



Bringing Tea Technology to the Farmer Doorstep; -Participant's Perception on the Effectiveness of Mobile Crop Clinic Approach in the Low Country Tea Growing Region of Sri Lanka

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Abstract

Understanding farmers' perception on the mobile crop clinic approach is vital for optimizing its implementation and ensuring its contribution to improved livelihood and the productivity in the tea sector. This study investigated farmers' perception regarding the effectiveness of this extension approach. A sample of 120 participants was selected representing three major tea growing districts of Low Country region in Sri Lanka (i.e. Ratnapura, Galle and Matara). Data were collected during October 2024 to March 2025 by using a pre-tested questionnaire including basic information, level of previous exposure to the tea extension services and the perception towards mobile clinics. As per the results, mobile crop clinics had been perceived as one of the most suitable extension approaches for the tea sector in terms of perceived benefits such as time and cost saving, efficiency, easiness in soil analysis and receiving more than one service successfully at a time. Simultaneously, respondents had perceived inadequacy of time as a limiting factor. While welcoming the joint effort made by public and private institutes in conducting mobile crop clinics, participants preferred keeping this as a toll-free service. Further, the farmers' perception was significantly correlated with their type of involvement in tea cultivation (full-time or part-time farming) and the level of fulfilling their objectives through the mobile clinic service.

Keywords: Mobile Crop Clinics, Farmer's Perception, Agricultural Extension, Tea Smallholders, Sri Lanka

1. Introduction

Agricultural extension plays a major role in providing farmers with appropriate technology, information dissemination, skill development and giving advices for the problems encountered. Its' vital contribution to farmers' livelihood development and productivity enhance in the agricultural sector is well recognized. The past few decades have witnessed the emergence of several extension approaches in the agricultural extension sector, such as the training and visit (T&V) model, farmer-to-farmer extension, privatized extension and

farmer field schools (FFS) (Tambo *et al.*, 2020). It is widely accepted that agricultural extension services in Sri Lanka as well as other developing countries have not been able to adequately meet the needs of farmers due to number of barriers and constraints (Wanigasundera, 2015). Takenaka *et al.* (2007) stated that traditional extension institutes in many Asian countries are unable to make any significant impact and positive changes due to numerous weaknesses. Nevertheless, the extension workers in the agricultural sector often put effort to reach all the farmers by using the methods other than that of conventional. In response to the limitations of conventional extension, alternative approaches are being explored and the Mobile Clinic Approach is identified as one such possible way of reaching the farmer at the grass root level aimed at addressing the issues at the farm land. According to the Global Forum for Rural Advisory Services (GFRAS), mobile clinics could be considered as a practical way of enabling the agricultural specialists to work closely with extension workers in offering farmer advice on how to manage all types of plant health problems (GFRASS, 2024). Though previous researchers in Sri Lanka have examined the effectiveness of various extension methodologies (Wanigasundera, & Atapattu, 2019), there remains a limited understanding of farmer perceptions specifically concerning mobile crop clinics, particularly within the context of the low country tea sector. This study seeks to address this research gap by providing insights into how tea smallholders in this region perceive the effectiveness and benefits of this relatively new extension strategy.

1.1. Mobile Clinic Approach

The mobile clinic concept is widely known in many terms. Srivastava (2013) has identified that mobile clinic is referred to as plant clinics, walk-in clinics, community-based clinics and plant health camps in many parts of the world. As Kumara *et al.* (2015) pointed out, these mobile clinics are often referred to as plant clinics or crop clinics in Sri Lanka. The mobile clinic approach can be defined as a system in which farmers obtain advisory services on the plant problems affecting agricultural crops and provide management strategies for the issues encountered such as pest management (Danielsen *et al.*, 2022). As pointed out by Bentley, (2009) and Majuga *et al.*, (2018), plant clinics are considered as the meetings places where farmers struggling with any plant health problem can take samples of their crop and present to the extension officers for free diagnosis and seeking the recommendations on how to manage the problem. These mobile clinics have been functioning since 2003 in 34 countries in the continents of Africa, Asia and the Americas, where farmers can obtain expert advice on plant health problems. However, despite the popularity of plant clinics, there is little empirical evidence on their contribution to farm productivity and households' well-being (Boa, 2009).

