

**Proceedings on**  
**Application of ICT in Agricultural**  
**Research and Development**

**12** March  
2013

**Seminar Room**  
**BARI, Gazipur**



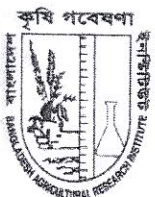
Agricultural Statistics and Information & Communication Technology Division  
Bangladesh Agricultural Research Institute  
Joydebpur, Gazipur-1701, Bangladesh

Proceedings on  
*Application of ICT in Agricultural Research and Development*  
Workshop



Compiled by

*Mrs. Suraiya Yasmin, CSO & Head*  
*Dr. Md. Saiful Islam, PSO*  
*A.F.M. Tariqul Islam, SO*



Agricultural Statistics and Information & Communication Technology Division

Bangladesh Agricultural Research Institute  
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[www.bari.gov.bd](http://www.bari.gov.bd)

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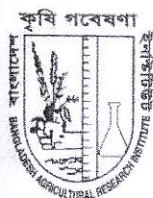
**Program Schedule**

10.00-10.30	<b>Registration</b>
10.30-11.45	<b>Inaugural Session including Key Note Paper</b>
10.30-10.35	Recitation from Holy Quran
10.35-10.40	Welcome Speech: Suraiya Yasmin, CSO & Head, ASICT Division
10.40-11.10	<b>Key Note Paper</b> <b>Speaker:</b> Suraiya Yasmin, CSO & Head, ASICT, BARI on behalf of Mr. Abid Hossain Chowdhury, Director, Computer & GIS, BARC, Dhaka
11.10-11.20	<b>Discussant:</b> Dr. Samajit Kumar Pal, CSO & Head, TTT, BSRI, Ishurdi
11.20-11.30	<b>General Discussion on Key Note Paper</b>
11.30-11.35	Speech from Special Guest: Dr. Samajit Kumar Pal, CSO & Head, TTT, BSRI, Ishurdi
11.35-11.40	Speech from Special Guest: Dr. Md. Khaled Sultan, Director, HRC, BARI
11.40-11.45	Speech from Chairman: Dr. Md. Kamal Humayun Kabir, Director General, BSRI, Ishurdi
11.45-12.00	<b>Refreshment</b>
12.00-1.30	<b>Technical session</b>
	<b>Session Chair:</b> Dr. Amzad Hossain, CSO, PGRC, BARI, Gazipur
12.00-13.00	<b>Institutional Paper Presentation</b> 1. Implementation of BARI Automation Software- Dr. Md. Saiful Islam, PSO, ASICT, BARI, Gazipur 2. বাংলাদেশ রাইজ নলেজ ব্যাংক পরিচিতি- Dr. Md. Ismail Hossain, SSO, Agricultural Statistics, BRRI, Gazipur 3. Documentation of Plant Genetic Resources Information- Dr. Md. Tariqul Islam, PSO, PGRC, BARI, Gazipur
13.00-13.30	<b>General Discussion</b>
13.30-14.30	<b>Prayer &amp; Lunch</b>
14.30-14.40	<b>Closing</b>

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Paper-01

# **Application of ICT in Agricultural Research and Development**

**Keynote Paper**

**Md. Abeer Hossain Chowdhury**  
Director  
Computer and GIS Unit  
Bangladesh Agricultural Research Council

## **Introduction**

Agriculture is the mainstay of our economy and major source of livelihood of majority people in Bangladesh. About 20 percent of GDP contributed by agriculture sector and another 36 percent by the rural non-farm sector, the rural economy as a whole contributes around 60 percent of the total GDP. The country has made significant progress in the field of agriculture towards increasing productivity over the decades. This is due to constant infusion of high-impact agricultural technologies and its diffusion at farmers' level through extension services. However, agriculture is facing multifarious challenges like shrinking and degrading of land, water, genetic resources along with flood, drought, salinity, pest and diseases due to global climate change. To overcome the challenges to agriculture science and innovation-led agricultural growth must be inclusive and address the needs and aspirations of small and marginal farmers.

There is need to develop an effective and efficient agricultural knowledge and information system that provides relevant information at all levels to all actors in agricultural production cycle. Public and private sector actors have long been on the search for effective solutions to address both the long and short-term challenges in agriculture, including how to answer the ample information needs of farmers. ICT is one of these solutions, and has recently unleashed incredible potential to improve agriculture. ICT is an umbrella term that includes anything ranging from radio to satellite imagery to mobile phones or electronic money transfers. Many of the questions asked by farmers (including questions on how to increase yields, access markets, and adapt to weather conditions) can now be answered faster, with greater ease, and increased accuracy. Many of the questions can also be answered with a dialogue—where farmers, experts, and government can select best solutions based on a diverse set of expertise and experience.

