

# Capacity building of agriculture extension officers and farmers in ICT skills to minimize the digital divide and construct a sustainable social learning capital capable of using ICT for knowledge acquisition and sharing

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## ABSTRACT

Traditionally majority of the rural farming community in Sri Lanka rely on agriculture extension officers for advice, guidance and training opportunities on crop cultivation, particularly due to government assistance schemes in agriculture. Ongoing COL-L3F project implemented by the Open University of Sri Lanka (OUSL) recognized that it was an essential pre-requisite to develop ICT skills in the officers involved with agri-extension services to establish a sustainable ICT based knowledge acquisition system in farming community. Preliminary survey revealed that 37 % of 175 officers who underwent training had prior exposure to ICT, whereas only 22% of them used it in extension services. Although 26% had an exposure to the internet, less than 10% used it for knowledge acquisition. Farming community had no prior knowledge in ICT. A programme was developed by OUSL to train 175 officers involved in agri-extension service in the Export Agriculture Department along with some farmers from the farming community. The programme consists of a 'bridge course' in ICT, custom made modules on application of ICT in agriculture, knowledge acquisition through ODL and use of OER was offered by OUSL. Results of the summative assessments, quantitative and qualitative studies conducted by means of a questionnaire and interviews revealed that 80% of officers (140) have successfully completed the examinations and qualified for OUSL certificate on computer literacy. Sixty-six percent of them have planned ICT based activities for extension service. Sixty percent claimed that their ICT literacy level increased at least to 'average level' from 'unfamiliar' or 'new comer' status. Twenty percent stated that they are at the level of 'adaptation' or 'creative application' on applying ICT in agriculture. Many have acquired skills in ODL and use of OER for knowledge acquisition. Motivated by the programme, farmers are in the process of building an IT resource center in the village.

## INTRODUCTION

The earliest form of agriculture extension in Sri Lanka was the duty of the most experienced farmer in the village. Modern agriculture extension in Sri Lanka dates back to the colonial period of Dutch in 17<sup>th</sup> century aiming at expanding the exportation of cinnamon; and then in 18<sup>th</sup> & 19<sup>th</sup> centuries during the British period, with the aim of spreading of tea, coffee and rubber (Hathurusinghe, 2010). Providing evidence to a long history, with well organized institutional arrangements, village level extension service was the primary contact point of farmers, facilitating the smooth flow of information and technology transfer between the farming society and research and development sectors (Wijekoon, 2009).

Department of Export Agriculture (DEA) is one of the main government institutions of Sri Lanka which is responsible for research, development and extension activities of export agricultural crops; mainly spices. Having nearly 200 Export Agriculture Extension Officers (EAEO) positioned throughout the country, DEA extension service serves as the 'live wire' that transmit knowledge about cultivation, production and quality improvement of export agricultural crops to farmers and other stakeholders (Department of Export Agriculture, 2010). Accordingly, farmer dependency on EAEOs is mainly of twofold: technical advice, guidance and training opportunities on crop cultivation and production, and the administering government incentive schemes. Hence, there had been a heavy interdependence between EAEOs and farmers.

Sri Lankan agriculture is mainly based on small-size, family-owned, dispersed units (Department of Agriculture, no date, probably 2010). Given that there is a large number of farmers per EAEO (more than 1500 families per officer), catering to individual needs, requirements and queries of farmers is beyond the existing capacity and resources. Applications of ICT which enable people to communicate effectively overcoming the limitations of time and space in extension service are a viable solution to this problem (Richardson, 2006). ICT empowers people and also avails them with opportunities for learning and income generating and enabled people to actively participate in decision making process (Asian Development Bank, 2004).

In providing solutions on appropriate ICT applications for improving extension services, skills and competencies of stakeholders need to be improved while providing necessary advocacy. Asian Development Bank, (2004) presented the concept of 'Multi stakeholder ICT partnerships' that collaborate with non-traditional parties in creating lasting and meaningful impacts in community development. This research study analyzes the effectiveness of the first phase of the collaborative approach of a university centred lifelong learning project, in empowering the extension officers of the DEA in using ICT in livelihood development of the farming community.