Under the Sri Lankan context, mobile crop clinics were initially organized in 2010 in the Hambantota district, with the purpose of reducing the risk of crop failure by pests and diseases thereby increasing the productivity, rural household income and minimizing environmental pollution resulting due to use of agro-chemicals (Kumara *et al.*, 2015). They have further highlighted the effectiveness of crop clinics in terms of its accessibility of the farming community to obtain timely solutions to the problems related to pests and diseases affecting the crops. By 2015, these crop clinics had been initiated in more than 15 districts in the country.

1.2. Necessity of mobile clinics for the tea smallholdings sector of Sri Lanka

With the share of nearly 75% of the national tea production, smallholders are of great importance in the tea industry of Sri Lanka. Though the tea smallholders are scattered in all the tea growing regions, they are more concentrated in the Ratnapura, Galle and Matara districts of Low Country Region in the country. According to the statistics, there are nearly 250,000 tea smallholders in these three districts which is approximately 50% of total tea smallholders of the country (TSHDA, 2005).

According to Amaratunga *et al.* (2008), major barriers and limitations in the extension service of the tea sector such as inadequate field staff and lack of resources, hinder the knowledge dissemination process at the grass root level. Currently, there are only a limited number of extension officers available in the government institutes such as Tea Research Institute (TRI) and Tea Smallholding Development Authority (TSHDA) to cater the extension needs of large-scale estates and the tea smallholdings sector of the country. Accordingly, the smallholder, extension officer ratio is so high that a single extension officer has to cater nearly a range of 2500 - 3000 smallholders depending on smallholding distribution pattern of tea growing districts (Amaratunga *et al.*, 2008). It is clear that these problems and limitations hinder the process of knowledge dissemination particularly in very rural and remote areas. This in turn has caused poor level of adoption for proven technologies in relation to cultural practices by tea smallholders (Amaratunga *et al.*, 2008). In the light of above-mentioned issues, knowledge and adoption rate of recommended agricultural measures developed by the TRI is found to be considerably below the expected level in the smallholdings sector (Mahindapala *et al.*, 2019).

In response to the above-mentioned constraints found in the extension service, TRI launched a series of crop clinics during the past two decades with the participation of tea related subject matter specialists such as agronomists and entomologists along with the extension expertise with the aim of addressing the grass root issues encountered by the tea growers. However, these crop clinics were not mobile clinics, as these clinics were organized within the TRI station premises itself (TRI, 2023).

Mobile clinic (or mobile crop clinic as it is referred to) is quite a novel extension approach initiated in the tea sector of Sri Lanka. The 'mobile crop clinic' concept was first initiated in the tea sector by the TRI in year 2023 (TRI, 2023). While adopting to scientific procedures, these clinics were well-designed for catering advisory and soil analytical needs of the tea growers with special attention being given for smallholders. Simultaneously, these clinics were equipped with a mobile laboratory exclusively designed for soil analytical works with analytical facilities (Plate 01). Clinical programs were organized mainly in the remote rural tea growing areas based on the requests coming from the tea smallholdings sector. Subject matter specialists, extension expertise and technical officers of TRI along with the professionals of Tea Small Holdings Authority and Sri Lanka Tea Board, participate for these clinics as a panel of resource personnel.

