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The Impact of ICT on Agricultural Extension Service Delivery: Experience from Agricultural Information & Communication Centre in Bangladesh

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Abstract

This study examines the impact of ICT enhanced service delivery on agricultural extension services in Bangladesh. The gaps in supply of demand of information and production enhancing skills inhibit the farmers from effectively utilizing and adopting modern technologies. This paper seeks to find out the role of recent innovation of agricultural information delivery developed by the government initiative, started with 20 Agriculture Information and Communication Center (AICCs) that increased to 245 till 2015 in different parts of the country and planned to increase further to cover most of the Agro-Ecological Regions of the country. AICC developed recently with the participation of local community through the experiences of functioning IPM/ICM clubs in 1995. The paper also describes how the AICCs have affected the dissemination of agricultural information and modern technologies opened business opportunity and social integration. It analyzes those factors associated in further development of such initiative in the country or elsewhere and at the same time points out dynamics of the development process in the diverse agro-ecological situations. Assistance in supervision and monitoring in the development stage of the AICC by the sponsoring agency helped them grow as potential change agent. There are also indirect benefits from this ICT-enhanced services delivery system in not only greater awareness and knowledge in agriculture technology and information but also in terms of farmers' attitudes towards trying new technology and new ways of life in future.

Keywords: *Information and communication technology, agricultural extension services, impact analysis, Agriculture Information & Communications Centre (AICC)*

Introduction

Bangladesh is an agricultural country with the majority of rural population. About 80 percent of the total population based on the rural areas and 62 percent is directly or indirectly dependent on agriculture as a source of livelihood in a wide range of agricultural activities. The agricultural sector of Bangladesh contributes to around 13.09% of the country's Gross Domestic Product (GDP) (Bangladesh Economic Review, 2014) and generates employment for 43% of the total labor force. Increasing agricultural production for growing people is a major challenge for present agriculture. The production system is smallholder dominated with average farm size of 0.6 ha (BBS, 2009). Besides, our agriculture is subject to climate change and natural hazards. These small farm-holding farmers need to intensify and diversify farming through acquiring adequate knowledge and information. Location specific agricultural technology is no doubt central in enhancing agricultural productivity and facilitating poverty alleviation among rural farmers (Adebayo, 2006). Proper dissemination of information for agricultural and rural communities is a crucial tool in the fight

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against poverty and hunger. Dissemination of relevant information with the help of ICT to the farming communities can facilitate the effective adoption of agricultural inputs, decision making on markets and adoption of scientific methods (Kiplang et al., 1999). Efficient farming is often constrained due to limited scope to access of knowledge and information in an inappropriate and timely manner. Therefore, the role of ICT based centers in the field of agricultural information service delivery is very important for increasing agriculture production. That is why the study was conducted to examine the pertinent issues of continuous development for agricultural information dissemination services in rural Bangladesh.

ICT based Agricultural Information Service Delivery in Bangladesh: ICTs are real sources of information and knowledge for people including farmers to reduce the distance among different communities of the world (Herselman, 2003). The problems related to production, processing and marketing of our agriculture could be solved to some extents when farmers receive information in right time from a reliable source at community level. Access, efficiency and affordability of agricultural information are the major barriers in the battle to uplift agricultural productivity among small-scale farmers (Muriithii *et al.*, 2009). In Bangladesh, agricultural information services as provided by the government, NGO, private organizations, agricultural research organizations and advisory centers are increasingly involved in orienting services towards the specific needs of the rural service delivery. A number of government and non-government organizations like Department of Agricultural Extension (DAE), Department of Livestock Services (DLS), Department of Fisheries (DoF), Agricultural Information Service (AIS) and National Agricultural Research System (NARS) have taken many ICT initiatives. A one-stop approach with Farmers' Information and Advisory Centres (FIAC) has been introduced by the World Bank funded National Agricultural Technology Project (NATP) as an innovative approach established in selected Union Parishad (grassroots level). Department of Marketing (DAM), public and private TV channels, Bangladesh Betar (radio) and Community Radio are engaged in improving farmers' livelihood by their programs. In this field, DAE and AIS under the Ministry of Agriculture play an important role. The National Agricultural Extension Policy is currently under revision where e-agriculture has been added as one of the nine principles of the policy. AIS of the Ministry of Agriculture has been proving agricultural information to farmers in various modes both in print and electronic media like Agricultural Information Communication Centre (AICC), Krishi Radio 98.8, Toll free call centre, television program, video documentary including a user friendly website (www.ais.gov.bd) in Bangla language. Bangladesh Betar (radio) has introduced 'Coastal Community Radio Unit' assigned to produce and broadcast bi-weekly participatory community programs for coastal fish folk.

