



## Assessment of Mobile-Based Extension Service Usage among Medium-Scale Tea Growers in Kandy District, Sri Lanka

K.G.M.J.W. Gunapala<sup>1\*</sup>, U.I. Dissanayeke<sup>1</sup> and C.E. Munasinghe<sup>2</sup>

<sup>1</sup>Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka.

<sup>2</sup>Advisory and Extension Centre, Tea Research Institute of Sri Lanka, Deniyaya, Sri Lanka.

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Gunapala, K.G.M.J.W.   
<https://orcid.org/0000-0002-7571-3158>



\*Corresponding Author:  
[janakiwathsala29@gmail.com](mailto:janakiwathsala29@gmail.com)

### ABSTRACT

Tea (*Camellia sinensis* (L.) Kuntze) is one of the major foreign exchange-earning agribusinesses in Sri Lanka, where several mobile-based extension services have emerged to deliver information to tea growers. This study has focused on the present status of mobile-based extension services, perception, and factors affecting the usage of mobile-based extension services by medium-scale tea growers. A survey was conducted over the telephone using a random sample of 56 medium-scale tea growers in the Kandy district. The majority were above 50 years old (77%), and educated up to the advanced level (77%). The majority (59%) were part-time tea growers, having experience (75%) in tea cultivation for ten (10) years or more. All respondents owned mobile phones, and the majority (89%) had smartphone access to the Internet. According to the perception of users, current mobile-based extension services have a problem with knowledge improvement. The results of the Pearson Chi-Square test showed that the awareness of mobile-based extension services was significantly associated with education level  $\chi^2 (4, N=56) = 9.951, p < 0.05$ . The usage showed significant associations with the education level,  $\chi^2 (4, N=56) = 12.245, p < 0.05$  and Internet access  $\chi^2 (2, N=56) = 9.148, p < 0.01$ . The study concludes the necessity to improve current mobile-based extension services to be more oriented toward technology transfer and develop a single Information and Communication Technology platform to support all media formats for information sharing among medium-scale tea growers.

## INTRODUCTION

Sri Lanka is one of the oldest tea-producing countries in the world. The tea industry plays an important role not only in the economy of Sri Lanka but also in socio-cultural and political scenarios (Bandula and Sandika, 2017). Tea was recorded as the second-highest export earner for the year 2019 in Sri Lanka. The country exported over 300 million kg of tea to the global market earning revenue of USD 1.24 Billion (EDB, 2020). Currently, Sri Lanka is the fourth largest tea-producing country and the third leading tea exporter in the world. Further, Sri Lanka is the largest producer of orthodox tea in the world. Simultaneously, the tea industry generates direct and indirect employment for over one million people in Sri Lanka.

The tea-grown areas in Sri Lanka are classified into three different elevation zones, upcountry, mid-country, and low country. Upcountry tea is mainly grown above 1200 m elevation, in the Badulla and Nuwara Eliya districts. Kandy and Matale districts fall into the mid-country region between 600 m and 1200 m elevation. Low-grown tea is in Galle, Matara, Ratnapura, Kegalle, and Kalutara districts, mainly cultivated below 600 m elevation. The Sri Lankan tea industry consists of two main sectors including the corporate sector and the tea smallholdings. Tea estates with over 50 acres or 20 hectares are considered corporate tea estates. It includes Regional Plantation Company (RPC) estates, Janatha Estates Development Board (JEDB) estates, and Sri Lanka State Plantations Corporation (SLSPC). The tea smallholding sector in Sri Lanka is defined as tea land extents of less than 10 acres or 4 hectares. However, around 0.5% of tea smallholders in Sri Lanka own lands from 10 to 50 acres (Esham *et al.*, 2018), and are categorized as medium-scale tea growers.