Information and Communication Technology consists of three main technologies. They are: Computer Technology, Communication Technology and Information Management Technology. These technologies are applied for processing, exchanging and managing data, information and knowledge. The tools provided by ICT are having ability to: (i) Record text, drawings, photographs, audio, video, process descriptions, and other information in digital formats, (ii) Produce exact duplicates of such information at significantly lower cost, (iii) Transfer information and knowledge rapidly over large distances through communications networks. (iv) Develop standardized algorithms to large quantities of information relatively rapidly. (v) Achieve greater interactivity in communicating, evaluating, producing and sharing useful information and knowledge.

There are two distinct interfaces for ICT use in agriculture. The first is the Research Institution – ICT use interface, where ICT is used primarily to link people and institutions that research and innovate. The second is the Farmer/User Community – ICT use interface, where ICT is used to link people, especially rural communities, to innovations in agriculture. This key note tries to discuss ICT use at these two interfaces in agricultural research and development.

## **Drivers of ICT in Agriculture**

Five main trends have been the key drivers of the use of ICT in agriculture, particularly for poor farmers: (1) low-cost and pervasive connectivity, (2) adaptable and more affordable tools, (3) advances in data storage and exchange, (4) innovative business models and partnerships, and (5)

the democratization of information, including the open access movement and social media. These drivers are expected to continue shaping the prospects for using ICT effectively in agriculture.

### Phases for ICT development

Four developmental phases can be identified for ICT use in agricultural research and development. These are:

- Infrastructure
- Operational
- Coordination and Control
- Strategic

Infrastructure phase of ICT use in agricultural research and development, are centered on establishing physical connectivity, and acquiring hardware and software to use ICT. Operational issues, such as enabling multi-disciplinary and multi-location networks, architecture and design of information systems, Management Information Systems (MIS), for agricultural research and development, their management, administration and use. Coordination and control through establishing information management and coordination cell in institutions and access to the right information, validation and credibility of information available on the Internet. Maturity of using ICT in agricultural research and development is reached when the country concerns itself with the strategic use of information and information systems. Examples of strategic use include using information systems that support collaborative learning by a multiple of stakeholders to agricultural development in the country and enabling farmers to participate in national and global markets. Such strategic use of information accessed through ICT is just emerging and cannot be considered widespread in most developing countries.

	<b>Immediate</b>	<b>Short-term</b>	<b>Mid-term</b>	<b>Long-term</b>
<b>Infrastructure</b>	Establishment of organization wise hardware, network and internet connectivity	Establishment of LAN connectivity within the organization and share ICT resources	Establishment of server centric environment	Establishment of multi-location connectivity (VPN), Data Centre, Video conferencing, Cloud computing
<b>Operational</b>	Capacity building through training and orientation to resource use	Enabling MIS especially Research Management System & content development	Training on MIS modules and other software applications	Focuses on web, mobile enable content generation. Implementation of decision support system.
<b>Coordination and Control</b>	Establishment of Information Management and Coordination Cell	Ensure information/data generation and accumulation.	Standardization of content and its access through appropriate taxonomy and ontology for access through	Ensuring intellectual property rights issues related to on-line information



	<b>Immediate</b>	<b>Short-term</b>	<b>Mid-term</b>	<b>Long-term</b>
			search engine, decision support tools, etc.	
<b>Strategy</b>	Establishment of institutional web portal.	Initiating use of groupware.	Focus on content to support multi-stakeholder learning through "Open Archives" "Open Knowledge Sources" and "Shared Information Spaces"	Collaborative learning. Focus on developing on-line social networking and partnership skills.

### **Issues for ICT use**

The issues for ICT use in agricultural research and development are as follows:

- Connectivity
- Content
- Capacity Development

#### ***Enhancing Connectivity***

Acquiring appropriate hardware and software for connectivity and establishing Local Area Networks and Internets. Establishing Wide Area Networks and Virtual Private Networks to coordinate information flows for efficiency in resource use information centers, research laboratories and NARS wide Management Information Systems.

#### ***Generating Content***

Content must be relevant to local conditions (crops, climates, soils, farming practices, and so on). The use of video provides opportunities to customize materials. When videos feature farmers' fellow villagers, farmers often instantly connect with the message. People will use a system for sharing information, including agricultural information, if the content is adapted to local needs, sourced appropriately, and presented suitably.