Some NGOs and private farms are also playing important role in developing the sector. BIID has established e-krishok, Batighar and Farm Book. Besides, mpower uses mobile technology to help farmers. Other programs include GrameenPhone GP-Communication Information Center (GPCIC), Pallitathya Help Center, Krishi Sheba, Krishi jigyasha of Basnglalink, Gonokendras of BRAC**,** D.NET-Pallitathaya Kendra etc.

Agriculture Information and Communication Center (AICC): The idea of establishing AICC at rural level has driven from the farmers' clubs like the Integrated Pest Management Clubs that aimed at providing farmers with demand-led agricultural technologies and information at their doorstep. AICC aims to leverage the then infrastructures of existing clubs to set up integrated information centers for farmers. These clubs are a venue for the male and female, young and old farmers, fish farmers and livestock owners to interact and learn together, thus ensuring social integration. Under the initiative, the government has primarily established 20 AICCs in 1995 in different agro ecological zones. Currently, 245 AICCs are in operation across the country, which are under close monitoring of the Department of Agricultural Extension.

Objectives: The objectives of AICCs are mainly two in number. The first one was to increase farmers' access to demand led and timely information on agriculture and agribusiness and secondly, to enhance extension, media and ICT activities to attain poverty alleviation, income generation and thus livelihood development.

Infrastructure: A single room is set for computer, printer, multimedia projector, sound system, digital camera, mobile phone and furniture. In some AICCs, two rooms in a separate house are arranged for ICT tools and meeting. These rooms are managed by many ways - donation of a benevolent person, a farmer, a group farmers or some curious persons or a UP Chairman or a local landlord.

Management: AICCs are monitored and assisted by the personnel of AIS and DAE. Moreover, Upazilla committee sometimes monitors, supervisesi and guides AICCs activities and provides necessary suggestions. The committee sends their report on the AICC activities to AIS Director in every two months. An executive committee is also formed in each AICC with president, secretary, treasurer, computer operator and other members. The number of general members varies from 30-200 or more. All members including president and secretary pay fix subscription to maintain the monthly expenditure of AICC. The subscription also varies from AICC to AICC. The subscription is collected mainly for the maintenance of ICT equipments. President and secretary keep in touch with AIS and extension personnel. The committee maintains a cooperative fund too.

Services: AICC provides computer training, composing and printing necessary documents, internet service like receiving public examination results, government circular, Skype call etc. to meet queries from website source or directly communication of AIS personnel at HQ at Dhaka. It also provides expert opinion using phone cell. If necessary, AICC enables to arrange video conference through Skype. AICC shows multimedia drama on specific agriculture production system.

Beneficiaries: Mainly local farmers and different club members are regarded as real beneficiaries. The selection of area reflects the beneficiaries.

Future Initiative of AICC: More 254 AICCs are going to be established in 254 upazillas under different districts across the country with the financial support of National ICT Infra-network for Bangladesh Govt. phase-2 (Infosarker) under Information and communication technology division (http://infosarker.bcc.net.bd). These newly established AICCs will be monitored and supvised by AIS, MoA. Necessary ICT logistics would be provided amongst these AICCs.

Research Methods

The research followed a simple random survey method. A flexible approach for empirical inquiry employed to conduct in-depth investigation and to compare the performances and social economic condition of the AICC members and non-AICC farmers. In this study, data were collected from two types of respondents- AICC members and non-AICC farmers. Therefore, the study respondents were 660 AICC members from different districts in Bangladesh and 498 non-AICC farmers from other regions.

