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# FACTORS AFFECTING THE UTILIZATION OF INFORMATION & COMMUNICATION TECHNOLOGY (ICT): A CASE OF BADULLA & NUWARA ELIYA POTATO FARMING COMMUNITY, SRI LANKA

## I.V. Kuruppu[1] and J.V. Chathuranga[2]

[1]*Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka*
[2]*The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka*
*E-mail: virajithkuruppu@gmail.com; vihangachathuranga12345@gmail.com*

***Abstract:*** ICT upgrades farmer knowledge thus, enhancing overall production and marketing aspects in agricultural systems. However, transferring traditional farmers into new technologies in developing countries is a significant challenge. At present, there have been many ICT tools introduced to farmers in Sri Lanka. Thus, the central question is whether the agro-community is constructively utilizing these different ICT tools. Therefore, the objective of this study is to explore the factors which affect the overall usage of ICT tools of potato farmers in Sri Lanka and their perception of future use of ICT. Primary data was collected from 241 farmers randomly in Badulla and Nuwara Eliya Districts using a pre-tested questionnaire. Correlation analysis was deployed to elicit the relationship between selected socio-economic factors of the farmer and the number of ICTs those farmers have utilized. Results revealed education level ($p<0.05$, $r = 0.659$), average monthly farm income ($p<0.1$, $r = 0.352$) and number of crops cultivated ($p<0.05$, $r = 0.851$) by farmer were positive and significant with the number of ICT appliances used by the potato farmer. Age ($p<0.05$, $r = -0.7432$) and years of experience engaged in agricultural activities ($p<0.05$, $r = -0.254$) were negative and significant with the number of ICT appliances used by the potato farmer. Further, 60% of farmers have used the internet once a week to gather agriculture-related information. Another, 13% have used GPS and only 1% have used e-mail. Even though there have been numerous ICT tools, still ICT literacy of local farmers was still not up to a satisfactory level. This implied Sri Lankan agriculture sector is not fully utilizing ICT in agriculture. Perhaps changing the way or mode of delivering ICT tools may cause a positive influence in agriculture. Rather than focusing on advanced ICT appliances and tools, it is recommended to exploit the full potential of current ICT appliances and tools to disseminate vital information. Consideration

of farmer accessibility of different ICT appliances and tools is much important to decide the next step of agriculture modernization in Sri Lanka.

*Keywords:* Agricultural Information, ICT, Potato Farming

## INTRODUCTION

Facilitating, disseminating, and sharing information is one of the key success factors in modern agricultural systems around the globe. The continuous flow of accurate information through different modes may enhance farmer knowledge thus, it directly increases both production and marketing aspects of agricultural commodities. In other words, it lessens inefficiencies in all farming activities. ICT is one such approach which used to disseminate information promptly regardless to distance. ICT could be described in various ways and most prominently it's a computer-based technology. ICT is a process of gathering, distributing, and communicating information through computers and computer base networks (Parmar, *et al.*, 2019). ICT is becoming a profound game-changer in every sector. ICT has vast and enormous strength to revolutionize the agriculture sector in any country. Adaptation to technology is a complex and dynamic process governed by many factors. Hence, transferring traditional farmers into new technologies in developing countries is a significant challenge. Nevertheless, successful transformation always creates a commercial and market-oriented producer. The economic rationale for the farmers' access to information is to enable them to manage risks and uncertainties regarding the production and marketing of their produce. The better the farmers manage these risks and uncertainties the more profitable their businesses become. ICT facilitates awareness and access to market information among the farmers. Anecdotal evidence of research findings pointed that mobile phones, radio and television are the most important tools of communication which can be accessed by farmers for agricultural-related information and knowledge (Olaniyi, 2013; Chhachar *et al.*, 2014). Particularly, telephone facility (including mobile phones) has been reported to increase the opportunity of getting access to the people living in rural areas (Gupta, 2005). The use of mobile phones is setting an unprecedented pace despite the poorly developed rural electrification.