First, users can access content in different formats (audio, data, location data, pictures, maps, text) and with different dynamic properties, produced by different authors, on the same device. Second, users can take advantage of different options (radio, GSM, Wi-Fi, Bluetooth, satellite) for accessing that content.

#### ***Developing Capacity***

Learning through ICTs can provide fresh approaches that are learner-centric, which engages multi-stakeholders including producers and their communities in designing and implementing the learning experience. It can also make it easier to maintain quality by supporting feedback mechanisms and ensuring appropriate accreditation and certification processes.

## **Use of ICT in Agricultural Research and Development**

The areas where ICT can be used in agricultural organizations are:

### ***Research***

- Enhance knowledge sharing much earlier in the research process, during program formulation, design, and as part of ongoing planning and review.
- Using digital social media tools, which are easy to access and use, to extend and open up communication and knowledge sharing throughout the research process.
- Access to scientific and technical information, such as “Open archives”, improving quality and quantity of accessible technical literature, reducing costs, duplication and time spent for availing information.
- Cooperating with the distant farming communities.
- Facilitating data management through common databases and datasets of multi-disciplinary and multi-location research, farming systems and geospatial entities.
- Perform data analysis in modeling, simulation, visualization, and cloud computing.

### ***Education***

- E-learning - the use of electronic technologies to deliver, facilitate, and enhance both formal and informal learning and knowledge sharing at any time, any place, and at any pace.
  - o provide fresh approaches that are learner-centric, engaging producers and their communities as partners and adult learners in designing and implementing the learning experience.
  - o make it easier to maintain quality by supporting feedback mechanisms and ensuring appropriate accreditation and certification processes.
- Facilitating “distance learning” and “distance education” for a varied group of clients including students, farmers, extension workers, subject matter specialists, field professionals, researchers and managers.

### ***Extension***

- e-Extension - integrate and harmonize delivery of advisory services for agriculture, fisheries, and natural resources and to use its network of institutions to provide a more efficient alternative to a traditional extension system.
- Use of Radio and Television for agricultural extension.
- Facilitation of interaction among researchers, extension (knowledge) workers, and farmers.
- Up-to-date information, supplied to farmers, about subjects such as packages of practices, market information, weather forecasting, input supplies, credit availability.

### ***Organization Management and Administration***

- Improving financial management systems
- Improving human resource management by managing databases of e.g., personal information, expertise, location, training of individual staff
- Research Management Information System for research and extension projects
- Management Information System for Library, equipment/inventories
- Managing and sharing information related to agricultural education system

### **Advisory services**

- Web services like “ask the expert,” mobile messaging for advice, radio programs to disseminate technical information, and video.

### **Risk Management**

- ICT applications for mitigating agricultural risk through gathering, processing, and disseminating information that helps farmers mitigate risk.
- ICT applications to transfer agricultural risk through instruments such as insurance.
- ICT applications for coping with agricultural risk through facilitating transfers and remittances to farmers from state and relief agencies.

### **Messaging for collaboration and partnership with related organizations**

- Messaging systems using e.g., e- mail, list services, news groups, web based discussion groups, active messaging, video-conferencing, Net meeting
- Intranets and Collaborative computing
- Promoting on-line social networks

### **Present scenario of ICT usages and facilities in NARS and other organizations**

- National Agricultural Technology Project (NATP)
  - o ICT infrastructure established at BARC and 7 NARS institutes
  - o VPN connectivity established among NARS (7 NARS institutes with BARC)
  - o A common MIS development is under process
- Bangladesh Agricultural Research Council (BARC)
  - o Research Management Information System (RMIS) for NARS and related organizations
  - o Personnel Management Information System for NARS
  - o Payroll Management System for BARC
  - o Access to TEEAL full-text and bibliographic information by NARS
  - o Inventory Management System for BARC
- Bangladesh Agriculture Research Institute (BARI)
  - o Developed four MIS modules/applications
  - o Web-based Question/Answer services where experts respond to queries
- Bangladesh Rice Research Institutes
  - o Bangladesh Rice Knowledge Bank (BRKB)
- Soil Resource Development Institute (SRDI)
  - o Online fertilizer recommendation software to provide fertilizer recommendations based on location specific soil testing results
  - o Developed a massive database that stores soil data named SOLARIS
- Department of Livestock and Fisheries
  - o SMS based gateway for identify and control diseases
- Bangladesh Sugar and Food Industries Corporation (BSFIC)
  - o SMS base sugarcane procurement system – e-Purjee

## **ICT applications in Agriculture**

### **E-agriculture**

Information and communication have always mattered in every community especially for those who are involved with agriculture. Ever since people started growing crops, raising livestock, and catching fish, they have sought information from one another. There is a huge potential of ICTs that can play a vital role in agriculture of the developing countries. The World Summit on the Information Society (WSIS) recognizes the role of ICT in the systematic dissemination of agricultural information to provide ready access to comprehensive, up-to-date and detailed knowledge and information, particularly in rural areas. It also encourages public-private partnerships to maximize the use of ICTs as an instrument to improve production.