Data were collected through recall method to gather information from baseline (2012) and follow-up (2014) production with the help of two trained enumerators. A structured questionnaire and informal interview was the instruments for the purpose. A number of 660 questionnaires were served among the AICC farmers within the command area and 498 among non-AICC farmers. The researcher informally interviewed extension personnel, AIS personnel and different input dealers. Data analysis was performed by using simple descriptive statistics (SPSS, Excel) such as frequency counts, percentages, means, counterfactual and standard deviations.

Result and Discussion

The section discusses two service areas, the division wise respondents, education, gender, access to mobile and TV. The difference in production of two service areas are also given importance.

The Table 1 shows that about 57% of the farmers are AICC center based and about 43% are non-AICC farmers.

Table 1 Service area and population

Surveyed Area	Size	Average
AICC	660	56.99
Non-AICC	498	43.01
Total	1158	100.00

Table 2 District wise non-AICC respondents

Divisions	**Districts**	**Respondents**	**Percentage**
Dhaka	Dhaka, Mymensigh, Narsighdi, Netrakona, Gazipur	125	25.10
Chittagong	Ragamati, Comilla, Bandarban	65	13.05
Khulna	Khulna, Jhenaidah, Satkhira, Magura, Kustia	96	19.28
Rajshahi	Bogra, Natore, Srirajganj	65	13.05
Barishal	Barguna, Jhalokati	28	5.62
Rangpur	Rangpur, Nilfamari, Panchagrah	44	8.84
Sylhet	Sylhet, Moulibazar, Hobiganj	75	15.06
Total	**24 Districts**	**498**	**100**

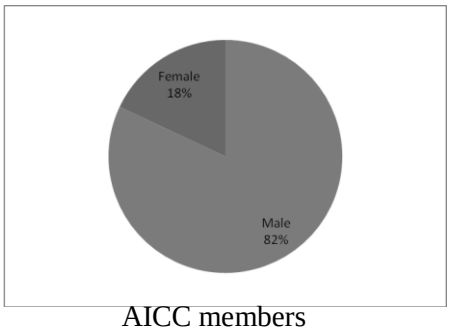
The Table 2 shows that there are seven divisions from where data were collected from non-AICC farmers.

The Table 3 shows that 22.73% data were collected from Dhaka Division, 3.63% from Barisal, 17.58% from Chittagong, 17.27% from Khulna, 15.76% from Sylhet and 15.30% from Rajshai.

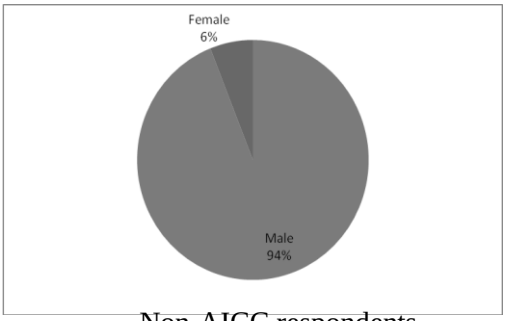
Table 3 Division wise AICC respondents

Divisions	Districts	AICC	Respondents	Percentage
Dhaka	Dhaka, Narshigdi, Mymensingh, Netrokona, Manikganj, Gazipur	12	150	22.73
Chittagong	Ragamati, Comilla, Bandarban	6	116	17.58
Khulna	Khulna, Jessore, Jhenaidah, Satkhira, Magura, Kustia	12	114	17.27
Rajshahi	Bogra, Pabna, Natore	6	101	15.30
Barishal	Barguna, Jhalokati	2	24	6.64
Rangpur	Rangpur, Nilphamari, Panchagarn	6	51	7.72
Sylhet	Sylhet, Moulibazar, Hobiganj	6	104	15.76
Total	26 Districts	50	660	100

