and Mobile Applications

The rise of smartphones and Internet connectivity has expanded communication services in developing countries, although connectivity remains uneven in some regions. Mobile phones and smart applications now constitute everyday "internet communication tools", with both mobile and fixed connections extending to remote areas (Rao, 2018). While urban connectivity typically outpaces rural access, coverage expansion has increased mobile phone reach in many remote locations. Mobile communication is now a primary channel for data, services, and voice, and it plays a central role in supporting farmers' market awareness and decision-making. Farmers value mobile phones for fast problem solving and direct access to market and weather information; phones also facilitate direct contact with buyers, potentially improving price realisation.

2.3 Importance of Agriculture in the Sri Lankan Economy

In Sri Lanka, agriculture is central to employment, food security, and rural poverty alleviation. The sector is driven by subsectors, such as coconut, tea, rubber, vegetables, sugar, export crops, and paddy. Ranathunga et al. (2020) noted a downturn in 2016 relative to 2015, attributing the decline to weather variability. They call for coordinated responses across natural resource management,

marketing, finance, inputs/logistics, value chains, and regulation, combined with stakeholder communication and appropriate technologies to enhance sector efficiency and socioeconomic stability.

2.4 Application of Mobile Phones and Mobile Apps in Agriculture

Agricultural information is central to farmers' advancement. Communication technologies can raise profits and productivity and enable direct sales to buyers via mobile phones. Persistent barriers limited infrastructure and awareness and path-dependence on traditional practices underscore the need for training and knowledge-sharing, which mobile technologies can support (Chhachhar et al., 2014). Consistent with this, prior work associates ICT use with agricultural development and poverty reduction. Evidence from Bangladesh indicates that mobile phones ease information access for both women and men and can improve living standards (Abraham, 2008). Mobile agriculture applications (for example, "Agri App") provide crop production information and connect farmers, services, and retail on a shared digital platform. Organizational and technological arrangements shape profitability, productivity, and sustainability, whereas mobile apps extend rural advisory services.

Sri Lankan evidence further supports feasibility: over 90% of farmers in Batticaloa use mobile phones for information exchange, with education and income not acting as barriers, suggesting scope to leverage SMS and related tools for timely dissemination of agronomic guidance (Jayathilake et al., 2016).

Regional findings echo this: farmers in Sindh, Pakistan widely own and use phones for market and weather information (Chhachhar & Memon, 2019); Indian farmers report productivity and income gains from mobile-enabled information services, with differential barriers for smallholders (Mittal & Tripathi, 2014). Together, these studies indicate the promise and uneven readiness of mobile technology in agriculture.

Despite encouraging regional and Sri Lankan evidence, there is limited empirical work focused on the coastal divisions of Ampara Akkaraipattu, Ninthavur, and Addalaichenai where paddy fields are central. Existing studies highlight infrastructure constraints, training needs, and uneven connectivity, but do not specifically assess how mobile phone and mobile application use relate to paddy production and farmers' socioeconomic outcomes in this locality. Addressing this gap, the present study focuses on Ampara's coastal paddy farmers and examines mobile phone usage and mobile application usage in relation to production and socio-economic development, using a quantitative design and structural modelling consistent with the reviewed literature.

3.Methodology

3.1Research Design

This study employed a quantitative research design to assess the impact of mobile phone and mobile application usage on paddy production and the socio-economic development of farmers in the

coastal area of Ampara District. The design was chosen as it allows for the use of statistical tools to test hypothesised relationships among variables. Structural Equation Modelling (SEM) was applied as the principal analytical approach, combining factor analysis and multiple regression techniques to evaluate both measurement and structural models. The analysis followed a two-stage process: first, Confirmatory Factor Analysis (CFA) was performed to validate the constructs, and second, the hypothesised structural relationships were tested.

