Cyber Extension: An Information and Communication Technology Initiative for Agriculture and Rural Development in Sri Lanka

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ABSTRACT

The weak linkages among extension, research, marketing network and farmers limit the effectiveness of research and extension to contribute agricultural development. As an Information and Communication Technology (ICT) initiative, Cyber agricultural extension mechanism has been implemented in the year 2004 as an appropriate information delivery mechanism affordable to rural farmers to satisfy their thirst for information. The project established 45 Cyber Extension Units (CEU) at 45 *Govijana Kendra* offices (Agrarian Service Centres) during the period of 2004-2006. Interactive Multimedia based digital extension strategies were used in the phase one. Continuous monitoring and evaluation process of digital extension mechanism was done during past two years using four methods. After considering the rapid development of e-government situation in Sri Lanka, CDMA (Code Division Multiple Access) telecommunication facility and internet connection were provided in the year 2007 to CEUs to enhance national agriculture research and extension system by improving the generation and collaborative use of agriculture knowledge and information system.

Lack of awareness of cyber mechanism is the major problem identified and this paper discusses the success stories and draw backs of the Cyber extension mechanism. Farmers' database introduced by the Cyber Extension project, as a solution for marketing must be expanded islandwide. Sri Lankan link of Rice Knowledge Bank of International Rice Research Institute (IRRI), which is the largest information repository of rice, must be developed to reach majority of rice farmers in Sri Lanka.

KEYWORDS: Information and Communication Technology, Cyber extension

INTRODUCTION

Agriculture Sector is the backbone of the Sri Lankan economy as in many developing countries, since it contributes a significant amount (17.2 % in the year 2005) to the Gross Domestic Products (GDP) and the contribution to the economic growth is 4.4% (Central Bank, 2006). As to the situation in 2005, 80% of its 19.7 million population is rural and 45% of the total Sri Lankan work force is employed in Agriculture sector. Nearly 30% of the population still depends on the agriculture as main livelihood. The country's GDP has been growing at 6% per annum (in 2005), though that of agriculture is growing at only 1.6%.

Earlier, *Krushikarma Viyapthi Sevaka Niladari* (KVSN) were the grass root level extension officers providing face to face extension services, which facilitated the smooth transfer of technologies and information to the farming community.

Drastic changes, such as trade liberalization, withdrawal of agricultural extension workers from extension activities, provincialization and decentralization of powers to provincial councils, there has been a significant erosion in the public agricultural extension system in the country. This has paved the way to severe setbacks in regular information flow from knowledge repositories (Research Station) to farmers and back to researchers/ agriculturists. Therefore as an ICT initiative; 'Cyber extension' mechanism has been implemented in Sri Lanka in the year 2004 as an appropriate information exchange mechanism affordable to rural farmers to satisfy their information needs.

Background of ICT Sector in Sri Lanka before the project implementation

In the 2003, e-government index of Sri Lanka was 0.92, which was below the global mean e-government index of 1.62 and it described, the e-government capacity of Sri Lanka was poor (Kumarawadu, 2003). In the year 2003, country had a very small numbers of PCs/100 (0.56) and only 0.6% of the population was on-line.

A research (Kumarawadu, 2003) on the web survey of government institutes revealed that 30% of the ministries in the country did not have web sites or may not be accessible since they were inactive.

38% of the ministries were in the infant stage and information available in web pages was often static in content and the number of pages was limited to few web pages. Only about 17% of ministries offered interactive web content, where users have access to regularly updated information and can communicate through e-mail and download government documents through the Internet. In the same study, it was found that 99% of e-mail were not responded by the web masters. In the year 2003, the progress of e–government solutions was very slow and very little information was accessible by the users through the internet. After considering the poor teledensity (telecommunication facility) and the poor e-government solutions in Sri Lanka (See Fig. 1, 2 and 3) web based ICT initiative was not introduced in the cyber extension project in the year 2004.

What is Cyber Extension

Cyber extension is an agricultural information exchange mechanism over cyber space, the imaginary space behind the interconnected computer networks through telecommunication means. It utilizes the power of networks, computer communications and interactive multimedia to facilitate information sharing mechanism (Wijekoon, 2003).