Gender wise respondents



AICC members

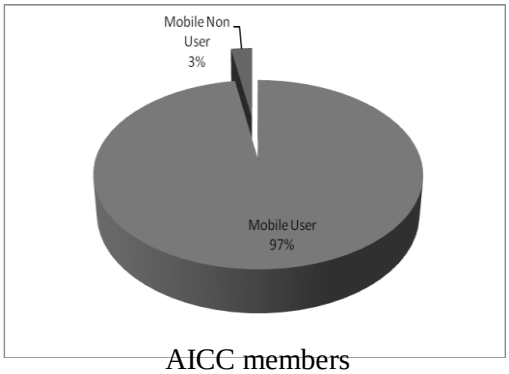


Non-AICC respondents

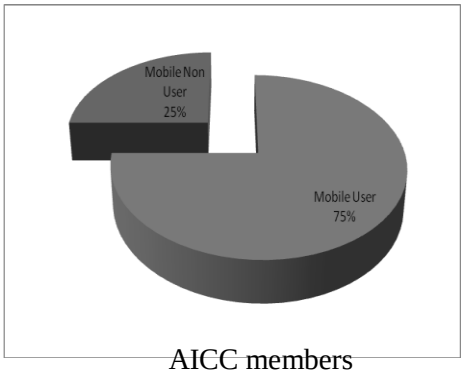
Figure 1 Gender wise respondents

The Figure 1 presents male and female farmers in two service areas separately. 82% male and 18% female constituted the AICC respondents whereas 94% male and only 6% female of the non-AICC respondents were found in the study.

Access to mobile phone



AICC members



AICC members

Figure 2 Access to mobile

The Figure 2 represents mobile access to the AICC farmers. 97% of AICC respondents hold at least one mobile set and only 3% do not use mobile phone whereas 75% of the non- AICC respondents hold mobile set but 25% do not.

Reasons for Using Mobile

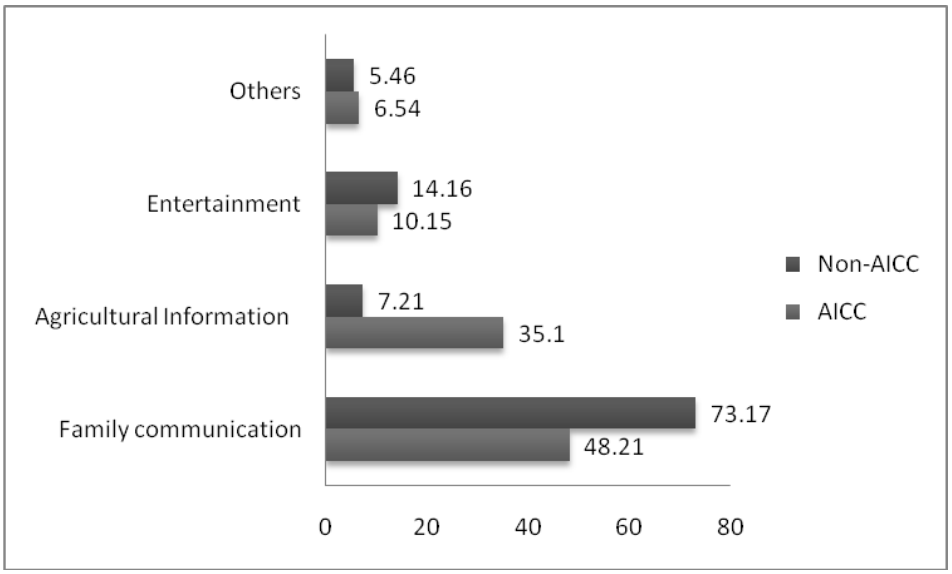


Figure 3 Reasons for using mobile

The reasons of using mobile phone by farmers are family communication, agricultural information, entertainment and few others. The figure 3 shows that 73.17% non-AICC and 48.21% AICC farmers use mobile phone for family communication. However, for agricultural information 35% AICC and only 7.21% non-AICC farmers use the cell phone.