Tea growers in the respective region are given a pre-notice asking to attend the mobile crop clinic program with the soil samples taken from their own tea land and hand over to the mobile laboratory along with

necessary details (Plate 02). In parallel to the soil analysis, an interactive session is conducted by the resource personnel to deliver presentations regarding the specific tea related issues prevailing in the respective region and the remedial measures recommended to overcome them (Plate 03). Participants are then allowed to visit the stalls prepared by the institutes where various samples related to tea cultivation are exhibited. During the stall visit, participants are given opportunity to discuss with the resource personnel and get necessary advices for their own problems encountered in the tea land (Plate 04 and 05). Simultaneously, the soil samples received by the mobile laboratory are analyzed in-situ and the analytical results are issued to the respective client along with necessary advices (Plate 06) (TRI, 2024).

Bentley (2009) has reported the necessity of evaluating the performances of mobile clinics owing to the little availability of empirical evidences related to its effectiveness. As far as farmer adoption is concerned, individual perception associated with the particular technology or methodology plays a crucial role on the decision-making process (Asiedu – Darko, 2014). Having initiated just two years back in 2023, mobile clinic approach in the tea sector of Sri Lanka still remains in its infant stage. It is therefore timely important carrying out a scientific study to evaluate its success achieved so far in terms of farmers’ perception towards it. Recognizing the crucial role of agricultural extension in technology dissemination and farmer support, this research addresses a gap in the existing literature by specifically examining the reception and perceived benefits of mobile crop clinics among tea smallholders. This would be of much useful in determining its current status and identifying necessary structural changes to be made in order to make it more farmer oriented effective way of addressing the pain points of tea smallholders at the grass root level.



Plate 01: Mobile laboratory designed for soil analysis



Plate 02: Soil samples are being received for analysis



Plate 03: Interactive session for discussing specific tea related issues



Plate 05: Advises are being given for a specific problem found in the field

Plate 04: Participants visit the stalls to see the exhibits



Plate 06: Soil pH analysis in the laboratory

2. Methodology

2.1. Study area, sampling frame and sampling technique

Ratnapura, Galle and Matara districts of the Low Country Region were selected as the study area. The lists of the tea smallholders who participated in mobile crop clinics conducted during October 2024 to March 2025 were considered as the sampling frame. A sample of 120 participants were selected from these three districts by using Simple Random Sampling method (Table 01). The sample included 60 participants from Ratnapura while 30 respondents being selected from each of other two districts (Galle and Matara), comprising approximately 10% of the sampling frame.

Table 01: Sample selection from the three districts

District	Sample size
Ratnapura	60
Matara	30
Galle	30
Total	120

2.2. Data Collection Instruments

A semi-structured questionnaire was developed for data collection from the respondents. The questionnaire consisted of five (05) major sections i.e. basic information, extension services hitherto obtained, experience on previous mobile clinics (if any), perception on this mobile clinic program and willingness for paid mobile

clinics in the future. Each of these questions were further sub divided into sub questions. Smallholder perception on mobile clinics was measured based on the given statements, for which the responses were recorded using 5-point Likert Scale with ranking from one (01) to five (05) (ranging from strongly agree to strongly dis-agree) (Likert, 1932).

The consistency of the questionnaire was performed by using the Cronbach α as the reliability coefficient (Santos, 1999). Further, a group consisting of 10 respondents randomly selected outside the sampling population was used to perform the questionnaire reliability (Kathuri and Pals, 1993) to measure the reliability of questionnaire, using the SPSS statistical analysis software version 16. Following the consistency and reliability tests, the questionnaires were pre-tested prior to use for field data collection. The pretesting was performed by using another randomly selected 10 respondents within the study area but outside the sampling population.

2.3. Data collection, processing and analysis

A survey was conducted to collect data from the respondents during the mid-March to mid-April, 2025. Data were collected through interviewing each responder separately over the phone. 15 minutes time was allocated for each respondent to ask the questions and fill the questionnaire based on their own answers, views and ideas given for each question. Questionnaires were re-evaluated and data were entered to an Excel Worksheet (MS Excel 2010) for analytical works. Respondent's perception ranks were summed up for evaluating the perception. Descriptive statistics were prepared using charts and graphs. The relationships between the independent and dependent variables were analyzed by using the non-parametric statistical techniques run in SPSS 16 software package.