Mobile technology has provided multi-dimensional benefits to rural people. Its importance in usage is clear in sense of urgency and emergency (Sife *et al.*, 2010). For instance, farmers also reported using ICTs to know the market days, to know where products could be sold and identify different market locations for efficient marketing of produce (Oyeyinka and Bello, 2013). However, traditional ICTs viz., radio and television have also been reported to be used by farmers in accessing agriculture-related

information (Batte *et al.*, 1990; Nazari and Hasbullah, 2008; Shetto, 2008; Emmanuel, 2010; Nakweya, 2013). However, ICT applications such as calls and Short Messaging Services are used often by farmers (Mtega and Msungu, 2013). This indicates that the use of mobile phones is increasing and gaining importance in the lives of the people to further contribute to the development and better communication. Computers and the internet have also been shown to be used for agricultural information and sharing (Shetto, 2008). In this current situation, the Sri Lankan agriculture sector has faced a big problem in the Agriculture Information Communication Technology system. Sri Lanka has also been taken some initiatives to use ICT for rural agricultural development. But its effectiveness in overcoming rural backwardness is rather sluggish despite relatively better literacy rates among rural communities compared to other South Asian countries. Despite rapid economic growth in the recent past, regional disparities are widening in the country indicating negative effects of urban biased development. This situation is visible in the western province and coastal areas of the country (Central Bank of Sri Lanka, 2010).

Access to the right information at the right time through the right medium is crucial for people involved in the agricultural sector. This includes farmers, fishers, foresters, policy makers, industries and other actors in the agricultural value chain. Increasingly, the challenges faced by smallholder farmers as a result of climate change, irregular rainfall patterns, attack of pests, and the onset of diseases, drought, desertification are detrimental to the agriculture sector's goals. However, opportunities exist through innovative ICT solutions to address a number of these challenges. In the recent past, the role that ICTs play in promoting innovation in the agricultural sector has been phenomenal and potentially transformative. Smallholder farmers, particularly women and youth involved in the sector, have a huge advantage when the right ICTs are induced into the agricultural value access to the right information at the right time gives them the capacity to make informed decisions that would improve their livelihoods, make agri-business more attractive and play a major role in ensuring food security. The Role of ICTs in agriculture; Improving market access, Agricultural extension and advisory services, Climate change adaptation and early warning, Food safety, traceability and certification, financial inclusion, insurance and risk management and Precision Agriculture.

Farmer is the principal node of agricultural production thus, decides how, when and what to produce. Timely and accurate information is pivotal for famer to decide the optimal combination of resource allocation in the production process. This ultimately drives the efficiency of the marketing process. Since, information acts as a key player, farmer awareness,

availability, accessibility and usability of different ICT appliances may decide the overall productivity in the agriculture sector. At present, there have been many ICT tools introduced to farmers, traders, and other actors within the agricultural value chain by both private and public entities in Sri Lanka. Those tools provide information related to production and marketing. However, information asymmetry is present in the agricultural markets in developing nations. This implies that the farmers and other actors in the value chain are not utilizing ICT properly to harness its benefits (Ajayi, *et al.*, 2018). Thus, it is important to understand the present ICT usage behavior of farmers in Sri Lanka before advancing further. In light of this, the sole objective of this study is to explore the factors which affect the overall use of ICT appliances of potato farmers in Sri Lanka and their perception of future use of ICT.

## METHODOLOGY

### Study Area/s

Potato cultivation in Sri Lanka is mainly concentrated within the Uva and Central Provinces of Sri Lanka and it contributes 99% to the total national production. The highest number of potato cultivation extents are located in Badulla (77%) and Nuwara Eliya (22%) districts. Therefore, Badulla and Nuwara Eliya districts were selected for the study. Three DS divisions (*Welimada, Uva Paranagam* and *Bandarawela*) were selected from Badulla district, while one DS division (Nuwara Eliya) was selected from Nuwara Eliya district based on the respective potato land extent.

### Sample and Sampling Technique

The population of the study was the total number of potato farmers in both provinces. Multi-stage random sampling was deployed to select farmers. Several GN divisions were selected from each DS division based on the total number of potato farmers. Accordingly, 89 farmers from *Welimada*, 63 farmers from *Uva Paranagama*, 51 farmers from *Nuwara Eliya* and 38 farmers from *Bandarawela* were proportionately selected for the study. The total sample of the study was 241 farmers.

### Data Collection

Both primary and secondary data were used for the study. Primary data was collected from both farmers and key informants. Secondary data was collected from various publications and reports. Data collection was carried out in the latter part of the year 2019. A pre-tested structured questionnaire

was administered to collect data from the farmers. Key informant interviews were carried out for the selected stakeholders using a key informant interview guideline.