Television Programs

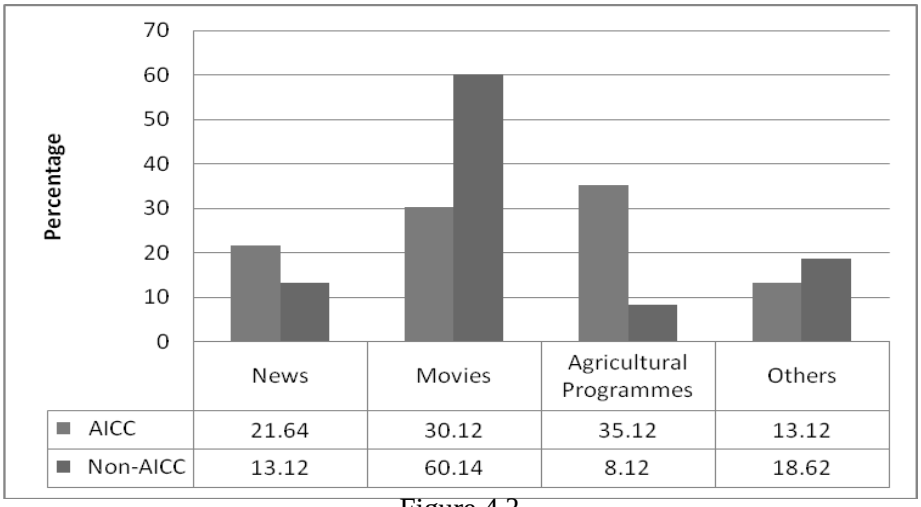


Figure 4 ?

The Figure 4 shows that 60.14% non-AICC and 35.12% AICC farmers watch TV for for watching movies. Agricultural TV programs are watched by 35.12 % AICC and 8.12 % non-AICC farmers. Here it is proved that AICC farmers are more consious of watching agricultural programs than non-AICC farmers. News is listened to by 21.64% of AICC and 13.12% of non-AICC farmers.

Some General Findings: AICC farmers are benefitted by new agricultural technologies from obtaining trainings like basic computer, internet usage, IPM, fertilizer usage pattern, soil health, and market price. It serves the rural communities with access to different ICT tools including computers and internet through some field work activity. The print and electronic media like computer, laptop with web camera, modem, mobile, printer, digital camera multimedia, documentary CDs, folder, leaflet, poster, booklet, magazine, krishi dairy, phone book etc. are catering new and updated knowledge and technologies on agriculture and thus increasing their production.

AICC Contributes to Agricultural Production: New technologies on agricultural production including disease protection, cultivation method, balanced fertilization, pest management etc. are provided by AICC to the farmers. AICC farmers are able to get timely appropriate information for their specific problems of the farming. AICCs provide technical knowledge generated by agricultural research. Farmers are adapting newer varieties like short-duration, salt-tolerance, drought-tolerance, disease-resistant and other high-yielding varieties that ultimately accelerate agriculture production.

Production performance of Rabi Rice by baseline and follow-up

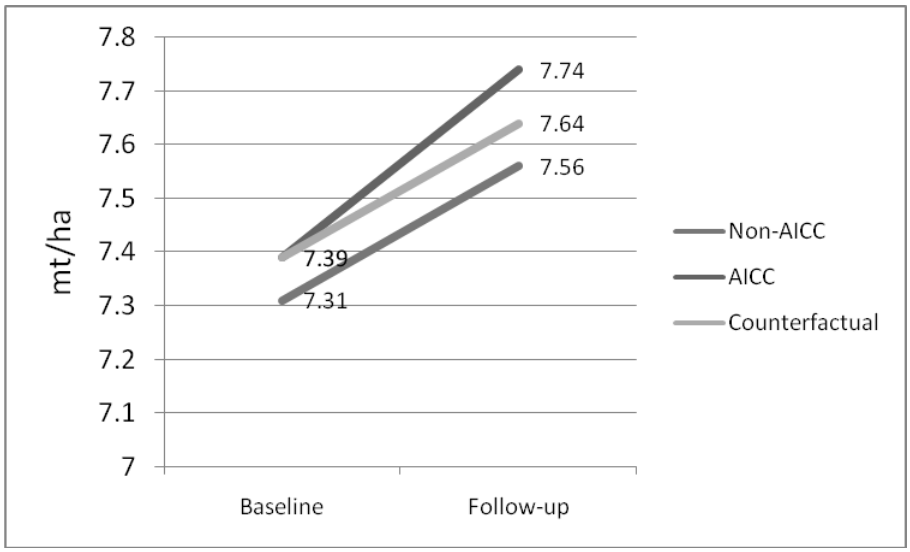


Figure 5 Production performance of Rabi Rice by baseline and follow-up

This Figure 5 shows counterfactual conditionals of the production performance of Rabi rice that take the generic form of difference of differences. The counterfactual marked yellow in the figure makes claims about the difference of production from non-AICC that did not actually occur. It is found that the follow-up production of both AICC and non-AICC farmers has gradually increased (7.50>7.31 and 7.74>7.39) but to some extent, the increase rate of AICC farmers is higher than that of Non-AICC farmers (7.74>7.64). AICC farmers could be able to provide better treatment for crops by getting the right decision about variety selection, fertilization and other important technology regarding cultivation. Therefore, their production increases proportionately.