Since the colonial era, the extension and advisory services have been recognized as pre-requisite for the development of the tea industry in Sri Lanka. Advisory and extension services hold the responsibility for the dissemination of agricultural knowledge to tea growers. Tea Research Institute of Sri Lanka (TRI) and Tea Small Holdings Development

Authority (TSHDA) is mainly responsible for providing and disseminating technical information on tea cultivation to the stakeholders and thereby contributing to the adoption of technologies and good agricultural practices at the field level. TRI bears the main responsibility for the dissemination of tea-related information and providing advisory services to tea growers in the country. Various extension approaches of TRI include advisory visits, group training programs, Regional Technical and Extension Forum (RTEF), Regional Scientific Committee (RSC), Experimental and Extension Forum (E & E) for the corporate sector and smallholdings sector, cyber extension activities, and audio-visual services ensure effective dissemination of technologies to stakeholders and get feedback from them.

TSHDA involves the improvement of productivity and working for the welfare of the tea smallholders in Sri Lanka through the provision of support services creation of an economically and socially sustainable tea smallholding community. According to the study by Bandula and Sandika (2017), the most believable information source for tea smallholders is TSHDA. Sri Lanka Tea Board (SLTB) offers advice and assistance to overseas tea buyers and tea brand owners, tea exporters, traders, manufacturers, and cultivators in Sri Lanka. Other than that, some private organizations, mainly agrochemical companies, private tea factories as well as mobile companies like Dialog Axiata PLC are involved in providing advisory and extension services for tea growers either in collaboration with TRI / TSHDA or on their own.

Information and Communication Technology (ICT) plays a vital role in the agriculture extension, while mobile phones and mobile-enabled information services are showing rapid growth among rural communities in Sri Lanka. Further, the mobile phone is considered the most popular ICT tool in developing countries due to the reasons such as easy access, portability, small size, and cost-effectiveness. According to the Telecommunication Regulation Commission of Sri Lanka (TRCSL) (2019), mobile subscribers have been increased to 32.53

million by the end of 2018. Further, there were 115.06 mobile subscriptions registered for every 100 people in 2019. The high mobile phone usage is the main reason for the high teledensity in Sri Lanka (Samansiri and Wanigasundera, 2014).

The mobile-based agriculture extension and advisory service (M-extension) is a new extension approach that is applicable in a wide range of knowledge dissemination. These mobile-based interventions in agricultural extension improve the amount, quality, and speed of service delivery, and farmers get benefits in terms of knowledge and awareness of the new agricultural practices (Fu and Akter, 2016). Moreover, Bjorn and Edmund (2011) found that mobile phones affect the entire farming life, and have resulted in considerable changes in the entire livelihood, increased opportunities, and reduced risks for rural farmers in Tanzania. Compared to other ICTs, tea smallholders consider mobile phones to be an inexpensive, easy-to-access, and user-friendly option for accessing agricultural information (Samansiri and Wanigasundera, 2014). Further, plantation managers have perceived the mobile phone as the easiest communication channel, with regard to accessibility and availability (Samansiri *et al.*, 2014). Mobile-based tea farming information system facilitates communication between the factory, easier access to extension services, and generates more accurate and comprehensive information (Njeru and Bernard, 2018).

With the increasing use of mobile phones among farmers in Sri Lanka, mobile-based extension services have been initiated to fulfill information needs in the tea sector. During the last few years, both public and private organizations support tea growers by offering different types of M-extension services. For instance, the TRI has initiated a Short Message Service (SMS) and a Technical Information and Advisory Centre. SMS service shares timely important information among corporate sector estate managers, medium-scale tea growers, tea smallholders, and extension officers in the tea sector. The Technical Information and Advisory Centre cater to the advisory needs of tea growers mainly solving

their varied issues related to tea cultivation and production.

“*Govi Mithuru*” is a demand-driven advisory service initiated by a private sector mobile service provider in 2015. It provides advisory services by means of pre-recorded voice narrations for different crop categories, including tea. The messages have been customized to address different management practices and cultivation stages. Pre-registered tea growers can access information through a dedicated call line, which has helped to save the time and effort of tea growers.