## **CONTEXT**

The Open University of Sri Lanka (OUSL), initiated the Lifelong Learning for Farmers (L3F) project of the Commonwealth of Learning (COL) in December 2010 to improve the livelihood of farmers involved in cultivation of Export Agriculture Crop with particular interest on ginger and turmeric cultivation in a rural village 'Wathurakumbura', in the Kandy District (Senadheera, et al., 2012). This project was implemented in collaboration with the Department of Export Agriculture, Regional Development Bank and SGS Lanka (Pvt.) Ltd. L3F framework of COL aims at building the capacity among farmers, landless labourers and extension officers, by the use of Open and Distance Learning (ODL) and ICTs.

At the very inception of this project, farmers were provided with the technical information on crop cultivation using ODL methodologies (mainly using print mode) made available at [www.ou.ac.lk/col](http://www.ou.ac.lk/col), while exploring the possibility of integrating ICT enabled self directed learning at later stages (Senadheera, et al., 2012). With the objective of narrowing the gap of digital-divide faced by the farmers, several ICT training workshops were conducted to train the farmers to use computers in acquiring knowledge needed for their crop cultivation and production.

While going through this process, project team identified that training farmers on ICT would not be a sustainable approach unless the extension officer is capable of using ICT in extension services. Department of Export Agriculture was also of the opinion that their officers be given ICT training as a precursor to increase the efficiency and effectiveness of the entire sector of agri-extension. However, there were no immediate plans or fund allocations to improve ICT knowledge and skills in EAEOs by the government. Hence, COL-L3F project team of the OUSL implemented the programme on 'Capacity building of EAEOs on usage of ICT on agriculture extension' on September 2012, to empower the EAEOs in using ICT, and to create a transformative influence among them in establishing a sustainable ICT based knowledge dissemination system. COL provided the necessary guidance and financial support for the programme.

## **TRAINING OF EXTENSION OFFICERS**

### **Project Initiation**

This project was designed to train 175 officers involved with export agriculture extension services throughout the country. Besides the 175 officers, 6 farmers involved in COL-L3F project of the OUSL were also given the opportunity to join in the programme with the expectation that they would involve in capacity building in other farmer where L3F project is being operated.

## **Aims and Objectives of the training**

With the aim of developing a strong social learning capital among the farming community capable of acquiring, storing, sharing, and applying new knowledge disseminated through ICT based ODL methods, the following objectives were set to achieve through the training of EAEOs.

- Enhance skills of EAEOs in using and applying ICT in agriculture, so that it build the capacity of the farmers in acquiring and sharing new knowledge, information, and technology on agriculture.
- Minimize the gap between the EAEOs and farmers in the information accessibility to improve lifelong learning capacity and ensure livelihood security.
- Enable the extension officers to serve the farming population in an effective and efficient way.

With the above aims and objectives, the knowledge consortium of OUSL-COL-L3F, developed a tailor made programme for training of EAEOs.

## **Programme Structure**

The programme consisted of five learning modules including three basic modules about computer literacy and two other tailor made modules to further improve application of ICT knowledge accrued through the first three modules in agri-extension context.

- Module 1- Introduction to computing
- Module 2 - Use of Microsoft office package
- Module 3- World Wide Web usage and electronic communication.

Module 4 - Application of ICT in agriculture and agri-information management. This Module consists mainly of four components:

- a) Use of the Internet tools in management and delivery of agriculture extension services
- b) Fundamentals of Information Systems for agriculture extension services
- c) Use of Open and Distance Learning in agriculture extension
- d) Open Educational Resources (OER) for agriculture extension services

Module 5 - Applying the acquired ICT knowledge in improving the agri-extension services through a mini-project. These mini projects were based on developing:

- Frequently Asked Questions (FAQs) for cultivation and production of various crops,
- Databases for stakeholder network for different crops,
- 'Crop Doctor' in identifying diseases related to various crops

## **Programme Delivery and Assessment**

The first three modules were delivered in parallel to the Computer Literacy programme conducted by the Regional Educational Services of the OUSL. Each of them was given course material especially developed for ODL. These three modules had 20 days of face-to-face learning sessions (6 hour/day) from. These sessions were conducted in parallel in the seven regional and study centers of the OUSL for the convenience of the participants.