METHODOLOGY

Considering the limitations in the original online cyber extension mechanism, which depends on telecommunications facility, the project was implemented in two phases.

Phase I   An alternative approach: Digital / wireless extension strategies

Phase II   Real cyber extension with internet and telecommunication facility

Phase I

An Alternative Approach to Cyber Extension: Digital/ Wireless Extension Strategies

Council for Agriculture Research Policy (CARP) funded for the phase one of the project by establishing Multi Media Computer lab at the Audio Visual Centre (AVC) of the Department of Agriculture (DOA) with employing two Research Assistants, six technical assistants and 12 computer graphic designers.

In this phase, Cyber Extension Units (Rural Agriculture Knowledge Centres) were established at selected ASCs. Initially, CARP funded for fifteen Cyber units and later increased up to twenty three.

Rice Granary Area Programme (GAP) with International Rice Research Institute (IRRI), Philippines funded for another twenty two and the total has now increased to 45 units, scattered all most all districts.

Each cyber extension unit comprises a high-end multimedia computers, digital camera, laser printer, Scanner and uninterruptible power supply (UPS) unit. The Cyber Unit is managed by the Agriculture Instructor (AI) and continuous computer training programs have been conducted at the AVC to improve computer skills of the AI. In this phase, multimedia e-learning strategies were implemented with the use of interactive Multimedia CD- ROMs (IMM CD-ROMs).

Interactive Multimedia CD-ROMs

A stand alone computer application distributed with CD-ROMs, with a range of media elements such as graphics, photos, text, illustrations, animations, sounds and video, presented in a user interface where users have some control to select, what information is presented and when (Wijekoon, 1999a; Wijekoon, 1999b).

Digital Extension Strategy 1 – Use of IMM CDROMs as Information Database in Various Agriculture Crops

e-leaning strategies have been introduced to cyber units by using IMM CDROMs on agriculture subjects. Objective of using IMM CDs as ICT strategy was to provide farmers with relevant agricultural content in an aesthetically pleasing and entertaining environment. Extension workers can use IMM CDROMs on agriculture, as a teaching tool (audio visual aid). Farmers also can use the CDROMs as a self-learning package. Farmers trained on use of information technologies in agriculture, will become 'e-farmer'. The extension workers will become 'e-extensionist'. The AVC of the DOA has already completed thirty three IMM CDs are distributed to Cyber extension units.

Each CDROM was developed with the assistance of a senior research officer of the subject, a research assistant and team of multimedia designers of the audio visual centre of the DOA.

In addition to technical information on each crop, organized under several chapters a separate chapter was devoted for compiling database on research papers and articles published by local authors in local and foreign journals. Each CD has a separate link for video films pertaining to each crop, which were produced and telecast through *Mihikatha Dinuwo* (weekly television program of the DOA) by the Audio Visual centre.

Digital Extension Strategy 2 – Use of Interactive Multimedia to Develop low cost Audio Visual Aids

Extension and training are inevitable in transferring technical know-how to farmers and most of these trainings are not supported with better quality audio visual media (Wijekoon *et al.,* 1999a). Therefore a CDROM to develop presentation skills (especially flipchart skills) of Agriculture Instructors was developed and given to all Cyber units. As a consequence, extension workers were able to produce low cost audio visual aids at their door step with locally available material (Hi-tech to improve low cost instructional media).

Interface and Navigational Design of CDROMs

CDROMs were produced for extension workers as well as farmers, where few of the potential users were expected to have had much previous exposure to such technologies. Considering the low computer literacy of extension workers as well as farmers, a familiar concept for the interface was used; an electronic book. Similar to reading an analogue book. Page turn is facilitated by two icons; 'Next' (to go next page) and "Previous' (to go previous page). The contents were organized into chapters, topics and sub-topics. Most of the pages contain variety of multimedia presentations (video, sound /voice-overs, animations, graphics and text).

All media are interactive and users may review and/or skip section, as they desire. Each page is printable and farmers will be able to get a print. CDROMs were developed using software packages of Macromedia Director and have been complied for operation in Windows PCs. PhotoShop, Illustrator, Microsoft Word, 3D Studio Max, Flash and Adobe Premier are the other software used for IMM CD development.