AICC Creates A New Income Generation and Social Integration: AICC farmers are grouped into a small team of 20 to 100 creating a degree of trust and sense of co-operation. Besides sharing knowledge of agricultural technologies, they ponder on accelerating their current income. They collect small amount of monthly subscription and from this they impart microcredit to the farmers on low interest. They started social service business by composing, printing, e-mailing, phoning and renting multimedia and different types of agricultural tools and machineries. For the common usage, they purchase agricultural tools and machineries like super granular urea applicator, power tiller, thresher and different types of ICT tools like TV, mobile, computer, printer etc. Cooperation among the members involving local community developed trust building and gave opportunity to earn through proving service.

AICC Strengthens Rural Institutions and Livelihood Support: AICC promotes employment opportunities by utilizing their ICT facilities and other agricultural tools for the service of the rural community to the rural people. It also strengthens linkages local organizations such as Upazilla, Union Parishad. Empowering rural communities especially women to create livelihood opportunities through micro-credit programs is particularly important in this regard. Their access to assets and confidence in micro-enterprise development help them lead a better life and develop a healthy social environment.

AICC Improves Market Access: AICC helps making farmers aware of up-to-date market information on prices. It creates significant and dramatic impact on farmers in making decisions about the best time and place to sell and buy agriculture commodities that helps them upgrade their livelihood.

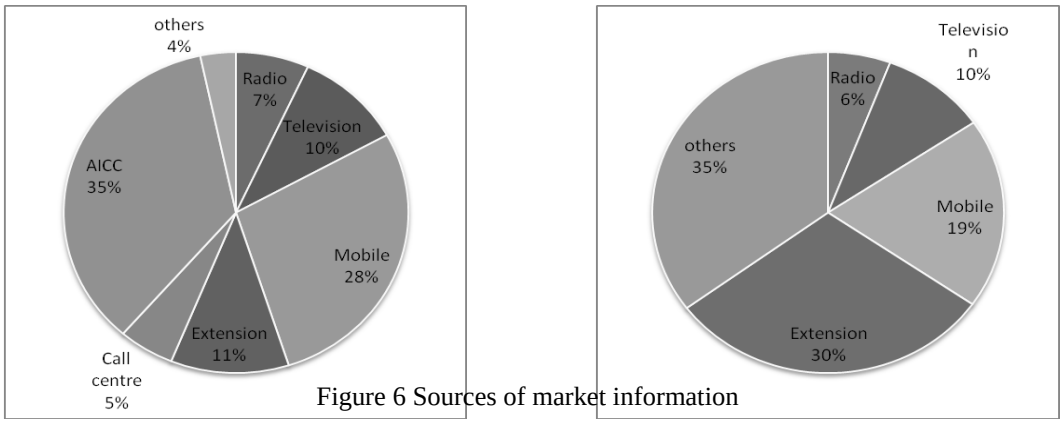


Figure 6 Sources of market information

The Figure 6 illustrates that AICC farmers prefer radio, television and mobile to other sources whereas non-ICT farmers do extension worker, progressive farmers and local agents more. AICC farmers obtain 7% information from radio, 10% from television, 28% from mobile whereas 11% from extension workers, 4% from progressive farmers and local agents and 35% information comes from AICC center. Whereas 35% non-AICC farmers get market information from others source means from progressive farmers, neighbors, input dealers local market etc. 30% non-AICC farmers depend on extension agent for market information. Therefore, it is obvious that traditional farmers depend on the extension workers, progressive farmers and local agents for the information of market price.

Capacity Building and Empowerment: AICC helps the farmers strengthen their capacity and confidence to participate in social development process. AICC enables rural communities to interact with other stakeholders that reduce social isolation. It widens the perspective of local communities in terms of national or global development that opens up new ideas and opportunities and allows easier contact with friends and relatives.