In order to fulfill the need for information, many tea factories have initiated SMS-based information systems to connect with tea growers and leaf collectors. The messages shared in such systems mainly include price information and other important messages. In 2015, Sri Lanka Tea Board (SLTB) initiated an SMS service for tea leaf collectors to share price information and weight deduction information in all tea-growing districts. There was a facility to access the service by entering a particular code number. However, currently, this SMS service is not regulated effectively. With the high popularity of social media in Sri Lankan communities, some Facebook pages and WhatsApp groups provide information related to tea cultivation, production, and exportation details. These services are operated by different tea-related organizations, including government institutes like TRI, TSHDA, and SLTB as well as other tea-related private organizations and associations.

The knowledge dissemination system in the tea sector currently faces a number of problems mainly due to inadequate extension staff in the government extension system (Amarathunga *et al.*, 2008). Other limitations include the lack of qualified extension officers to serve in bought leaf, agro-input, and service-oriented companies, and inadequate monitoring and evaluation mechanisms in current extension channels. Therefore, the conventional extension methods such as individual field visits, group training programs, field days, and crop clinics are inadequate to fulfill the information need of tea growers in Sri Lanka. Also, these

limitations have resulted in the poor adaptation of new technologies by tea growers. Medium-scale tea growers are not directly engaging in the exclusively designed extension programs such as Regional Technical and Extension Forum (RTEF), Regional Scientific Committee (RSC), Experimental and Extension Forum (E & E) for the corporate sector as well as the smallholdings sector. This has created a high demand for tea-related technical information and extension services among medium-scale tea growers, which has been largely ignored. Most of the medium-level tea-growers enjoy reasonable income enabling them to use technology-enhanced methods to receive agricultural information. However, the level of mobile-based extension usage by medium-scale tea growers has not been adequately studied. The mobile-based extension can be identified as a possible alternative to disseminate information among tea growers in Sri Lanka. It has a greater potential to increase the overall efficiency of the tea industry at the estate level so that it can be competitive with the current global and regional trends if individual tea estates adopt advanced and appropriate ICTs (Weerasinghe and Mudalige, 2010). The study has attempted to assess the awareness and usage of mobile-based extension services to get tea-related information by medium-scale tea growers in the Kandy district, Sri Lanka. The study also examined the level of perception of medium-scale tea growers towards available mobile-based extension services and factors associated with the usage of mobile-based extension services.

## METHODOLOGY

A descriptive study design was adopted. Medium-scale tea growers (land extent 10-50 acres) in Kandy were considered the study population. The list of medium-scale tea growers registered under the Sri Lanka Tea Board (SLTB) in 2019 was considered as the sampling frame. Fifty-six medium-scale tea growers (25% of the population) were selected for the study using simple random sampling to obtain a more representative sample. A pre-tested questionnaire was used as the data collection instrument. The telephone survey was selected as the primary

data collection method considering the time and resource constraints. The user perception of currently used mobile-based extension services was measured according to the degree of agreement or disagreement for related statements on a five-point Likert scale.

Secondary data were collected from journal articles, publications, web pages, and unpublished data from government and private institutes that offer different types of mobile-based extension services to the study community. These institutes include the SLTB, the Tea Research Institute of Sri Lanka (TRI), and Dialog Axiata PLC.

Data were tabulated in Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS). Descriptive methods such as frequencies were used for the basic analysis to understand the background information of medium-scale tea growers. The user perception of currently used mobile-based extension services was measured using the percentage of the degree of agreement or disagreement for each of the statements. Because most of the selected variables are under categorical variables, the Pearson Chi-Square test was conducted to identify associations between them. The awareness and usage scores were calculated based on the number of services to prepare the awareness and usage of mobile-based extension services for the Pearson Chi-Square test.