Digital Extension Strategy 3 – New dimension for Web Based (Internet) Delivery Mechanism with CD ROMs

The DOA has setup the web of www.agridept.gov.lk to serve farmers as well as the general public. The website, presents most of the agriculture related information as well as agricultural statistics, news, recently published books etc. The Cyber extension project has established a mechanism to distribute DOA web to *Cyber units*.

Digital Extension Strategy 4 – Develop Digital Training Material (Audio Visual Aids) for Local Extension and Training

The most of the farmers problems, reported in the recent past were location specific. In certain circumstances IMM CDs produced by the national centre would not give answers for their location specific problems.

Therefore, extensionist attached to *Govijana kendraya,* were able to produce their own 'Power Point' presentations and desktop publications by using the facility of Cyber extension unit for their extension training at local level. They were also asked to compile a visual database of local problems in each season and there by researchers would be able to investigate the history of local problems.

Phase II

A large number of pilot projects and studies in developing countries during the year 2000-2003 indicated that the (Maru, 2003; Riggs, 2003) main issues in the use of ICTs for agricultural and rural development cluster around 'connectivity' and it is so in Sri Lanka as well. Poor telecommunication facility was the key element for the problem of connectivity in the year 2003/2004. However, situation is now changed and Telecommunication industry in the country has leaped forward dramatically in the recent past (See Fig. 1,2 and 3). Inaddition to development in telecommunication facility, all most all government institutions have their own dynamic websites. DOA also has the largest website in this country (www.agridept.gov.lk) with all three languages (Sinhala, English and Tamil). This website is daily updated with latest news by the web master of AVC and text version of weekly television programs of the DOA also appear in the site.
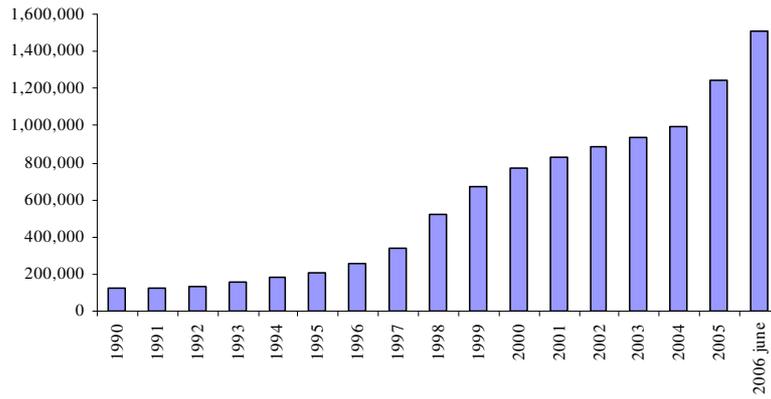
**Figure.1: Growth of Fixed Access Telephones**

(Source – http://www.tre.gov.lk/statistic.htm)
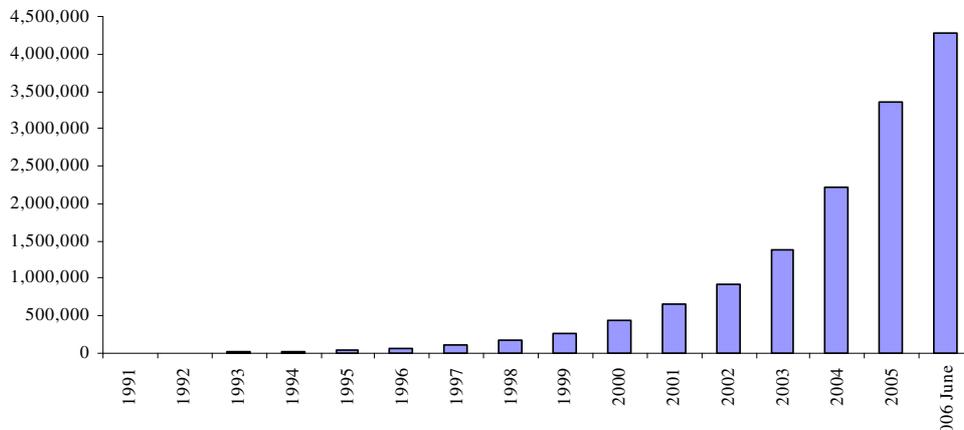
Figure.2: Growth of Mobile Subscribers