3.2 Research Model and Hypotheses

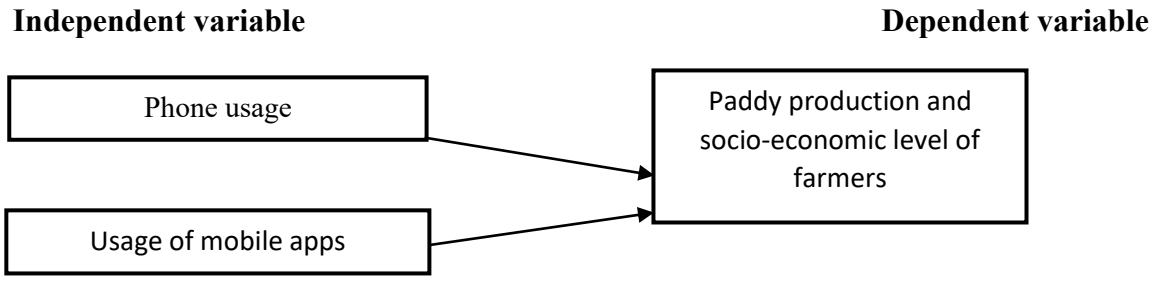

Figure 1. Conceptual framework

The conceptual model consisted of two independent variables, mobile phone usage and mobile application usage, and one dependent variable, paddy production and the socio-economic level of farmers (PPSELOF). Based on this model, this study formulated the following hypotheses:

H1: Mobile phone usage is positively associated with paddy production and the socioeconomic level of farmers.

H2: The usage of mobile applications is positively associated with paddy production and the socioeconomic level of farmers.

3.3 Population and Location of the Study

The target population comprised 388 farmers randomly selected from major paddy cultivation areas in the coastal area of Ampara District: Akkaraipattu, Ninthavur, and Addalaichenai. The study was conducted over 36 months, from September 2022 to August 2025.

3.4 Sampling Procedure

A completely randomised sampling method was employed, which reduces potential bias compared with other sampling techniques when properly applied.

Table 1. Sample distribution

Paddy cultivation area	**Number of farmers**
Akkaraipattu	130 farmers
Ninthavur	129 farmers
Addalaichenai	129 farmers
Total	**388 farmers**

3.5 Data Collection

Primary data were gathered using a structured questionnaire administered to 388 paddy farmers in Akkaraipattu, Ninthavur, and Addalaichenai. Respondents were given adequate time to complete the questionnaire, and the researchers provided support where required. The instrument was designed to capture information on mobile phone and mobile application usage in agriculture and their perceived impact on productivity and socioeconomic conditions.

3.6 Data Analysis

The dataset was coded and analysed using SPSS software. The reliability and validity of the constructs were tested using Confirmatory Factor Analysis (CFA) in AMOS, followed by Structural Equation Modelling (SEM) to examine the hypothesised relationships among mobile phone usage (PU), usage of mobile applications (UOMA), and paddy production and socio-economic level of farmers (PPSELOF). Descriptive statistics were also applied to summarise respondents' characteristics prior to the inferential analyses.