## RESULTS AND DISCUSSION

### Background information of medium-scale tea growers

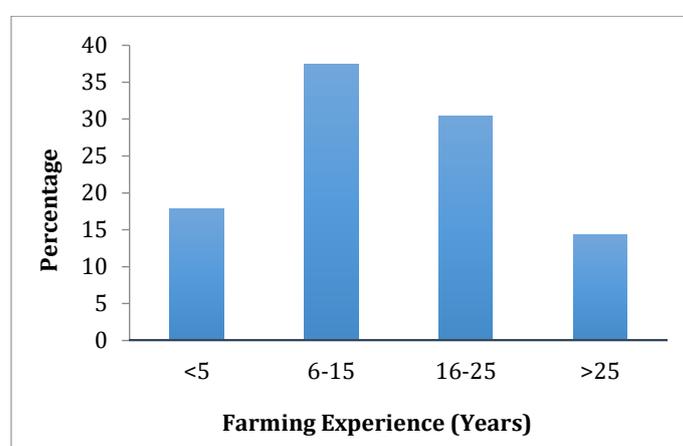
Age is an important factor in regulating the responses of an individual during numerous activities in the lifetime (Narmilan *et al.*, 2020). The demographic characteristics of the medium-scale tea growers showed that the majority (63%) of medium-scale tea growers belonged to age 51-65 years, while 18% and 14% of respondents belonged to the age group 36-50 years and above 65 years respectively. Only 5% of respondents were below 35 years.

Education is a strong correlating factor concerning the level of ICT use by farmers (Narmilan *et al.*, 2020). The education level of

the medium-scale tea growers was simply categorized into five levels primary, up to GCE (O/L), GCE (A/L) completed, diploma level, and degree level. Accordingly, the majority (50%) of the medium-scale tea growers had made their education up to an advanced level. Further, 27% of respondents had their education up to the diploma or degree level. It indicates that medium-scale tea growers who participated in this study were a well-educated group among other tea grower and their overall literacy rate was quite high. Further, the education level of farmers was closely associated with the usage of ICTs (Boz and Ozcatalbas, 2010). Therefore, the high education level of respondents is an opportunity to use modern technology in

extension and convey information via ICT tools.

Experience is significant in any field of life to gain benefits and improve individuals' living standards (Narmilan *et al.*, 2020). According to the findings, the majority (38%) of the respondents had 6-15 years of farming experience under tea cultivation (Figure 1). The farming experience caused more harvests and increase productivity by implementing advanced technologies in cultivation (Obinne, 1990). Therefore, the considerably higher farming experience of medium-scale tea growers is important to improve their productivity.



**Figure 1: Distribution of respondents by experience under tea cultivation.**

The majority (59%) of the respondents were involved in tea cultivation as a part-time activity. Most of them were engaging in different employments and were currently placed in urban areas, too far away from their estates. Most part-time estate owners had assigned a trained field officer or family members to manage all the activities in their tea lands. They had visited estates only one or two times per month. According to the findings, respondents were considerably different from the tea smallholders in Sri Lanka, because the majority of tea smallholders are full-time farmers (ILO, 2018).

Findings of this study indicate that the majority of the respondents (89%) used smartphones while comparatively less amount of medium-scale tea growers (11%) used feature phones. Because all smartphones

provide Internet facilities to their users, the Internet accessibility of medium-scale tea growers was similar to smartphone availability. Access to the Internet is significantly important to access mobile-based extension services.

#### **Awareness and usage of mobile-based extension services**

The use of mobile phones to share knowledge is an easy and quick method to fulfill the information needs of farmers. According to the findings of the study, many of the respondents were aware of the SMS services extended by Tea factories (46%), the 1920 Agriculture Advisory Service (41%), and the "Govi Mithuru" voice message service (38%) (Figure 2).