(Source – http://www.tre.gov.lk/statistic.htm)
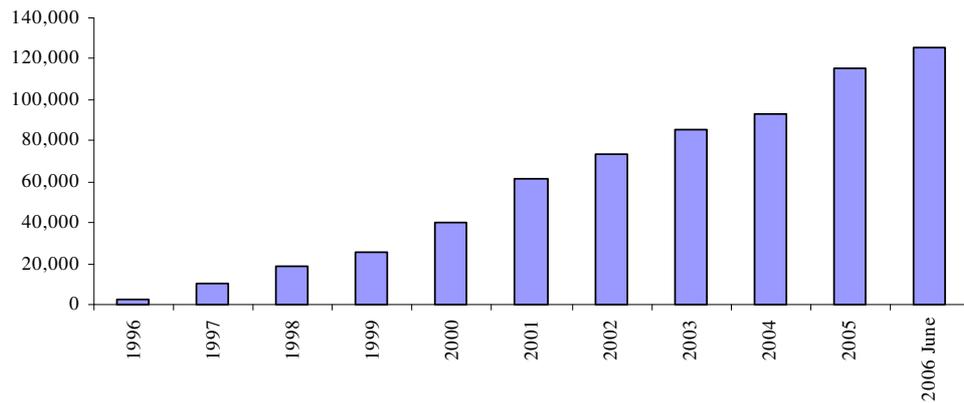
Figure. 3: Growth of Internet and Email Subscribers

(Source – http://www.tre.gov.lk/statistic.htm)

Rice knowledge bank is the latest addition to World Wide Web. The Home page of Rice Knowledge Bank (RKB) of International Rice Research Institute (IRRI), which is the largest information repository of Rice (Lapitan *et al.,* 2006), has Sri Lanka link in *Sinhala*, which contains fact sheets, leaflets, rice doctor, video clips etc. In short, large amount of information sources appropriate to local farmers are now available for internet browsing. (Wijekoon *et al.,* 2006)

After considering the development in telecommunication facility and rapidly grown dynamic e-government situation in Sri Lanka, a maximum utilization of original on-line Cyber extension was implemented in November 2006. CDMA (Code Division Multiple Access) and Internet facility were provided to all forty five Cyber units of the project.

The sustainability of agriculture sector can be improved by better information on knowledge of supply, demand, knowledge of buyer requirements and the prices. Pre- seasonal planning will help the country to avoid over production and ultimate low prices. Considering the importance of these information, a farmer database (name of the farmer, type of crop, extent, expected yield etc.) was introduced to the network of information repository of the DOA web site in early 2007. This initiative will be an attempt to solve marketing problems of the farmer as direct link will be established between the farmer and the whole sale buyer, both local and foreign, without middlemen.

The regular updating database will also give policy makers a clear insight of availability of crop at a given time, which helps them for export/import decision making.

RESULTS AND DISCUSSION

Continuous monitoring and evaluation was done for last 3 years by using four methods.

1). Results of the reports of the Cyber Units

Every cyber extension unit should submit a monthly progress report to the cyber evaluation team through their respective Deputy Directors. The main criteria (Performance indicators) and ranking of first 10 Cyber units are given in Table 1.

Since majority of above indicators are measurable and physically available at the Cyber Unit (eg. Power point presentations, Leaflets, Journals, Visual data base) Agricultural Instructors were not able to present faulty reports. In addition, the digital camera of the unit was used to keep visual records, such as training programs conducted by the Cyber unit.

Table 1: Ranking of Cyber Extension Units by Reports of Agriculture Instructor (First 10 units are given in the table)