4.Results

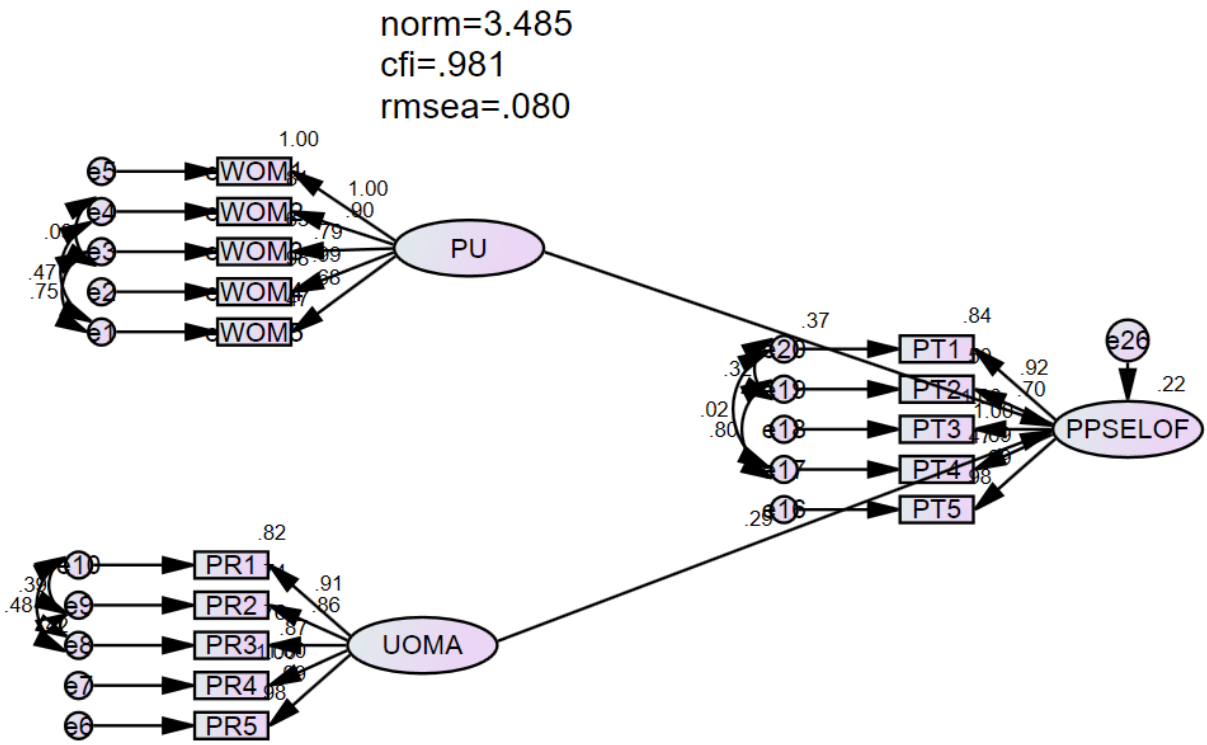

Figure 2 Structural equation model

Table 2. Regression weight

	Estimate	S.E.	C.R.	Label
PPSELOF --- PU	.489	.066	7 .427	** par_13
PPSELOF --- UOMA	.281	.044	6 .404	** par_14

Table 3. Standardized regression weight

			Estimate
PPSELOF	---	PU	.366
PPSELOF	---	UOMA	.289

Table 4. 4Results of hypothesis testing

Hypothesis with direction	P-value (p<0.05)	Estimate value >0.2	Findings
H1: PPSELOF← PU	0.000	.366	Accepted
H2: PPSELOF ← UOMA	0.000	.289	Accepted

The results of the statistical analyses provide empirical support for the hypothesised relationships in the research model. The adequacy of the measurement model was first assessed using several fit indices. The model demonstrated acceptable levels of fit, with a Normed χ^2 value of 3.485, a Comparative Fit Index (CFI) of 0.981, and a Root Mean Square Error of Approximation (RMSEA) of 0.080. These values fell within the recommended thresholds, confirming that the model adequately represented the observed data.

Following the validation of the measurement model, the structural model was examined to test the hypothesised relationships between the independent variables, mobile phone usage (PU) and usage of mobile applications (UOMA), and the dependent variable, paddy production and socio-economic level of farmers (PPSELOF). Path analysis revealed that mobile phone usage exerted a significant and positive influence on PPSELOF, with an unstandardised regression weight of B = 0.489 (S.E. = 0.066, C.R. = 7.427, $p < 0.001$) and a standardised coefficient of $\beta = 0.366$. Similarly, the use of mobile applications also demonstrated a significant positive effect on PPSELOF, with an unstandardised estimate of B = 0.281 (S.E. = 0.044, C.R. = 6.404, $p < 0.001$) and a standardised coefficient of $\beta = 0.289$.

These findings confirm that both predictors contributed meaningfully to improvements in paddy production and farmers' socioeconomic well-being in the coastal areas of Ampara District.

Consequently, both hypotheses were accepted, thereby establishing that the adoption of mobile phones and mobile applications significantly enhances agricultural outcomes in the study context.