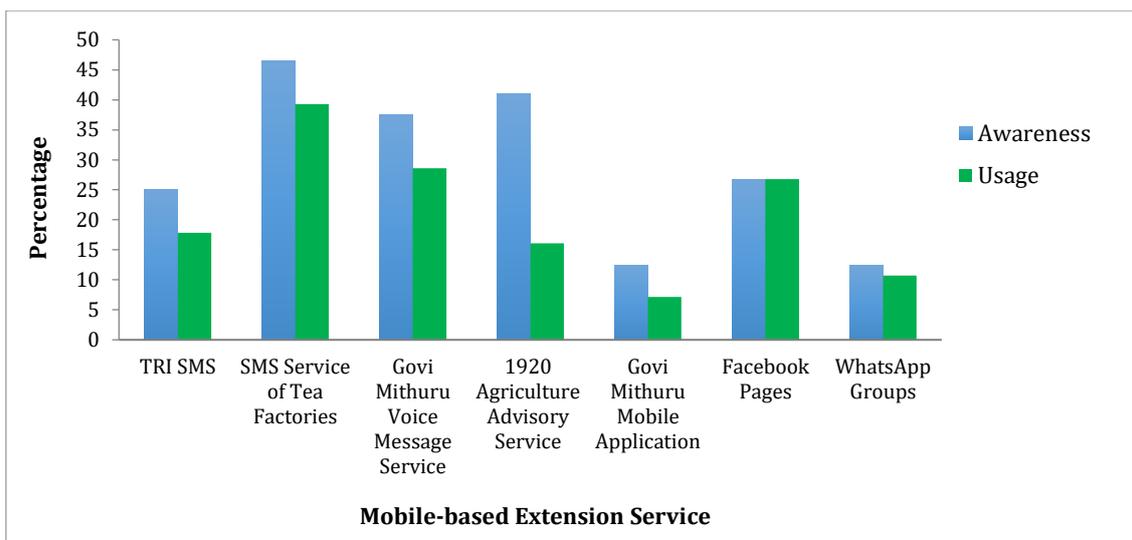


Figure 2: Distribution of respondents by awareness and usage of mobile-based extension services.

The tea factory is the more immediate and more frequent contact place for the respondents than other organizations.

Further, the 1920 agriculture advisory service is one of the most popular mobile-based extension services among Sri Lankan farmers that assist them to solve their varied issues related to agriculture. However, these services are not directly involved in solving the queries of tea growers. Therefore, most aware respondents of the 1920 agriculture advisory

service (61%) had never used that service (Figure 3). The 1920 agriculture advisory service had helped its users solve problems related to other crops that they had cultivated. Further, the usage of these mobile-based extension services was less than the awareness except for Facebook pages. Further, among aware respondents, a significant percentage had never used TRI SMS (29%), “Govi Mithuru” voice message service (29%), and “Govi Mithuru” mobile application (43%).

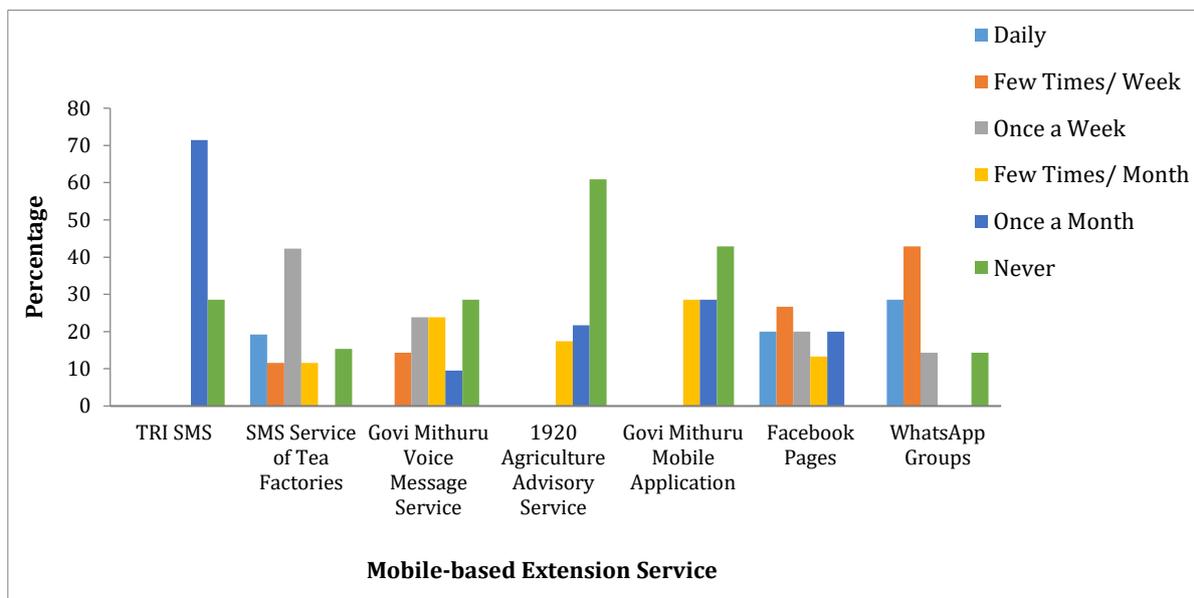
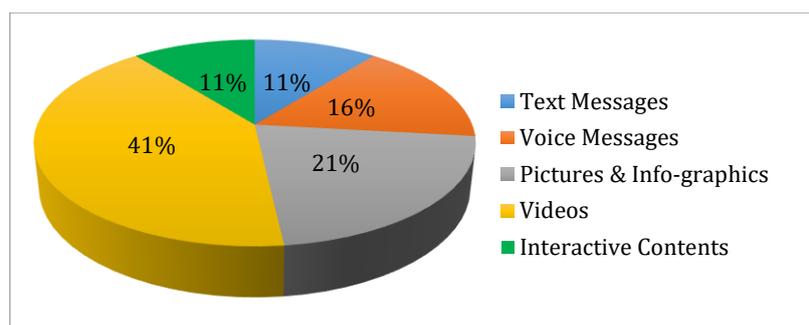