### **National**

#### **Mobile based Services**

##### ***krishi jigyaasha 7676***

The growth of Small and Medium Entrepreneurs (SMEs) is crucial in the path of developing the economy of Bangladesh. However, the existing and potential SME owners are often faced by difficulties regarding access to necessary information required to prosper in business. Realizing these difficulties, the mobile phone operator Banglalink the second largest mobile operator in the country introduced two separate kinds of services like krishi Jigyasha and babsha jigyaasha (Banglalink, n.d.).

Banglalink as the pioneer in Bangladesh in launched the krishi jigyaasha 7676 which provides suggestions and answers to any queries related to agriculture, vegetable and fruit farming, poultry, livestock, fisheries etc. To use this service a Banglalink customer just needs to dial 7676, talk and get expert's advice on the problem. At present, the service can address problems related to harvests, pesticides, agro diseases, information on seeds, fertilizers, poultry and livestock feed, fisheries techniques and much more.

Bangladesh, being an agriculture intensive country, this service will make a difference for many earning their livelihood in these sectors. The service will give them easy access to valuable advice and solutions to problems.

##### ***babsha jigyaasha 7677***

To help the existing and potential SME owners who are in need of business related advice, banglalink provides a one stop solution through babsha jigyaasha 7677. By dialing 7677 one can get useful advice on important issues relating to business, 24 hours a day and 7 days a week. They not only save valuable time and effort but also minimize operational cost. babsha jigyaasha 7677 gives information on the following: information relating to access to finance, business documentation process including trade license, tin, tax certificate, etc.

### ***Banglalink Krishibazaar***

The problems of not getting the fair price by the farmers for the produce are acute in the country. These are due to lack of proper information, price syndication and a group of manipulative middle men. To address this issue, Banglalink has come up with a one-of-a-kind solution by launching "Banglalink Krishibazaar" that has empowered the farmers with important market information and eliminated the middle men. Krishibazaar is an IVR (interactive voice response) based service that allows customers in two folds, firstly, customers can know the latest market prices of essential agricultural produces in 18 major markets across the 7 divisions of Bangladesh.

Secondly, the service allows agro buyers and sellers to find each other. Agro buyers and sellers can post or browse their desired agro product info in the service for selling or buying. The seller or buyer can also call up his/her desired seller or buyer instantly by pressing "8" and finalize the deal. The information of the products is available by categories, prices, locations, etc. to make the process easier. Recently Banglalink won the World Communication Award 2011 under the category of Best New Service: Consumer for its project 'Krishibazaar'. Customers can avail this service by dialing "2474", and can either listen to markets rates at his/her preferred market or upload the product information of his/her goods.

### ***Robi Bazar***

Similar to 'Krishibazaar', Robi has introduced the Robi Bazar service where mobile phone can be used as a 24-hours electronic market place. In RobiBazaar, Sellers can post their products' information to sell and buyers can search for their desired products to buy, using their mobile phone. In connection with it, buyers can reach to sellers, negotiate or start buying. Robi Bazar can be accessed by sending SMS to a dedicated port "8484" from all basic mobile phones or Robi subscriber can avail the same service through their WAP enable handsets, just by browsing wap.robibazar.com, which guides through the easy graphic interface. This service is also available in web- www.robibazar.com. Buyers and Sellers with internet facility on computer can also avail the benefits of RobiBazar ('seller' need to be a Robi subscriber) (Robi Axiata Limited, 2012a).

### ***Krishi Barta Robi Agro Services***

Recently, Robi introduced Krishi Barta, the agricultural portal for their subscribers, specially targeting the farmer community of the country (Robi Axiata Limited, 2012b). This bouquet of services will be helpful for those who are directly or indirectly related to agriculture or agro-business. This service basket will support the complete value chain of agro economy. The services that will be provided through the short code are:

- a) Agro Information: Robi subscribers are be able to get information on crops, fisheries, livestock, pests and insecticides, soil and fertilizer information.
- b) Weather update: Latest update on weather across all over the country.