## Model Specification & Data Analysis

Both descriptive (frequencies and percentages) and inferential statistics were used to analyze and interpret data. Correlation analysis was deployed to elicit the relationship between selected socio-economic factors of the farmer and the number of ICTs those farmers have utilized (Osondu & Ibezim, 2015). It is assumed that the micro-level socio-economic factors have an impact on the ICT usage of farmers. Hence, the model for correlation analysis is as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, ei)$$

Where;

Y    =  number of ICTs farmer has utilized

$X_1$   =  Age of the farmer in years

$X_2$   =  Gender of the farmer

$X_3$   =  Education level of the farmer

$X_4$   =  Farming experience of the farmer in years

$X_5$   =  Average monthly farming income of the farmer in LKR

$X_6$   =  Total number of crops cultivated by the farmer

ei    =  Error term

Accordingly, several ICTs farmer has utilized depends on the selected socio-economic factors such as age (years), gender, an education level (Grade one to five, grade 6-11, sat for O/L, Passed O/L, Sat for A/L, Passed A/L, Graduated and Diploma/NVQ), farming experience (years) and average monthly farming income (LKR).

## RESULT AND DISCUSSION

Results revealed that the majority (29%) of farmers were between the age of 46 years to 55 years. In addition, 16% were above the age of 56 years. Interestingly, only 14% of farmers were below 25 years of age. This implies an only a trivial number of youngsters were attracted and retained with the cultivation process. The average age of a farmer was 52 years. A majority (29%) of farmers had 16 to 20 years of experience in agricultural activities and the average was 17 years. The majority of farmers were used to extract information through traditional channels such as from traders, commercial

farmers, etc. Obinne (1990) specified that farming experience caused more excellent harvests and experienced agriculturalists could raise their productivity by implementing advanced technologies in their agronomic practices. Hence, adaptation to novel ICT appliances may inflict a challenging scenario. A majority (84%) of farmers were males. The farmer respondents were more males than females. However, justify the generally held view and common practice in developing countries that extension should be directed to the males. Compared with other countries women contribute to the agriculture sector more than 60%. (Osondu and Ibezim, 2015). Educated individuals are predicted to have positive aspects near farming skills, awareness, and information compared to unschooled people (Habib *et al.*, 2007). When referring to the education level of the farmers, the majority (46%) had educated up to grade six to eleven. Only 2% had completed their advanced level sample did not have any graduates. Interestingly, 1% have obtained Diploma or NVQ qualifications. However, in general, the sample had a reasonable educational background. Further, a more than 90% literacy rate was observed within the sample. The majority (33%) of farmers had four family members in their household (Table 1).

**Table 1: Demographic Characteristics of the Sample**

| Demographic Character | Category | Frequency (n=241) | Percentage |
|---|---|---|---|
| Gender | Male | 202 | 84 |
|  | Female | 39 | 16 |
| Age Category | <25 | 34 | 14 |
|  | 26-35 | 53 | 22 |
|  | 36-45 | 46 | 19 |
|  | 46-55 | 69 | 29 |
|  | >56 | 39 | 16 |
| Education Category | Grade 1-5 | 46 | 19 |
|  | Grade 6-11 | 112 | 46 |
|  | Sat for O/L | 41 | 17 |
|  | Passed O/L | 19 | 8 |
|  | Sat for A/L | 14 | 6 |
|  | Passed A/L | 6 | 2 |
|  | Graduated | 0 | 0 |
|  | Diploma / NVQ | 3 | 1 |
| Marital Status | Married | 210 | 87 |
|  | Single | 31 | 13 |
| Monthly Income (LKR) | <5000 | 8 | 3 |
|  | 5001-10000 | 10 | 4 |

| Demographic Character | Category | Frequency (n=241) | Percentage |
|---|---|---|---|
| | 10001-15000 | 16 | 7 |
| | 15001-20000 | 28 | 12 |
| | 20001-25000 | 35 | 15 |
| | 25001-30000 | 58 | 24 |
| | 30001-35000 | 45 | 19 |
| | >35001 | 41 | 17 |
| Farming Experience | <5 | 43 | 18 |
| | 6yr-10yr | 55 | 23 |
| | 11yr-15yr | 20 | 8 |
| | 16yr-20yr | 69 | 29 |
| | >21 | 54 | 22 |