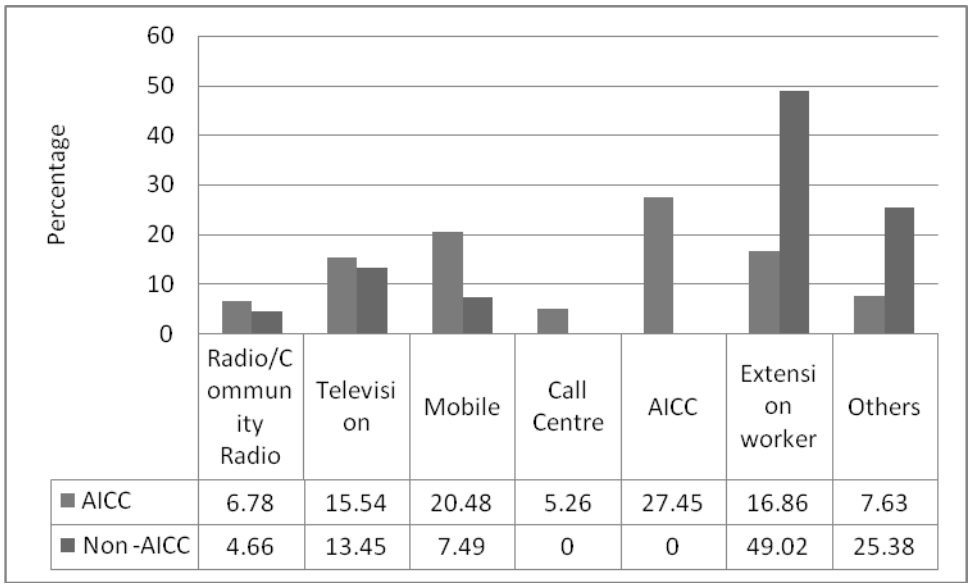


Figure 7 Information source of proper fertilization

The figure 7 shows that 27.47% AICC respondents obtain information from AICC centres. 16.86% and 49.02% non-AICC farmers get information extension workers for proper fertilizer for crops. 5.26% AICC farmers get from toll free call centre because they are aware of the services. Radio is the source of information. AICC farmers 6.78% and non-AICC 4.66% get information from this source. 15.54% AICC and 13.45% non-ICT based farmers get the information from television and from mobile phone 20.48% AICC and 7.49% non-AICC farmers get the same information.

The Table 4 shows some positive impacts from AICC. About 34% of AICC farmers opined that AICCs influence average increase of crop production and about 26% of the farmers believe that their production has increased due to the use of modern technology learnt from AICCs.

Table 4 Positive impact from AICC

	Frequency	%
Average increase of crop production	225	34.09
Increase of High value crops	78	11.82
Reducing the production cost	65	9.85
Use of modern technology	171	25.91
Pesticide free vegetables	121	18.33
Total	660	100.00

Contribution to Modernizing Extension Service: AICCs provide technical knowledge generated by agricultural research. AICC farmers are benefitted by new agricultural technologies. They started social service business by composing, printing, e-mailing, phoning and renting multimedia and different types of agricultural tools and machineries. AICC promotes employment opportunities by utilizing their ICT facilities and other agricultural tools. AICC helps making farmers aware of up-to-date market information on prices. It creates impact on farmers in making decisions about the best

time and place to sell and buy agricultural commodities. AICC helps the farmers strengthen their capacity and confidence to participate in social development process. AICC enables rural communities to interact with other stakeholders that reduce social isolation. It widens the perspective of local communities in terms of national or global development.