The purpose of the fourth and fifth modules was to facilitate the officers who gained basic knowledge in ICT to apply it in the management of agriculture extension services. Fourth module was conducted over 4 weekends in May 2013 by four resource persons appointed by the OUSL. Resource persons included two academics from OUSL, a project manager in a government institution and an assistant director of the DEA. Meanwhile, participants were guided to conduct mini-projects for the module five listed above.

The OUSL conducted theory and practical examinations at the end of the third module. This examination was the routine final assessment of the Computer Literacy programme in the OUSL. Submitting the project report and the group presentation for the last module was also used as a measure of completing the whole programme successfully.

## RESEARCH QUESTIONS

A study was carried out to investigate the effect of the ICT training programme on EAEOs conducted by the OUSL-L3F project. The research questions for this study were:

1. Level to which the ICT literacy was developed in EAEOs?
2. How did the training programme manifest the capacity building of EAEOs?
3. What were the motivating factors evident during the training process?
4. How are they going to adopt this training in community development of farmers after this training?

## METHODS

Quantitative and qualitative research methods were used to collect data. Quantitative data were gathered by administering a questionnaire among all the EAEOs who participated in the programme, at the beginning and at the end of the study programme. Interviews were conducted to gather qualitative data, and were carried out in the form of Focus Group Discussions (FGDs) and Key Informant's Interviews (KIIs). Four FGDs were conducted with a group size of 8-10, at the end of ICT training at Colombo, Kandy and Matara regional centres of OUSL. Four KIIs were conducted by interviewing the computer instructors at the same regional centers.

Performance of the final examination results of the computer literacy course and the mini projects submitted were also used to determine the competency in ICT literacy and skills.

**Data analysis** - Frequencies were computed for pre and post questionnaire data. Content analysis was carried out for qualitative data. Performance of students at the final examination and mini projects were also used to triangulate and validate the results.

## RESULTS AND DISCUSSION

### Participation and performance

Out of 175 officers enrolled in the programme, 140 successfully completed the first three modules of computer literacy, and received certificates from the OUSL. In addition, 4 out of 6 farmers who followed the programme also received certificates. Participants who completed all modules and successful in their mini-projects received the 'Certificate of Completion' offered jointly by the OUSL and COL. Out of the 50 officers who completed the mini projects, 40 officers were successful in receiving the 'Certificate of Completion' so far.

### Level of ICT literacy

Following figures (Fig. 1, 2 & 3) generated through the questionnaire data revealed the computer usage, knowledge on Internet, and the improvement of computer literacy of the EAEOs. Accordingly, after the programme, 100% of them have developed their capacity in using a computer in their own, and 65% are using emails (Fig. 1). Self-assessed status of the knowledge on using the Internet increased significantly after the training programme (Fig 2). Sixty percent of them claimed that their ICT literacy level increased at least to 'average level' from 'unfamiliar' or 'new comer' status and about three percent of them have improved up to 'advanced' level (Fig. 3).