To avail this service both agro information and weather update, subscriber needs to dial 27676 and they will land up on an IVR. According to the need of the subscribers, the live human agent on the other side will provide all the information. Only IVR charge is applicable with this service.

## **Web Portals and Information Exchange Networks**

Web portals and information exchange networks are emerging innovations in ICT use for connecting users of agricultural technology to sources of these technologies.

### ***Department of Agricultural Marketing (DAM)***

The Department of Agricultural Marketing (DAM) of the Ministry of Agriculture, Government of Bangladesh has undertaken an e-government initiative that would utilize the power of ICT to develop and disseminate critical agricultural market information to farmers, traders, government, policy makers, development agencies and other stakeholders. Under the overall coordination and support of the Government's Support to ICT Task Force, DAM has developed the first phase of its program to automate data entry at the district level where market information of agricultural products is collected from local markets. The initiative also attempts at developing the capacity of the DAM head office in Dhaka to consolidate and coordinate dissemination of the information to government, farmers, and other stakeholders.

The web enabled information system would significantly enhance DAM's capacity in collecting and disseminating updated information on agricultural market prices on a daily basis. The information system would also enable DAM to undertake extensive analysis of market behavior and pattern of agricultural products that would be of considerable value to the policy makers and other stakeholders. Besides, continuous efforts will be made to refine and update relevant information and analysis generated from its market information system (Department of Agriculture Marketing, 2012).

### ***E-Krishok, Bangladesh***

To provide information to farmers BIID (Bangladesh Institute of ICT in Development) launched "E-Krishok" an e-agriculture initiative in Bangladesh. General information is provided through a web portal and answers to specific requests delivered by an agricultural scientist through telecenters. The project initiated with only ten telecenters in October 2008 and extended to 100 locations by February 2010. Recently, BIID has launched "Nationwide Scaling Up of e-Krishok" program aiming to broaden its activities and thus increase the number of beneficiary farmers through ICT enabled services. BIID initiated to deliver the e-Krishok service nationwide across 493 Upazilas (Sub-District) of 64 districts to reach 500,000 farmers by 2012. The goal is to attain 5,000 locations all over Bangladesh by 2015, not only in telecenters but also through the Internet and mobile phones in order to reach a critical mass. Many farmers those who were reached by the service prefer e-Krishok as vital source of information. (BIID, 2012)

**Batighar-An inclusive business model for telecenters:** After successful piloting phase, BIID has introduced the Batighar (Light House) information centre based on inclusive business model for scaling up in all over the country. Batighar, the name derived from the English word "lighthouse", is meant to show people correct direction. Recently, BIID rolled out 10 Batighar centres all over the country. This particular business model can be distinctively characterized as a structured commercial model for for-profit telecenter ventures, which, are undertaken by entrepreneurs, businesses and organizations. It can also be termed as "entrepreneurship model" (Bangladesh Institute of ICT in Development).

*www.extension.org.bd*

Bangladesh Institute of ICT in Development (BIID) and Sher-E-Bangla Agricultural University (SAU) jointly launched the *www.extension.org.bd* portal in 2012 to establish an online platform that will foster usage of ICT in agricultural extension to faster growth in the agriculture sector through knowledge sharing, consequently enhancing the efficiency of knowledge and skill of expertise on continuous basis of relevant stakeholders including researchers, extension officers, academicians, policy makers, private sectors, media, development agencies, NGOs etc.

Instrumentally, it will coordinate among these stakeholders and link the research to field, provide relevant and updated extension related information to the people on a more quickly and regular basis. Due to concerns of food supplies and continued agro-economic growth, currently agricultural Extension in Bangladesh has received attention for coordination among agricultural experts in generating innovative ideas to deliver modern technologies and disseminating knowledge to the farmers. For countries like Bangladesh with low income that is heavily dependent on agriculture, integration of ICT is a must to increase agricultural productivity (BIID and SAU, 2012).

### ***Bangladesh Rice Knowledge Bank (BRKB)***

Bangladesh Rice Knowledge Bank is a dynamic source of rice knowledge, rice production technology. It is a repository of rice knowledge, and online rice and rice based knowledge hub prepared and maintained by senior scientists of BRRI Bangladesh Rice Research Institute. The BRKB contains rice knowledge to address the regional as well as national issues associated with rice production and training. Most of the materials such as fact sheets, training manuals, booklets, leaflets, brochures, posters, videos, have been prepared in Bangla which are easily understandable to Bangladeshi farmers.