*Source:* Survey Results

The majority (24%) of farmers earned LKR 25,001.00 to 30,000.00 monthly farm income and the average monthly farm income was LKR.29,467.00. Monthly farming income was derived only from agricultural sources of the respondent. The lowest average gross monthly income was noted in the *Bandarawela* DS division. Hence, farmers were not willing to take risks when engaging in the cultivation process. This is the major reason why farmers tend to restrict traditional approaches.
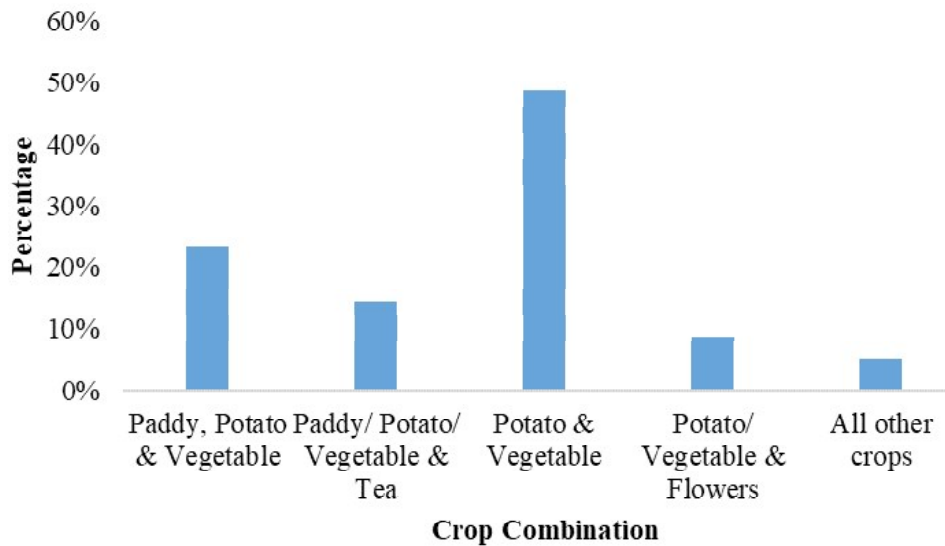


**Figure 1: Types of Crop Combination**

*Source:* Survey Results

Nearly half of the farmers have engaged in potato and vegetable cultivation. Another 23% have engaged in potato, vegetable and paddy. Paddy cultivation was prominent in *Welimada* DS Division. Interestingly, in *Bandarawela* there was an increasing demand for cut flower cultivation. This is mainly due to the exercise of irregular cultivation system, relative easiness of the cultivation and moderate-income generation by the cut flower cultivation. Nevertheless, vegetables, potato and paddy are the main crop types cultivated in these areas and always there was a rotation between these crops. Apart from those farmers also engaged in tea and cut flower cultivation.

**Table 2: Utilization of ICT Appliances**

| Type of ICT | Availability | | Accessibility | | Usage | |
|---|---|---|---|---|---|---|
| | *Frequency* | *%* | *Frequency* | *%* | *Frequency* | *%* |
| Radio | 234 | 97 | 219 | 91 | 219 | 91 |
| Television | 221 | 92 | 221 | 92 | 221 | 92 |
| CD/DVD Player | 176 | 73 | 116 | 48 | 95 | 39 |
| Land Phone | 114 | 47 | 96 | 40 | 96 | 40 |
| Feature Phone | 241 | 100 | 202 | 84 | 198 | 82 |
| Smart Phone | 165 | 68 | 85 | 35 | 25 | 10 |
| Computer | 48 | 20 | 9 | 4 | 3 | 1 |
| Tab | 5 | 2 | 1 | 0 | 1 | 0 |
| Laptop | 29 | 12 | 2 | 1 | 1 | 0 |
| Printer | 9 | 4 | 1 | 0 | 1 | 0 |
| Scanner | 2 | 1 | 1 | 0 | 1 | 0 |
| Fax machine | 3 | 1 | 0 | 0 | 0 | 0 |
| Removable Storage Device | 67 | 28 | 0 | 0 | 0 | 0 |
| Projector | 0 | 0 | 0 | 0 | 0 | 0 |
| Digital/Manual Camera | 56 | 23 | 19 | 8 | 14 | 6 |

*Source:* Survey Results

The highest number of farmers utilized television (92%) and radio (97%) as common ICT appliances (Table 2). Interestingly, feature phones were available in all most every household. However, only 84% had accessibility and 82% had usability over feature phones. More than half of the farmers had smartphones within their households. However, only 10% had usability over smartphones. From the total sample, 20%, 12% and 2% of farmers had computer, laptops and tabs respectively within their households. However, only 1% of farmers had the usability of any of those appliances. The radio, television and feature phones were accessed by farmers without prior ICT knowledge. They did not require higher education knowledge and technology for used these facilities. In comparison with table 2, Sri Lankan

farmers have limited knowledge related to ICT. It directly affected the development and production of the agriculture sector.