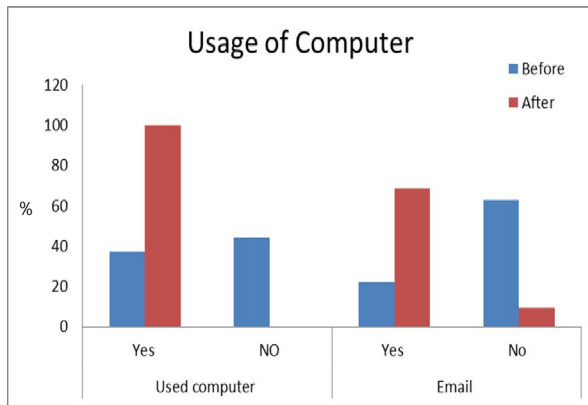


Figure1- Status of computer and email usage capability

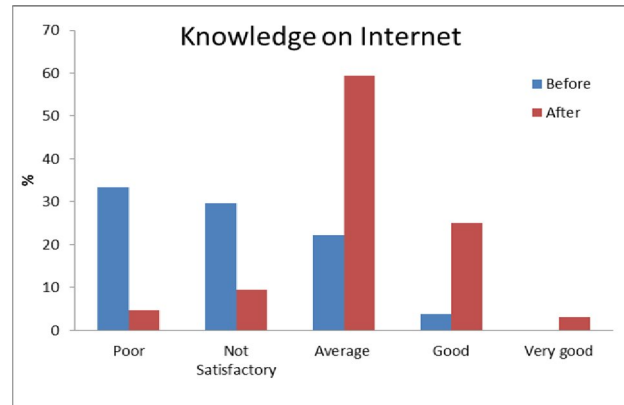


Figure 2- Development of competency on using the Internet

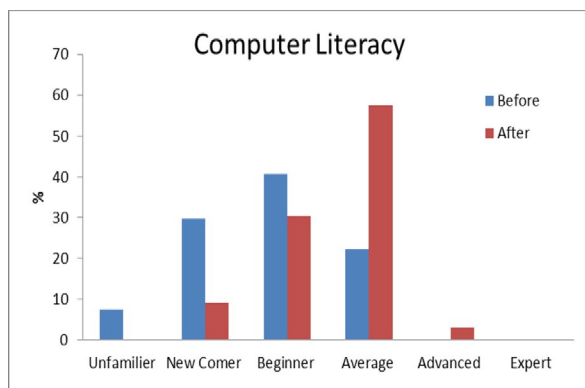


Figure 3- Improvement in computer literacy

Computer instructors of the OUSL disclosed that unlike for the young OUSL students who were following this computer literacy course, they had to put an extra effort in training these EAEOs.

*'At the beginning of the course only a few of them could use the computer in their own. We had to change our normal course activities to suite them, and had to put an extra effort in training them. But their motivation was so high and we could see a progressive improvement within a short period. Except for about 5%, all others performed well at the end'. (English Translation - KII1/KM)*

Instructors also said that farmers who participated in the training were equally competent as EAEOs. However lesser skilled EAEOs and farmers requested extra sessions which were accommodated with much difficulty.

Above results revealed that many of the EAEOs were not computer literate/users before the training, and therefore they lacked the functional computer literacy foundation upon which to build new technology and skills. However, after the training, they significantly improved their ICT skills on computer. As identified by Gelb & Voet (2010), this kind of ICT training serves as a dominant and a common factor in ICT adoption in agriculture.

### Capacity Building in ICT

Capacity building starts with frequency, familiarity and the confidence of the participants in using computers. Quantitative results obtained through questionnaires showed that the frequency of using computers increased after the training (Fig. 4). As indicated in Figure 5, usage of computers for word processing, calculations, photo editing and using the Internet have increased, while use of computers for games have decreased. This can be attributed to the fact that proactive and effective usage of technology increases with effective capacity building.

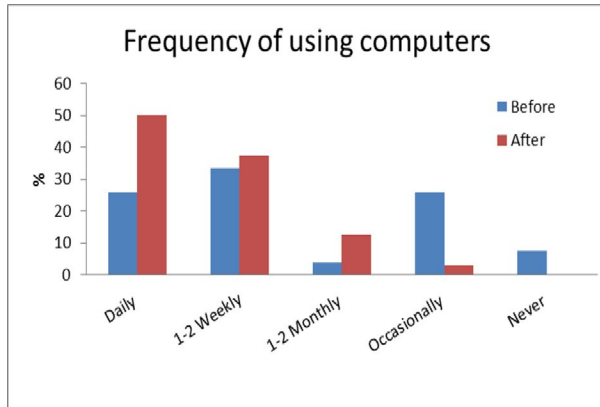


Figure 4- Frequency of using computers by EAEO

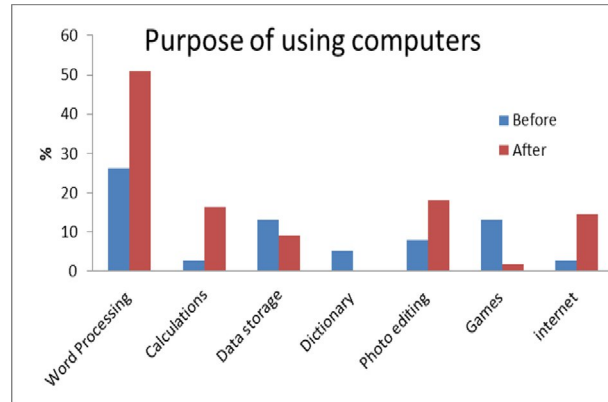


Figure 5- Specific purposes of using computers

Their usage of ICT skills was apparent while submitting their mini-projects too. Out of the 40 who successfully completed the mini-project, two groups showed extraordinary capacity in using their ICT knowledge by developing two interactive multimedia (incorporating hyperlinks etc) by the use of MS PowerPoint ( Fig. 6 & Fig. 7).