	Evaluation Criteria	1 Rassagala (Ratnapura)	2 Wavinna (Ampara)	3 Marassana (Kandy)	4 Urapola (Gampaha)	5 Mannar	6 Embilipitiya (Rathnapura)	7 Kanthale (Trincomalee)	8 Mahawa	9 Kelaniya	10 Thellulla (Monaragala)
1	Trainings conducted for farmers using CDs as a teaching tool - (%)	80	18	34.7	38.7	14.67	45.3	19.3	14.6	17.3	6
2	Self learning sessions for farmers/ Officers - (%)	38	94	18	34	6	20	0	16	0	28
3	Farmers trained - (%)	26	97.9	48.7	29.8	20	29.6	38.1	13.6	22.1	4.1
4	Power Point Presentations produced for farmer trainings - (%)	38	36	10	22	12	24	60	36	42	4
5	Inquiries made by farmers for which solutions are available - (%)	70	46	44	30	74	72	0	0	8	0
6	E-mails sent to researchers and response - (%)	60	0	0	0	0	0	0	0	0	0
7	Leaflets produced) - (%)	28.3	28.3	83.3	41.6	8.3	40	21.7	3.3	31.7	38.3
8	CD burning - (%)	86.8	19.7	6.2	1.8	0	9.5	1.3	2.8	3.8	0
9	Flip charts produced - (%)	75	0	15	90	50	0	75	15	10	0
10	Information provided to School Teachers, School Children and Entrepreneurs - (%)	33.3	43.3	28.3	0	93.3	0	0	56.7	0	53.3
	Total (%)	53.54	38.32	28.82	28.79	27.83	24.04	21.54	15.79	13.49	13.37

2). Results of the Observation of Cyber Evaluation Team

ICT officers of the AVC visits all the Cyber units regularly. The evaluation was done by using the following criteria.

1. Whether Cyber units is closed/opened/actively functioning

2. Functions of the unit by investigating the digital photo library of the unit. (Every activity of the Cyber unit must be visualized through digital photos)

3. Computer skills of the Cyber Staff

4. Inspection of training material/Instructional media material produced by the Cyber unit

5. Arrangement/Cleanness of the Cyber unit

6. Arrangements to keep open the Cyber unit for five days/week

Rassagala, Vavinna, Marassana, Urapola, Kalaniya, Mannar, Mahawa, Thellulla, Kanthale, Savasthipura are the best Cyber units according to observation by the Cyber extension team.

3). Results of the Questionnaire Survey

A questionnaire survey was conducted using structured questionnaires with users of the six Cyber extension units (Rassagala, Vavinna, Hanguranketha, Yatiwawala, Marassana, Urapola). Questions were based on the following criteria and analyzis was done by using Statistical Package for Social Science (SPSS). Individuals for the sample was selected by observing the digital photographs of Cyber training programs as participants for training programs appear in the photo.

1. Method of awareness of Cyber extension unit

2. Frequency of visiting the Cyber unit

3. Objective of visiting the Cyber unit

4. Quality, clarity and appropriateness of information provided by the Cyber unit

5. Participation for training at Cyber unit and the quality of training due to new digital instructional media material (IMM CDs, Power Point, Visual database etc.)

6. User interphase and navigation scheme of IMM CDs

7. Perception of information presented in CDs

8. Computer skills and interest of Cyber staff

Primary objective of this study was to evaluate the responses of farmers to cyber extension as a method of technology dissemination.

Although not investigated in the study, (only users of Cyber unit were interviewed) it was revealed that the majority of general public of the area covered by the Agrarian Service Centre are not aware of the Cyber extension unit. The analysis revealed (Rathnayaka, 2006) that the majority of the respondents (50%) were received the information about Cyber extension unit, when they were visiting the agrarian service centre. 51.1% of the farmers visit the CEU for training programs and clarify their questions on farming practices. 48.9% farmers participated for the training program conducted using IMM CD ROMs and Power Point Presentations.

18.9% of the farmers have visited the Cyber Extension unit for training. 11.1% of the farmers visited Cyber unit, when they were visiting the ASC for fertilizer, seeds, planting material etc. It is surprising that only 8.9% farmers have visited Cyber unit to use IMM CDs as self learning material. Reason, was that they are computer shy. It was also reported that the majority (80%) of CD ROMS were used by Agriculture Instructors for their training programs as a teaching tool.

4). Field Impact Survey

One field impact survey was conducted with farmers under perview of *Ambalantota* Cyber unit.