Figure 3: Distribution of respondents by usage frequency of mobile-based extension services.



**Figure 4: Most preferable media format of medium-scale tea growers.**

A higher percentage of the medium-scale tea growers (41%) preferred to receive tea-related information in the video-based format (Figure 4). Videos enhance farmers' access to information and influence behavioural change in farming practices. Karubanga *et al.* (2017) found that videos significantly enhance awareness, knowledge acquisition, and uptake of innovations among rice farmers in Uganda. Other than that, pictures and infographics (21%) and voice messages (16%) were stated as the preferred formats. A few respondents preferred text messages (11%) and interactive content (11%). It indicates that the use of one single media format for sharing information among medium-scale tea growers is not applicable. Loki *et al.* (2020) discovered that multiple sources of extension services should be the main source of extension provision since farmers can select the best information mix suited to their farming needs based on the diversity inherent among farmers. Consequently, repackaging of agricultural information into various formats is needed to meet smallholder farmers' information-seeking behaviour (Brhane *et al.*, 2017). Therefore, it is needed to select a single ICT platform that can support more of these media formats. As an example, mobile platforms including Facebook, WhatsApp, and Viber have facilities to share information related to tea cultivation in text, voice, pictures, and videos.

Furthermore, about half of respondents (52%) preferred English as a language to receive information related to their farming activities. Sinhala was preferred by 39% of respondents, while Tamil was preferred by a comparatively less percentage of respondents (9%). This indicates that the use of one single language for disseminating cultivation-related

information among medium-scale tea growers is not applicable. Therefore, a mix of these three languages is needed for information sharing among medium-scale tea growers.

#### **User perception on mobile-based extension services**

The perception of the respondents on mobile-based extension services was measured using five statements on mobile-based extension services on a five-point Likert scale. Most respondents (85%) agreed with the statement that "Using the mobile-based extension services would help me get timely important information". Further, "The information provided by mobile-based extension services is understandable" according to the perception of respondents (80%). The respondents (74%) had also agreed with the statement that "The information provided by mobile-based extension services is capable of addressing cultivation-related problems". The majority (71%) of the respondents had disagreed or strongly disagreed with the statement "Using the mobile-based extension services would not help to save my time". It indicates that mobile-based extension services help to save time for their users.