These higher level skills could be ascribed to their prior knowledge to some extent, and their competency was also prominent at the computer literacy course where they had to obtain more than 70% marks at the final examination. Questionnaire data also revealed that 32% of 175 officers who underwent training had prior knowledge on computer usage, whereas only 22% of them tried to use it in extension services. On the other hand farming community had no prior knowledge on ICT. The programme would have been more effective if a grading test was performed at the beginning of the course to identify those with prior knowledge and exempt them from following the basic sessions. They would have given the opportunity of starting the course at a higher level and develop their skills to the level of 'master trainers'.

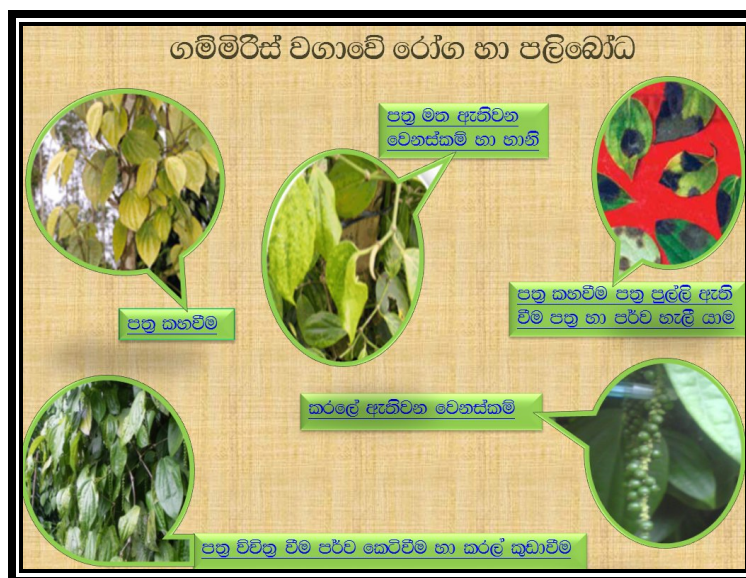


Figure 6- Screen shot of a Multimedia presentation of 'Crop Doctor in Pepper'. This can diagnose disease through series of conditions with illustrations and recommend treatments.





Figure 7- Screen shot of a Multimedia presentation of 'Crop Doctor in Ginger'. This can diagnose disease through series of conditions with illustrations and recommend treatments

### Motivation

Participants' attendance at weekly training sessions was at a very high level (75-80%), and so was the rate of completion (>75%) of the ICT training programme. A very good response was also observed in submitting mini-project proposals, although some projects still to be completed. All these facts can be credited as indicators of motivation showing their willingness to develop ICT skills. The final module of this training programme demanded considerable amount of independent and group work beyond normal working hours. As in the KII4 statement given below, presenting proposals that required more time and skills indicated the motivation and also that participants could identify ICT solutions for exiting problems in their agri-extension mechanism.

*“Although many of the participants seemed to be slow learners, there was a significant increase in the competency of ICT towards the end of the course. Most of them were very much interested in doing the mini-project. However, about 60% of the proposals presented by them as mini-project titles could not be implemented in the short period of time and also with their present knowledge.”* (English Translation – KII4/CM)

During FGDs, EAEOs demanded for advanced sessions on the Internet, more sessions of using ODL in agri-extension, and more training in developing databases. Already a letter was received by the project coordinator of COL-L3F at OUSL through the Director of Export Agriculture, requesting to organize another workshop on the Internet. These facts indicate that this programme brought about considerable motivation among them in acquisition and usage of ICT skills in agri-extension. Motivated by the programme, farmers are in the process of building an IT resource center in the village.

### Application of ICT skills

According to Figure 8, many EAEOs who were at the level of 'awareness' have scaffold themselves to the levels of 'understanding', 'familiarity', 'adaptation' and 'creative application', after the programme. Thirty six percent stated that they are at the level of 'familiarity', 'adaptation' or 'creative application' on applying ICT in agriculture. Many of them agree that they have acquired skills in ODL (90 %) and use of OER (70 %). These results together with the project activities have shown that in addition to the technical knowledge, they have acquired vital extension skills such as knowledge acquisition and effective delivery methods that can be adopted in a demand-driven extension service.