### ***Web-based Agriculture Credit-MIS***

Bangladesh Sangbad Sangstha the National news agency reported that – on Sep 12 Bangladesh Central Bank has introduced ‘Web-based Agriculture Credit-MIS’ software to facilitate banks in carrying out qualitative and quantitative performance monitoring of disbursement of farm credit. It is expected that this software will help banks to upload information. The system will help furnish information timely and correctly and it will also help reduce waste of paper (Bangladesh Sangbad Sangstha (BSS), 2012).

### ***Agricultural Information Service***

The Agricultural Information Service (AIS) has the responsibility of providing mass media support to agriculture sector in general and disseminate agricultural technology from research station to the rural farming community in particular. AIS works with radio, television, printed media and also produce documentary films, posters, folders, leaflets, booklets, newsletters, magazines, banners, festoons and etc. for creating awareness among the farmers on the new technologies, which assists in boosting up agricultural productivity of the country. Thus AIS is playing an important role in changing the traditional practice of the rural farmers that contributes to improving their livelihood. AIS has been publishing the only monthly farm magazine *Krishikatha* (in Bangla), since 1939. The organization has been providing services through successful and rational use of various media for transferring new agricultural technologies and

information. Moreover, ICT is included for faster transfer of appropriate agricultural technology. The web portal of AIS is designed to accomplish goal of the Vision 2021 through implementation of 'Digital Agriculture' for the benefit of the people (Agricultural Information Service, 2012). Also AIS has established Agricultural Information and Communication Center (AICC) and mobile based agricultural information dissemination service is on-going.

### ***Jatiyo e-Tathyakose***

*Jatiyo e-Tathyakose* or the National E-information hub has been created as a national initiative under the Access to Information program of the Prime Minister's Office. In this initiative effort has been made to compile comprehensive information from all public and private institutions. This is a electronic repository contains information related to people's life and livelihood in various sectors of Bangladesh including agriculture, education, health, law and human rights, tourism, employment, citizen services, non-agriculture initiatives, industries and commerce, science and technology, environment and disaster management. All the contents of this site are in Bangla having a search engine to look for required information. Almost every farmers encounter seed, crop and land-related problems. The objective of the inclusion of the agriculture section in this web portal is to meet the information needs and provide related services of the rural mass through the Union Information and Services Centers. The contents are generated from the publicly released information of various public and private organizations. Agricultural information in this section can be found in the form of text, audio, video, animations and pictures (Access to Information program of the Prime Minister's Office, n.d.).

### **Agricultural Programs on Radio**

Among the electronic mass media, radio is cheaper and conveniently usable even where there is no electricity and that is why radio is assumed to be more appropriate media for farmers. The Bangladesh Radio broadcasts various types of agriculture related programs from its national centre in Dhaka and other centres in Chittagong, Khulna, Rangpur, Rajshahi, Sylhet, Rangamati, Barisal, Cox'sbazar and Thakurgaon. There are different types of name for these programs. Desh Amar Mati Amar, Krishi Samachar, Sonali Phoshol, Krishikatha, Krishi Khamar, Krishi Samachar, Chashabad, Ajker Krishi, Khet Khamare, Khet Khamar samachar, Shabuj Bangia, Ajker Chashabad, Shamol Sylhet, Khamarbari, Krishikatha, Sonali Prantor, Ajker Krishi, Ksham Mati Desh etc. Each radio station on an average allocates 33.2 minutes for broadcasting programs on agriculture. All together there are 10 radio centers and their total allocation for agriculture related program is on an average 5 hours 30 minutes in a day (Source: (Krishi Kotha, 2007).

### **Agricultural Programs on TV**

Agricultural programs on television started in 1978 with the name *Amar Desh* on BTV and supported by the Agricultural Information Services (AIS) 1985 it became *Mati-O-Manush* (Men and Soil) with Shyakh Siraj. Many technologies became popular because of this program. In this respect *Mati-O-Manush* made immense contribution.

Among the television channels, eleven channels including the state owned BTV have been telecasting agricultural programs. The BTV allocates 2 hours 30 minutes air time for agricultural related programs in a week. Other channels allocate 25 minutes programs that aired once a week.



On an average, the daily air time of agricultural related program in the television channels is 35 minutes only. Table 5 gives list of channels and titles of agricultural programs.