A special attention was given to *Wileyaya* (52 Acres, 18 farmers) in *Ridiyagama*, as rice yield of farmers in this village was very poor for several years. Cyber staff of Ambalantota Cyber unit conducted a Participatory Technology Delivering (PTD) study with farmers and found that their knowledge in paddy cultivation was very poor and latest innovation such as use of straw, paddy husk charcoal etc. were never adopted. Therefore, Cyber staff conducted several training programs at the Cyber unit in the year 2005 and the yield was gradually increased from following season (See Fig. 4).
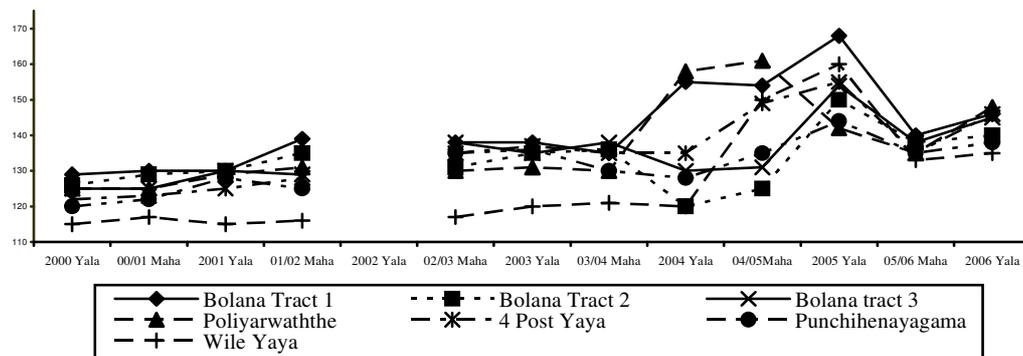

Figure. 4: Average Yield of *Ridiyagama* AI Segment in Past 13 Seasons (Bu/Ac)

Lessons Learnt

1.) Lack of awareness of Cyber agriculture extension

This was identified as the main draw back for not using the Cyber facility of the *Govijana Kendraya*. Even though farmers have seen the computer facility in the office of the Agriculture Instructor they have thought that the facility is not for farmers and computer is for office work of the Agriculture Instructor. To overcome the problem a name board and a poster were given to display at the office to inform people that computer facility is available for farmers. Mass media strategies were not used as the project is confined to 45 Cyber units out of 550 units in the island and therefore localized awareness programs were implemented. One such an initiative was the Information day.

This was a multiple media approach in one whole day at the Cyber unit and two such Information days were organized; one at *Marassana* and the other at *Rassagala*. A Street drama, Muppet show, Mobile Cyber exhibition stall and Banners were used as media strategies, in addition to face to face farmer/extension/research dialogues for specific agricultural issues in the area.

2). Opening days for a week of Cyber unit/Agriculture Instructors' office has increased

Traditionally, the Agriculture Instructor's room of the ASC opens on Wednesday, as this day is the office day of the Agriculture Instructor. With the provision of Cyber facility to AI's office, they were instructed to open the Cyber unit for five days and Monitoring officers and Agriculture Research and Production Assistants (ARPAs) were requested to manage the Cyber unit, when AI is not available. Name of officers who manage the Cyber unit during each day of the week was provided to project management and they were given training on computer skill. This arrangement has another hidden advantage as farmer will be able to visit ASC during five days of the week for their other agricultural needs.

3). Strengthening the digital instruction media material production activity up to the standard of National Audio Visual Centre at Gannoruwa

Since continues training programs have been conducted at AVC for Cyber staff during past three years, majority of staff are now capable of producing latest digital instructional media material.

These units are now working as satellite stations of the national Audio Visual Centre at Gannoruwa, as they provide audio visual service not only to Cyber unit but also to district and even provincial extension staff.

4). Formation of Cyber villages

It was revealed that with the provision of Cyber units, there is a tendency to form Cyber groups (user groups) in some areas. Cyber villages of *Biso Bandara* and *Mandalagiriya* of *Madirigiriya* Cyber unit and *Hathamuna* and *Siriketha* of *Hingurakgoda* Cyber unit are some of the villages, which are given special attention for Cyber extension mechanism. Impact studies are being conducted at these Cyber villages to investigate the effect of Cyber extension. This concept was introduced by IRRI project on Technology promotion using Cyber unit in the rice granary area and the concept is called participatory technology delivery strategy. (Lapitan *et al.,* 2006)

Cyber village concept works effectively as effort of Cyber extension could be centered to farmers in these village rather than diluting the effort to entire area covered by the Cyber unit.