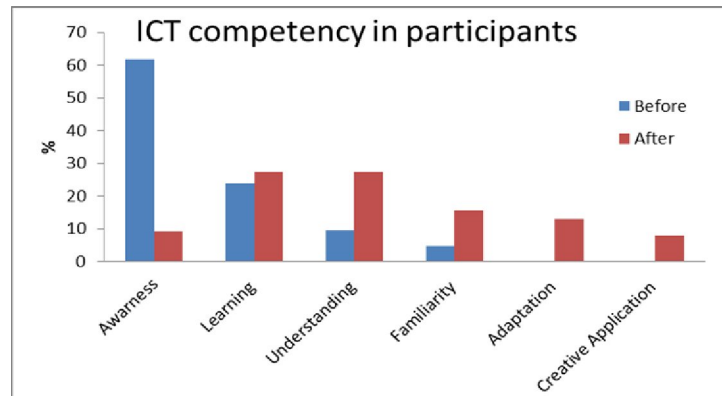


Figure 8- Levels of ICT competency in participants

Answering the question, 'How you are going to adopt the acquired skills in agri-extension?' participants have stated the following in serving the farming community.

- *Use PowerPoint presentations in farmer training*
- *Make farmers aware about new developments and establish quick communication through ICT*
- *Maintain farmer Databases*
- *Data Processing for requirements of the Head office*
- *Increase knowledge in the field of agriculture*
- *Update market trends and prices*
- *Prepare effective ODL material*
- *Increase efficiency of agri-extension services*
- *For research*

These results show that the training programme has facilitated EAEOs in exploring and adapting ICT in agri-extension in complementary to the conventional systems. Although they are thriving on new lines of thoughts there limitations due to resource availability in establishing a sustainable social learning capital that is capable in using ICT. Hence, as stated by Hosseini, Nicknami & Nejad (2009, p.1479), '...ICT adoption is rarely instantaneous; the technology has to be taught and learned, adapted to experience and integrated into production...' they are in the path of ICT adoption, breaking the barriers of digital divide.

## CHALLENGES

As has always been with many projects, there were several challenges to meet with. There was a difficulty in having all officers released in certain days of the week due to their busy work schedule. Urgent meetings scheduled by the Ministry prompted to readjust the dates in the timetables of the programme. Accommodating the officers in computer laboratories in some regional centers of the OUSL was also a challenging task due to limitations in computers and also due to demands of the regular students. When the course was progressing it was apparent that some of the participants had prior knowledge on computer and they could have started course at higher level and developed further to the level of 'trainer of trainers' level. Meanwhile those with lesser knowledge demanded extra sessions which we accommodated with much difficulty. Considerable number of officers was complaining that they had no computer facilities at home or at office to practice what they were learning.

## FUTURE PLANS OF OUSL

The objective of providing this ICT training for extension officers is to increase their efficiency and also to promote and develop similar skills in farming community to establish a social learning capital. Following actions are planned to convert the output of the training programme in achieving project outcomes;



It is envisaged to select a group of EAEOs who had successfully followed the above ICT programme from four/five Districts and be employed in improving digital literacy among farmers to upgrade their cultivations and livelihood standards. It is also make available necessary ICT based knowledge repositories and good ICT based farmer tools (for instance 'Crop Doctor' tools developed by some EAEO as mini-projects) for farmers in L3F sites. Also possibilities to institutionalize the ICT usage among the farmers will be explored.

## CONCLUSION

This study shows a collaborative approach of a university centred lifelong learning project, in empowering EAEOs in using ICT in agri-extension service. Quantitative and qualitative studies showed that the programme was capable in building the capacity of the EAEOs in ICT and its application in agriculture. Six farmers were included in the programme with the intension that they would contribute to enhance the capacity of their peers in the village. Future plans of the EAEOs indicate that they be involved actively in reducing the 'digital divide' in farming community and bring about livelihood improvement. Moreover, it is shown that extension officers and selected farmers of the L3F community have been capacitated and motivated to use the acquired knowledge in ICT for agri-extension and knowledge empowerment of farmers towards their livelihood improvement.

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