Problems faced in getting Information from AICC

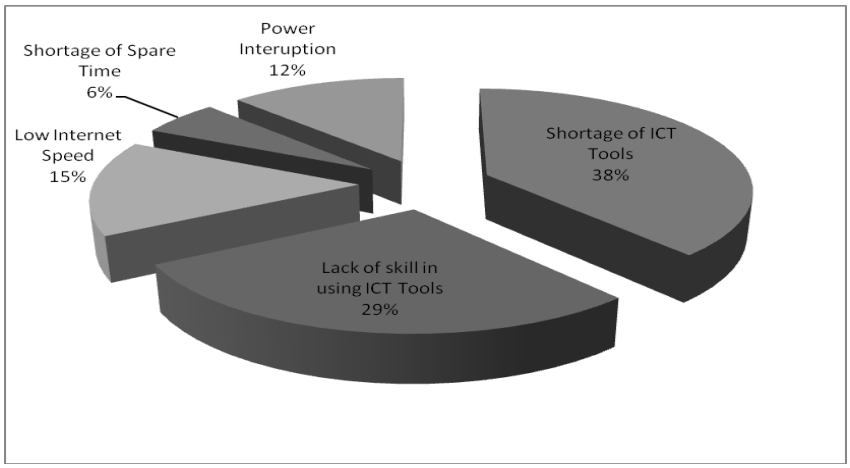


Figure 8 Problems in getting information from AICC

The Figure 8 brings out the obstacles that AICC farmers feel to get information the AICC centers. Farmers are actually faced with at least four major problems. About 29% of respondents suffer from the lack of skill in using ICT tools. Next 38% are affected by the shortage of ICT tools. 15% of the respondents agree to low internet speed and 12% blame the power interruption. A few farmers almost 6% identified shortage of spare time as problem.

Constraints

There are some constraints as identified in the study. Some of these are as follows:

1. Monthly regular subscription by the farmers seems to be difficult because of less income of the farmers.
2. Frequent interruption and insuficient power supply distrub ICT works.
3. General Packet Radio Service (GPRS) based internet is very slow for low network coverage in the remote areas. It is time consuming and one of the obstacles to provide internet based services.
4. Lack of proper skill in operating ICT tools.
5. Inadequate training of the operator
6. Minimum ICT tools create severe problems in browsing for many farmers at a time in the centers.
7. Irregular monitoring of AICC activities as well as ICT equipments by AIS.
8. Women members have little access to ICT
9. Age barrier for adopting new technologies.

10. Availablity of free time for browsing 11. Inadequate literacy of farmers

Conclusion and Recommendations

AICCs play a significant role in improving productivity and enhancing living standard of the farmers. If utilized its full potential, AICCs could be a hub of development activities in the community. The primarily established AICC are divided into three categories- developing, developed and highly developed. Low yield, poor fund, not training in operating ICT tools, poor subscriptions, irregular meetings, obtain information from SAAO, neighbors, and agricultural TV programs, using organic fertilizer and apply different IPM methods for their farming, collecting small amount of monthly subscription & limited electricity supply are the common characteristics of developing AICCs. Average crop yield, medium fund, not training in operating ICT tools, irregular subscriptions, irregular meetings but regular report submission to authority, obtaining information from documentary film and agricultural TV programs, using organic fertilizer and applying different IPM methods for their farming, taking part different trainings like IPM, soil testing, fisheries, basic computer etc. less internet usage for solving agricultural problems, introducing income generating activities by renting multimedia and different types of agricultural tools and machineries and lending money to the member farmers on low interest, low network coverage and limited electricity and solar facility are the common characteristics of the developed AICCs. But the highly developed AICCs are quite different from developing and developed ones. Higher crop yield, sound fund management, well trained members in operating ICT tools, regular subscriptions, regular meetings with members., regular report submission to authority, providing services like internet, email, skype communication, result of public examinations, admission forms and birth registrations, maintaining cash register, regular monitor and supervision by Upazilla Committee, purchasing agricultural machineries like fertilizer applicator, power tiller, thresher, and different types of ICT tools like TV, mobile, computer, printer, modem etc., application of advance production practices like VARMI compost, biogas etc. introducing income generating activities by renting multimedia and agricultural tools and machineries and lending money to the member on low interest are the common characteristics of the highly developed AICCs.

From the above discussions and observations it is significant that farmers are now potential. However, standard of service varies from one AICC to other. Setting communication standard of service with latest ICT infrastructure needs to be fixed. Given the growing interest of farmers to access to information, it is recommended that AICC as service provider should have cerate positive awareness to the farmers about AICC services, better capacity building programs like training, developing ICT infrastructure including internet network, adequate maintenance of the centre's facilities in order to realize their usefulness in agriculture. Organize young farmers to run the AICC as new generation are capable of ICT adaptation. The Upazila Committee should have better role in supervision and monitoring the centres. It can therefore, be expected that information and communication centre is becoming a more useful tool for information dissemination in the developing countries

like Bangladesh if all concerned will come forward to contemplate on the best means.

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