### International

#### *VERCON in Egypt*

Egypt launched a Virtual Extension and Research Communication Network (VERCON) in 2000 to develop and strengthen links among the research and extension components of the national agricultural knowledge and information system. By improving research-extension linkages, the initiative aimed to improve advisory services for Egyptian farmers, especially resource-poor farmers (see [http://www.fao.org/sd/2001/KN1007\\_en.htm](http://www.fao.org/sd/2001/KN1007_en.htm)).

VERCON-Egypt introduced and tested several innovative communication tools. One of the most useful tools is the Farmers' Problems Database, created explicitly to address farmer's problems. The web interface enables extension agents to pose questions on behalf of farmers seeking solutions to agricultural problems; they can also examine answers to questions already posed to researchers. Content is classified into four main categories of problems: production, administration, environment, and marketing.

The online database and tracking system enable farmers' questions to flow from provincial extension centers to the national extension directorate and research system. Farmers approach extension centers with problems, and if they cannot be solved using online resources such as extension bulletins or agricultural expert systems, the extension agent develops a full description of the problem and his/her proposed solution, which is forwarded to a specialized researcher who provides advice to address it (Beltagy et al. 2009). The problems and solutions are added to the online database to assist other users of the network who face similar problems. Aside from addressing farmers' problems, the system provides valuable information to track farmers' problems, including their incidence and significance. The system makes farmers' problems more visible and quantifiable for research planners, and chronic problems can be addressed in research projects.

#### *Mango Information Network*

The Mango Information Network (MIN) is an information service in English designed to manage the information needs of key players in The Philippine mango industry. This site is commodity specific and has monthly market information only on mangoes. Its central node is at the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) at Los Baños, Laguna, Philippines. PCARRD is also the apex body for agricultural research in The Philippines.

#### *Agroviet*

Agroviet is the official website of Ministry of Agricultural and Rural Development in Vietnam. It has commodity prices and information in Vietnamese about marketing and development of agriculture in Vietnam.

### ***Agrolink***

Agrolink is the official site of Ministry of Agriculture, Malaysia. It has several links to other agriculture related sites in Malaysia, as in Bahasa.

### ***Agricultural Geo-referenced Information System in South Africa***

This is a web based information system that uses a geographical information system to provide agricultural information in South Africa (Liebenburg, 2002). It is to be used by farmers through Multi-Purpose Community Centers that provide information access through tele-centers in South Africa.

### ***Agropedia***

Advanced online content aggregation system called agropedia (<http://agropedia.net>), which delivers and exchanges information through a web portal and mobile phone networks accessible to phones with limited or no data capability. Agropedia also provides a subsidiary platform to support online learning for agricultural extension (<http://www.agrilore.org>).

Agropedia was designed to overcome the paucity of useful agricultural extension information in the web space. Online discussions can be set up to support queries or validation. The platform incorporates Web 2.0 elements such as wikis, blogs, and commentary spaces and receives material in digital formats including text, still images, audio, and video.

Agricultural extension workers can use the agropedia platform to create their own groups of contact farmers or peers, facilitating e-learning. These groups can be sent timed SMS/text messages and voice messages, enabling specific interest groups to receive specific messages and not broadcasts. A farmer or a practitioner in the field can raise a query via voice or text. A virtual call center built into agropedia receives the query and passes it to appropriate extension workers and experts. In this way, trust and/or interest-based messaging networks can be formed and sustained.

Agropedia is an example of how a highly integrated platform can use multiple approaches to connect a spectrum of stakeholders, including research experts validating information, extension personnel in farm research stations and in the field, and farmers. Field-based producers do not need computers to connect to experts and extension personnel. Farmers with advanced practical knowledge and skills are in a position to share their tips and messages with a much wider community and can participate in discussions related to validation of particular pieces of information.

### ***ARENET***

In Uganda, ARENET (Agricultural Research Extension Network) is a web portal (<http://www.arenet.or.ug/index.php>) created to strengthen the links between the National Agricultural Research System and the National Agricultural Advisory Services program and its related extension service providers. The portal provides access to practical and technical agricultural information from national and international sources. Users can post questions and problems through the system to experts at research institutes and in local government, and ARENET makes it possible for farming communities, researchers, extension agents, and the private sector to communicate among themselves and to share their knowledge and experience.

## **Gyandoot**

Gyandoot is an initiative of the Government of Madhya Pradesh, India, to link villages to the Internet for information on governance, health, education and rural development, including agriculture, through the State Agricultural Extension System, that is linked to the State Agricultural Universities and Indian NARS. It has content in Hindi and English.