Only 41% of the respondents thought that "My knowledge of tea cultivation has significantly improved as a result of using mobile-based extension services". Many others had either disagreed (30%) or remained neutral (29%), indicating that there may be a problem with the capability of improving knowledge via mobile-based extension services. However, currently operating mobile-based extension services in tea cultivation provide timely important information related to their problems on tea cultivation, but it has a

problem with the providing new knowledge to improve the knowledge base of medium-scale tea growers.

### Factors associated with awareness and usage of mobile-based extension services

The association of awareness and usage of mobile-based extension services with some selected demographic factors was tested by using the Pearson Chi-Square test. The awareness of mobile-based extension services showed statistically significant associations with only the education level of respondents

(Table 1). It indicates that the education of farmers has an essential link with the awareness of these mobile-based extension services. The majority (79%) of respondents who were aware of mobile-based extension services had education levels up to A/L or higher. Therefore, higher education may support awareness and knowledge about new technologies in society. However, awareness of mobile-based extension services not showed any association with age, gender, farming experience, involvement time, estate ownership, and Internet access of respondents.

**Table 1: Association between demographic factors and awareness of mobile-based extension services.**

Demographic Factor	Awareness		
	Value	df	Asymp. Sig. (2-sided)
Age	2.019 <sup>a</sup>	4	0.732
Gender	2.627 <sup>a</sup>	2	0.269
Education Level	9.951 <sup>a</sup>	4	0.041*
Farming Experience	3.809 <sup>a</sup>	4	0.432
Involvement Time	0.489 <sup>a</sup>	2	0.783
Estate Ownership	4.202 <sup>a</sup>	4	0.379
Internet Access	4.949 <sup>a</sup>	2	0.084

\*Significance at  $p < 0.05$

**Table 2: Association between demographic factors and usage of mobile-based extension services.**

Demographic Factor	Usage		
	Value	df	Asymp. Sig. (2-sided)
Age	1.711 <sup>a</sup>	4	0.789
Gender	1.298 <sup>a</sup>	2	0.523
Education Level	12.245 <sup>a</sup>	4	0.016*
Farming Experience	3.613 <sup>a</sup>	4	0.461
Involvement Time	0.360 <sup>a</sup>	2	0.835
Estate Ownership	2.988 <sup>a</sup>	4	0.560
Internet Access	9.148 <sup>a</sup>	2	0.010**

\*Significance at  $p < 0.05$ , \*\*Significance at  $p < 0.01$

As presented in Table 2, the usage of mobile-based extension services showed statistically significant associations with only the education level and internet access of respondents. It indicates that education and internet access for medium-scale tea growers are having an essential link to the usage of these mobile-based extension services. The majority of mobile-based extension service users (82%) had education levels up to A/L or higher, and 97% of users had Internet access. The studies of Osadebamwen (2015); Munasinghe and Kanchanamala (2018) found that the secondary educated farmers had more probability to use mobile applications than low levels. Moreover, Internet access may help to increase the usage of mobile-based extension services among tea growers. However, usage of mobile-based extension services did not show any association with age, gender, farming experience, involvement time, and estate ownership of respondents.

## CONCLUSIONS AND RECOMMENDATIONS

Most medium-scale tea growers do not use mobile-based extension services related to tea cultivation. Probable reasons would be less awareness of M-Extension services among the population. It is necessary to conduct awareness programs about current mobile-

based extension services related to tea cultivation for medium-scale tea growers. Even though medium-scale tea growers were not fully using mobile-based extension services, there is a high potential to use smartphones for information sharing among medium-scale tea growers in terms of education, the higher usage of smartphones, and the Internet among others. Further, future extension research in this area is needed to design and develop media content for extension activities.

Mobile-based extension methods need to be based on field research to test their applicability and usefulness. It is important to assess the information needs of medium-scale tea growers before designing such interventions. It is also suggested to develop a single Information Communication Technology platform to support all media formats for information sharing among medium-scale tea growers. In conclusion, it is necessary to improve current mobile-based extension services to make them more user-friendly and more technology transfer oriented. Further, comparative studies are needed to compare the usage of mobile-based extension services in other tea-growing regions in Sri Lanka.

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