2.4. Exclusion Criteria and Ethical Considerations of Selecting Respondents

Concerning the participants' age, those who were below 18 years and over 70 years of age were excluded from the sample, assuming that they were not capable of understanding the objectives of the study and properly responding to the questions. In consideration of survey ethics, the participants who were not in consent either to provide information or be interviewed were also excluded from the sample. Moreover, all the respondents willing to be interviewed over the phone were clearly made aware on the objectives of the study, prior to asking questions. Simultaneously, it was not made compulsory for the respondents giving answers for all the questions and were given the chance to quit whatever the question they do not wish to response.

3. Results and Discussion

3.1. Demographic information of the respondents

The sample consists of over 76% of male participants and all of them were recorded as the tea smallholders with at least one plot of tea land owned by them. Nearly 63% of the respondents mainly depend on tea

cultivation as full-time farmers, while the rest were the part time cultivators whose main income source was not related to tea. Education level of the respondents was reported fairly good, with more than 40% had attended up to the GCE A/Level or above. It was observed that approximately 66% of the participants had experience of more than 15 years in tea cultivation (Figure 01).

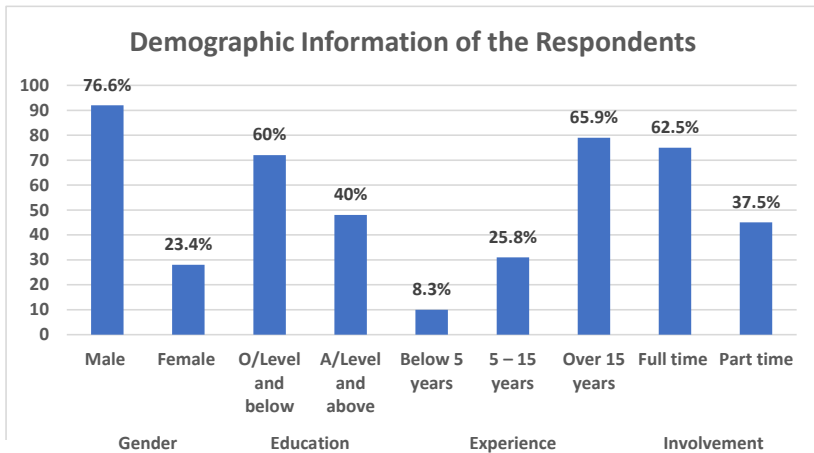


Figure 01: Demographic information of the respondents

3.2. Early experience on tea related extension services

Smallholders' early experience about the tea extension services rendered by the tea related institutes including the government institutes and private companies was investigated prior to inquire their perception. As revealed by the responses, approximately 82% of the respondents have received tea extension services from different extension agents (Table 02). Out of all the respondents, nearly 20% had maintained extension links only with the extension agents of the private sector such as input supplying companies and the tea factories. It is also important to note that 26% of the participants had relied only on the government extension officers in receiving extension services. Further, it was revealed that the majority of participants (nearly 54%) had trusted both the government and private extension agents (i.e., government institutes, tea factories and input supplying companies) to meet their extension needs in tea cultivation (Table 02). Further, it can be noted that 87% of the respondents were satisfied with the extension service rendered by the extension agents and had no problems encountered. Respondents who had encountered problems in extension service (13% of the respondents), mainly pointed out un-satisfiable answers given by the extension agents for their problems, difficulties in getting appointments from the extension agents and travelling difficulties from remote areas to urbans where most of the extension officers are stationed (Table 02).

3.3. Willingness to pay for mobile clinic service

Under the concept of privatizing extension services, farmers are expected to pay a fee for the extension services which could be considered as a supplementary or an alternative to the public extension service (Saravanan and Gowda, 2000). Mobile crop clinics conducted so far were held on the basis of cost sharing approach, where the sponsor of the program (i.e. tea factory or input supplying company) is made responsible for covering the cost of the mobile clinic program. In the light of this sponsorship, the participants were given extension and soil analytical services free of charge. In this survey, the participants were asked whether they too were willing to share a certain amount of cost for the service they receive. As per the responses given in the Table 02, it was revealed that approximately 63% of the respondents were of the view that mobile clinic service be rendered free of charge.