**Table 3: Utilization of ICT Facilities**

| Type of ICT | Availability | | Accessibility | | Usage | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Internet | 198 | 82 | 170 | 71 | 145 | 60 |
| GPS | 120 | 50 | 51 | 21 | 32 | 13 |
| E-mail | 15 | 6 | 10 | 4 | 2 | 1 |

*Source:* Survey Results

Further, only 60% of farmers have used internet facilities. Another 13% have used GPS and only 1% have used e-mail facility. This clearly shows cases the reality of ICT usage among Sri Lankan potato farmers. Even though there have been numerous ICT tools, still ICT literacy of local farmers is not up to a satisfactory level. Nevertheless, this doesn't mean the Sri Lankan agriculture sector is not ready for the ICT revolution. Perhaps changing the way or mode of delivering ICT tools may cause a positive influence in agriculture.

**Table 4: Correlation Analysis of Selected Socio-Economic Factors and ICT Usage of Farmer**

| Variable/s | Y | X1 | X2 | X3 | X4 | X5 | X6 |
|---|---|---|---|---|---|---|---|
| **Y** | 1 | | | | | | |
| **X1** | -0.7432** | 1 | | | | | |
| **X2** | 0.537 | 0.564** | 1 | | | | |
| **X3** | 0.659** | 0.541 | 0.654 | 1 | | | |
| **X4** | -0.254** | 0.265 | 0.326* | 0.235 | 1 | | |
| **X5** | 0.352* | -0.231 | -0.321 | 0.654 | 0.326 | 1 | |
| **X6** | 0.851** | 0.351 | -0.654 | 0.245 | -0.214 | 0.694 | 1 |

*Source:* HARTI survey, 2018

***$p<0.01$, **$p<0.05$ and *$p<0.1$ are represented significance at the 0.01, 0.05 and 0.1 respectively.

The interpretation on the correlation analysis of selected socio-economic variables of farmer and number of ICT appliances used by the farmer. According to the results education level ($p<0.05$, r = 0.659), average monthly farm income ($p<0.1$, r = 0.352) and the number of crops cultivated ($p<0.05$, r = 0.851) by the farmers are positive and significant with the number of ICT appliances used by the potato farmer. Age ($p<0.05$, r = -0.7432) and years of experience engaging in agricultural activities ($p<0.05$, r = -0.254)

are negative and significant with the number of ICT appliances used by the potato farmer. Interestingly, farmers who cultivated several crops tend to seek more information. Hence, they used multiple sources including different ICT appliances. In general, these farmers seek production information such as price, types, availability of inputs including seeds, fertilizers, and chemicals and weather forecast specifically rainfall. Farmers also seek information related to marketing aspects such as market price to determine farm gate prices, buyers' and traders' details, marketplace places, etc. However, it is envisaged that most of the time farmers were able to obtain partial information. Hence, information asymmetry is a crystal-clear issue. Rather than focusing on advanced ICT appliances and tools, it is recommended to exploit the full potential of current ICT appliances and tools to disseminate vital information. Consideration of farmer usability of different ICT appliances and tools is much important to decide the next step of agriculture modernization in Sri Lanka.

## CONCLUSIONS

Agriculture and the development of agribusinesses were the ideal foundation in the development of the Sri Lankan economy. Novel technology, innovation, tools, and knowledge were most important and affected the development of agriculture. The farmers had a good preference and favorable response from the ICT usage in their agriculture practices. The farmers' exprinec and monthly income were positively significant to the usage of ICT technology. According to the study, farmers did not use ICT technologies properly in their cultivation process. Most of the farmers still preferred radio and television. Only a few preferred to use features phone to acquire knowledge to improve their cultivation. Consideration of farmers' awareness, access and usage over different ICT applications is important before implementing novel ICT applications. Continuous awareness and demonstration are key to promoting ICT usage among farmers. Public-private collaboration with a sound policy is recommended to extract, gather, store and disseminate vital information in agriculture. Creating and updating accurate farmer databases with cultivation dimensions is a must to implement timely decisions. Continuous monitoring and training are the keys to transferring ICT knowledge to rural farming communities.

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