5.Conclusion

This study examined the role of mobile phones and mobile applications in enhancing the agricultural productivity and socio-economic development of paddy farmers in the coastal areas of the Ampara District in Sri Lanka. Guided by these two hypotheses, the research employed a quantitative design and applied Structural Equation Modelling to data collected from 388 farmers. The findings demonstrate that both mobile phone usage and mobile application usage exert significant and positive effects on paddy production and the socioeconomic well-being of farmers. These results highlight the importance of ICT adoption as a transformative tool for agricultural development, particularly in regions where traditional extension services and access to timely information remain limited. By situating the Sri Lankan case within broader regional experiences, this study adds to the growing body of evidence that mobile technologies can bridge information gaps, support decision-making, and empower farming communities. The contribution of this research is twofold: theoretically, it extends existing knowledge on ICT adoption in agriculture by offering empirical evidence from an underexplored context; practically, it provides valuable insights for policymakers, agricultural extension officers, and technology developers seeking to design farmer-centred digital interventions. In conclusion, the study establishes that mobile phones and mobile applications are not merely supplementary tools but essential enablers of sustainable and resilient agricultural practices in Sri Lanka, with the potential to improve productivity, strengthen livelihoods, and foster rural socioeconomic development.

Future Studies

Although this study provides valuable insights into the role of mobile phones and mobile applications in supporting agricultural productivity and socioeconomic development in Ampara District, several areas remain open for further exploration. Future research could broaden the scope by including additional variables, such as farmers' education, digital literacy, access to extension services, infrastructure quality, and sociocultural attitudes toward technology adoption, which may further explain variations in ICT usage and its outcomes. Comparative studies across other districts of Sri Lanka would be valuable in identifying region-specific opportunities and challenges, whereas cross-country research within South Asia could situate Sri Lanka's experience within a broader regional framework. Longitudinal designs are also recommended, as they would enable researchers to capture changes in farmers' behaviour and productivity over time, thereby offering deeper insights into the sustainability of ICT adoption. In addition, the rapid evolution of emerging technologies, such as artificial intelligence, Internet of Things (IoT)-based solutions, and advanced mobile device applications, presents another area for investigation, particularly with regard to their usability, affordability, and effectiveness in rural contexts. Finally, policy- and institution-focused research, including examinations of government initiatives, private sector programs, and gender-related

dimensions of ICT adoption, could provide further evidence to guide inclusive and equitable digital transformations in agriculture.

Reference

Abraham, R. (2008). *Mobile Phones and Economic Development : Evidence From the Fishing Industry in India*. *4*(1), 5–17.

Agriculture, M. of. (n.d.). *Creat interest in engaging in organic farming in Ampara district*. https://www.agrimin.gov.lk/web/index.php/news-and-events/1620-2021-07-30?lang=en#:~:text=A total of 330%2C000 acres,national paddy production is 22%25.

Chhachhar, A. R., & Memon, B. (2019). *Challenges in Usage of Mobile Phone Regarding Agricultural and Marketing Information among Farmers in Sindh , Pakistan*. *February*. https://doi.org/10.17485/ijst/2019/v12i6/141300

Chhachhar, A. R., Qureshi, B., Khushk, G. M., & Maher, Z. A. (2014). *Use of Mobile Phone among Farmers for Agriculture Information*. *June 2018*.

Jayathilake, C., Jayasinghe-mudalige, U., Perera, R., Lanka, S., & Lanka, S. (2016). *Use of mobile phone for agricultural knowledge mobilization : Exploring the case of " subsistence farmers in the bottom-of-the-pyramid " in Batticaloa , Sri Lanka Department of Agribusiness Management , Wayamba University of Sri Lanka , Makandura , Depart*.

Martyn F.warren. (2002). *Adoption of ICT in agricultural management in the United Kingdom : the intra-rural digital divide Uplatnìní ITC v zemìdìlském managementu ve Velké Británii : intrarurální digitální pøedìl*. *2002*(1), 1–8.

Mittal, S., & Tripathi, G. (2014). *Impact On Small Farmers and Fishermen Through Use Of Mobiles in India*. *January 2009*.

Rao, N. H. (2018). *A framework for implementing information and communication technologies in agricultural development in India*. *May 2007*. https://doi.org/10.1016/j.techfore.2006.02.002

Saidu, A., Clarkson, A. M., Adamu, S. H., & Mohammed, M. (2017). *Application of ICT in Agriculture : Opportunities and Challenges in Developing Countries*. *3*(1), 8–18.

Statistical Department, C. B. of S. L. (2020). *Economic and social Statistics of Sri lanka*.