Saravanan and Gowda (2000) investigation concluded that farmers had the most favorable attitudes towards fee-based extension service where majority of extension personnel and considerable percentage of scientists had anxieties about the advantages of privatization. Similarly, Malkanthi and Mahaliyanarachchi (2001) also revealed that more than 50% of the up-country vegetable farmers of Sri Lanka had been positive towards privatization of extension services and is possible to privatize it under certain conditions. In contrary, it was found out here that majority of tea smallholders prefer free of charge service and were not willing to pay for mobile clinic services. This is compatible with the findings of Yapa *et al.* (2005) where the negative attitudes of tea smallholders of Galle district Sri Lanka towards implementing a fee-based extension service was highlighted.

Table 02: Previous extension services received by the respondents

Factor	Categories	Number	Percentage
Previous exposure to extension services (N=120)	Yes	99	82.5%
	No	21	17.5%
Previous extension services received from (N=120)	Public institutes only	31	25.8%
	Private companies only	14	11.6%
	Tea factories only	10	8.3%
	All (public/private/factory)	65	54.3%
Problems encountered in extension services (N=99)	Yes	13	13.1%
	No	86	86.9%
What is the major problem encountered when receive extension service (N=11)	Difficult to get appointment	04	36.3%
	No satisfiable answers for the issues	06	54.5%
	Time consuming	01	9.2%
Willingness to pay for extension service (N=120)	Yes	44	36.6%
	No	76	63.4%

3.4. Participants' main objective of participation for mobile crop clinics

The participant's main objective of participation for mobile crop clinics was also investigated through their responses given in the questionnaire. Accordingly, 42% of the respondents have put forward soil analysis as their main objective of participation for mobile crop clinics. At the same time, 22.5% of the participants have

expected getting solutions for the problems found by themselves in their tea field. Meanwhile, another group of respondents (21.5% of the participants) have sought updating their existing knowledge on tea cultivation. As shown in the Table 03, 86% of the respondents have had one of the above-mentioned objectives of participation, while the rest 14% were not having any specific objective.

Tambo *et al.*, (2020) found out a significant interest among the marginalized farming communities in seeking plant health advices from the plant clinics held in the African continent. Srivastava (2013) has also described farmers' concern in the Indian sub-continent in updating knowledge on plant health related issues through the participation for mobile plant clinics. Similarly, the results of this survey also highlight the interest among the Sri Lankan tea smallholders of the Low Country Regions in seeking knowledge update and advices for field problems related to tea cultivation. Apart from that, the demand for soil analytical service, can also be considered as a positive trend. At the same time, these results further suggest that conventional extension approaches are not in a position to adequately cater the existing extension and analytical needs of the tea smallholdings sector in the country.

Table 03: Categorization of respondents' main objective

Objective	Response to the objective (N=120)	Percentage of responses
Soil pH analysis	50	42.0%
Clarifying field problem	27	22.5%
Updating knowledge	26	21.5%
Not specified	17	14.0%

3.5. Smallholder perception on mobile crop clinics

The American Psychological Association defines perception as the process of becoming aware by means of the senses, that enables organize and interpret the stimuli into meaningful knowledge (APA, 2018). Perception was described by Van de Bann and Hawkin (1988) as the process by which information is received and transformed into psychological awareness. When it comes to the field of agriculture, farmers' perception could be described as the process of utilizing information in weighing the pros and cons of agricultural technology adoption prior to reach a decision (Norton and Mumford, 1983).