5). Expansion of Cyber agriculture extension mechanism through *Nanasala* of Information and Communication Technology Agency (ICTA) which is the apex body for ICT in Sri Lanka, Tele centres of *Sarwodaya*, *Vidatha* of Ministry of Science and Technology.

After analyzing the success story of Cyber extension mechanism of the DOA, joint ventures are now being implemented with above Rural Knowledge Centres, especially to address the 'content'. IMM CDs produced by the AVC are now being used at above centres and several innovative projects are being planned with *Nanasala* and DOA. Establishment of *Nanasala* at the Department of Agriculture office located at *Dambulla* wholesale market and collaborative Cyber extension with *Nanasala* and *Govijana kendraya* at *Tangalle*, *Nanasala* and *Govijana kendraya* at *Maspanna* are some initiatives which are being planned. Since DOA has limited Cyber units the above mechanism is a good opportunity to expand the Cyber Agriculture extension.

6). Problems of Computer Skills of Cyber Staff

Since existing staff (AIs) of the DOA are utilized for Cyber extension, considerable effort was given to improve the computer skills of the Cyber Staff. The digital addition to extension system has affected the credibility, pride and dignity of the extension staff of the DOA.

It was observed that new look/appearance was also given to Agriculture Instructor's office with provision of ceiling, carpets and furniture. Most of the farmer societies of the ASC have taken keen interest to provide such modern look to Agriculture Instructors' Office.

Lack of time for Agriculture Instructor to involve with Cyber extension activities with hectic work load in the field was another problem identified in some Cyber units. Considering the problem of computer skills and the lack of time for Cyber extension, it is suggested that new set of extension workers with computer skills (can be selected from the recently trained Agriculture Research and Production Assistants) must be appointed to each Cyber unit to do only Cyber extension (Cyber extension officer).

7). Distance learning mechanism for Agriculture Research and Production Assistants (ARPAs)

Recently the Agriculture Research and Production Assistants (ARPAs) were attached to AI for 3 days to do agriculture extension. These ARPAs have not been given professional training in agriculture, on the other hand training of large number (9000) is not practical due to the limited facility of existing face to face training mechanism.

Therefore, most of the Cyber units have taken initiatives to train ARPAs through IMM CDs, and self learning strategy was used similar to distance learning mechanism implemented by Open University of Sri Lanka.

8). Administrative Problems

As in any government programs in the country, several administrative barriers were observed in few Cyber units. Lack of administrative support from higher officers (Some of the higher officers don't have digital facility that available at Cyber units), low financial support for day to day consumable supplies, transfer of trained Cyber staff, are some of the problems identified by the project management.

CONCLUSION

The paper discussed the results and lessons learnt after implementing Cyber extension mechanism in the year 2004 to strengthen the existing ground extension strategies. The result revealed that lack of awareness was the major draw back to popularize the new digital extension mechanism. Therefore, present awareness programs (Information days with multiple media approach) must be launched in other Cyber units as well.

Since all the other Rural Knowledge Centres (*Nanasala*, Telecentres, *Vidatha*) have appreciated and identified agriculture as a key element for their knowledge centres, more collaborative programs must be launched to reach majority of rural farmers in the country. On the other hand DOA extension mechanism must be strengthen with the latest ICT strategies as Computers, Software and the Internet are no longer novelties to many farmers around the globe. Therefore, number of Cyber units of the DOA extension system also must be increased to improve the accessibility to affordable and appropriate information and communication Technology (ICT) to rural farmers.

Since the problem of Agriculture marketing is the burning issue in this country for several decades, the regular updating farmers' database introduced by the Cyber extension will be a information repository for local and foreign buyers to keep direct link with farmers without a middlemen, and the data will be an important information source for policy makers for decision making. It is also suggested that island wide farmer Census day must be conducted to lay a solid foundation to farmers database of the Cyber extension mechanism. More impact study may be conducted to investigate the effect of Cyber extension for farmers income. New set of extension officers/ computer operators (trained ARPAS) must be appointed to each Cyber unit to do only Cyber agriculture extension (Cyber extension officer).

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