As illustrated in Table 04, perception of the tea smallholders towards the mobile clinics was measured by using the given statements in the questionnaire. As per the responses given, the respondents are of the view that mobile clinic is one of the most suitable extension approaches for the tea sector. This positive view towards mobile clinics is mainly supported by the responses given for the statement no 01, 04 and 05. Accordingly, over 97% of the participants were perceived those mobile clinics as the most effective way of soil analysis (statement 01). Simultaneously, around 90% had felt that mobile clinics were significantly time and cost saving and is possible to receive more services at a time, in comparison to visiting the tea related institute separately (statement 04 and 05) (Figure 02). Altogether, responses for these statements show that there is a positive perception among the participants towards the mobile clinics.

As per the responses given for the statement no 07, mobile clinics were not interpreted as a platform for undue commercial propagandas of the sponsors such as tea factories and private companies. Similarly, a majority of respondents have not found out any confusion with the answers given for their questions by the officers of different institutes (statement 06) (Figure 02). Responses given for these two statements suggest that the participants have perceived nothing wrong with the involvement of the private sector (i.e. input supplying companies and tea factories) in conducting mobile crop clinics. In contrast to the unwillingness to pay for the service, it is interesting to note their consent for the private sector be present there in collaboration with government institutes.

Some of the constraints and limitations associated with mobile clinics can be detected by analyzing the responses given for the statement no 02, 03 and 08. Accordingly, over 60% had understood the inadequacy of time as a limiting factor in getting the service fulfilled at required level (statement 08). Likewise, 45% of the respondents were of the view that it was not possible to sort out all the tea related problems they were having (statement 02). Further, only a half of the respondents (52.5%) were aware that their tea knowledge was satisfactorily updated through the mobile clinic (statement 03), whereas others had been either neutral or dis-agree. Consequently, the factors such as inadequate time and comparatively less attention given for providing with latest knowledge and technologies in tea cultivation, can be assumed the ‘bottle-necks’ of mobile clinics as perceived by the respondents (Table 04 and Figure 02).

Table 04: Participants’ responses for perception statements

Statement	Perception % (N=120)		
	Agree	Neutral	Disagree
It was very easy to get soil pH analysis done through the mobile clinic	97.5	-	2.5
It was able to sort out all the tea related problems through the mobile clinic	35	20	45
Knowledge related to tea cultivation was perfectly updated through the mobile clinic	52.5	30	17.5
Fulfills more than one service at a time in the presence of all the tea related institutes	87.5	10	2.5
Mobile clinic is efficient in time and cost saving compared to visiting the institutes	95	2.5	2.5
It makes confusion with the solutions given for the problems raised	10	60	30
Commercial propaganda is prioritized in the presence of profit-oriented companies	15	30	55
No adequate time to get the service fulfilled owing to the large number of participants	62.5	7.5	30

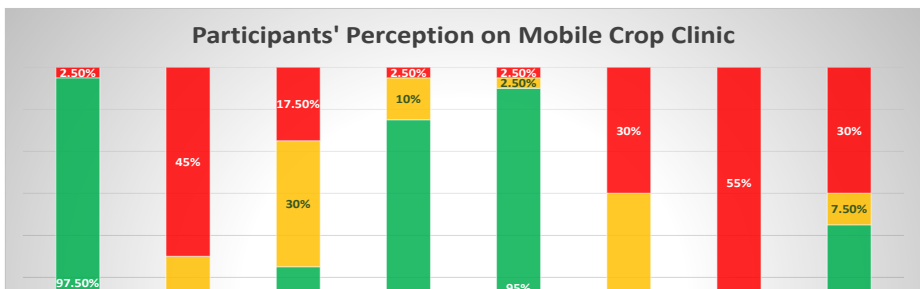


Figure 02: Percentage wise responses for each perception statement

3.6. Factors affecting the perception of mobile clinics

Eight (08) independent variables i.e., gender, education, experience in tea cultivation, type of involvement (full time or part time), previous exposure to extension service, problem encountered in receiving previous extension service, objective of participation and willingness to pay were used to determine the perception of the smallholders towards the effectiveness of mobile clinics. It was found that type of involvement in tea (full time or part time) showed a significant effect on perception (Table 05). Statistical analysis further shows that the part time tea smallholders (mean rank – 49.01) are having a better perception towards the mobile clinics than that of full-time farmers. These results are not compatible with that of the findings pointed out by Munasinghe *et al.* (2020; 2023) where the type of involvement (full-time vs part-time) has no significant effect on tea smallholders' attitudes and perceptions. In contrary, the results of this study suggest that part time farmers are more enthusiastic in participating for mobile clinics. This could be because of the less opportunities found by them to be exposed into regular extension programs owing to the lack of time and busy schedules adopted by them.

Objective of participation was also found significantly affecting the perception towards the mobile clinics. Accordingly, it was noted that the respondents whose main objective was 'knowledge updating' had the least perception towards mobile clinics, compared to those with other two objectives. These results are positively related to the responses given for statement no 03, where only a half of the respondents were of the view that their knowledge was perfectly updated through mobile crop clinics. It is therefore needed to re-consider the format and the content of mobile clinics and identify the possible constraints that hinder knowledge updating of the participants.

It was also revealed that participants' perception on mobile clinic approach is not significantly affected by the gender, education, experience, willingness to pay, previous exposure for extension service and problems encountered. It could therefore be assumed that by and large, the structure and content of mobile clinics are equally suited for the tea smallholders of all the categories irrespective of their differences. These findings are quite similar to that of Munasinghe *et al.* (2023), where it was found out that farmers' perception towards good nursery practices had no relationship with gender, knowledge, education and experience in tea, which is mostly due to the continuous effort rendered by the tea extension officers in conducting educational and awareness programs targeting the tea smallholders of all the categories.

Table 05: Factors affecting the perception of nursery holders

Variables	Categories	Statistical Technique	Mean	P Values
			Rank	Perception
Gender	Male	Mann – Whitney U test	40.86	0.15
	Female		49.95	
Education	GCE O/L or below	Mann – Whitney U test	42.99	0.99
	GCE A/L or above		43.01	
Experience in tea Cultivation	< 5 years	Kruskal – Wallis Test	43.79	0.11
	5 – 15 years		52.16	
	> 15 years		39.30	
Involvement	Full time	Mann – Whitney U test	38.95	0.05*
	Part time		49.01	
Willingness to pay	Yes	Mann – Whitney U test	43.18	0.96
	No		42.90	
Ranking based on level of objective fulfillment	Update knowledge	Kruskal – Wallis test	29.07	0.04*
	Problem solving		43.07	
	Soil pH analysis		43.38	
Previous exposure	Yes	Mann – Whitney	41.26	0.16
to the extension services Problems encountered in previous extension services	No	U test	51.10	0.12
	Yes		Mann – Whitney U test	
	No	U test	36.94	

* - significant at 0.05 level

4. Conclusions and Recommendations

Mobile crop clinic is a novel extension approach for the tea sector of Sri Lanka from which tea growers can update their knowledge on tea, sort out specific problems encountered in their tea fields and get soil samples analyzed. These clinics need to be made more oriented towards knowledge update of the participants preferably by revising its format and content. It is also needed allocating more opportunities for the participants to update their existing knowledge on tea and aware on latest technologies in tea cultivation. It is equally important preserving opportunities for the participants to get solutions for their own field problems and analysis of soil samples. It is further encouraged to launch mobile clinics under public-private participatory approach where the tea factories and input supplying private companies can render their

sponsorship towards these programs. Since participants prefer receiving a free of charge service, the public institutes such as TRI and TSHDA need to take upper hand in organizing the mobile clinic programs with the maximum collaboration of the private sector, that ensures an effective service while maintaining the standards and ethics of the programs. It is also suggested ensuring diverse and equal participation of tea smallholders for mobile clinics irrespective of gender, education, experience, age, whether full time or part time etc., while encouraging more involvement of young farmers.

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