## ***Agricultural Information Network in Thailand***

The Ministry of Agriculture, Thailand, has initiated The Agricultural Information Network. It will use the infrastructure developed under the Internet Village Project, to provide access to this network (Paiboonrat, 2002).

## ***ZADI, Germany***

The German Centre for Documentation and Information in Agriculture (ZADI) is the scientific information institute of the Federal Ministry of Consumer Protection, Food and Agriculture (BMVEL) (Ehrle, 2002). Among its tasks are information services, such as the development and maintenance of information portals, scientific information systems and databases, providing advice to Institutes associated with the Ministry, the execution of national co-ordination tasks and related research and development in the field of information sciences. An efficient information and communication technology allows the presentation of all information services on the Internet.

## **Africats**

Africa Trial Sites (<http://africats.org/>) is a portal that enables national and international research organizations to electronically pool their extensive information on trial sites and provides numerous tools (based on ICT advances in bioinformatics, GIS, and data management) that help farmers, plant breeders, and agronomists to evaluate new varieties more efficiently in the field and gain more useful data from field trials. For some time much of the data from field trials—representing an enormous investment of research resources over several decades—resided on the shelves of research institutions and was difficult to assemble, analyze on a large scale, and put to use.

Users can search the website for trial sites and data by country, design trials to evaluate cultivars, obtain tools to manage trials (from developing a budget to estimating water stress during the growing season), analyze trial data, view results of spatial analyses, examine data on an interactive Google map, and report results online. They can also rank varieties and add comments about their performance at a given site. The website allows the analysis of climate data for any point in Africa as well as climate similarity comparisons between trial sites and other areas of Africa. Finally, the site includes links to resources such as websites of the participating centers, from which anyone can request seed from breeders and genebank curators. The combination of African trial site data and interactive data analysis tools has made valuable information much more widely available and useful for the agricultural research, development, and extension community. Results for cultivars tested in Africa are rarely available online. Participants' data will significantly expand knowledge of which cultivars are suited to which environments (especially environments subject to stress from diseases, pests, or environmental factors). International agricultural research centers are beginning to use the trial sites in a climate

adaptation research program, drawing in national partners, and they are using Africats.org to standardize their trial site information.

## **Recommendation**

- The organizations and departments concerned with agricultural research and development needs to realize the potential of ICT for managing and dissemination of information to end-users.
- Efforts should be made to incorporate ICT in all endeavors related to agricultural research and development.
- Ensure that each researcher has basic levels of e-literacy and ICT access. It is critical to convince managers and funders that ICTs are “basic” to research, not just desirable add-ons.
- Websites established by agricultural research institutes should provide the latest information available to all stakeholders and obtain their feedback.
- The facilitation of interaction among researchers, extension (knowledge) workers, and farmers.
- Strong interfaces should be developed at village level so that the problem of IT illiteracy among farmers may be resolved. User-friendly applications, graphic interfaces and pictorial information would encourage more IT use.
- ICT services should provide early warning of disease and pest problems, question-and-answer services, information on cropping systems and planning, best and latest packages of practices for commercial crops, weather forecasting, soil testing and sampling, post-harvest technology, input prices/availability, farm business information and crop insurance.
- ICT-based agricultural development services should focus on enhancing the skills and knowledge of smallholder farmers and enabling smallholder value chains to improve their competitiveness and flourish.
- Develop standardized web-based content to end-users.
- Developments in shared technology, under the umbrella of cloud computing, can reduce costs and changing the equation on speed, complexity, and risks associated with deploying both application and computing services.

## **Conclusion**

The use of ICT in agricultural research and development organizations should focus in developing their information systems infrastructure such as hardware, software, connectivity, content development and capacity building. The use of ICT to connect sources of agricultural innovation to users, especially farmers, is limited by lack of connectivity, particularly to the internet, in rural areas. In countries where connectivity is improving, there are innovations in ICT use, such as web sites and portals that are now being tested to connect agricultural technology users to research institutions. In recent times, globally, all services/activities of ICT are moving towards cellular technology and applications are being developed upon considering this issue. So efforts should be made towards developing contents/applications accessible through mobile technology.

In Bangladesh, to ensure effective and efficient agricultural research and development immediate, short-term, mid-term and long-term initiatives should be taken-up depending on the needs and contexts mentioned earlier. Considering the capacity and resource availability in

public sector initiative can be taken through public private partnerships to service agricultural information needs.

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## Paper-02

বিএআরআই এর অফিস অটোমেশন সফটওয়্যার বাস্তবায়ন

### Implementation of BARI Automation Software

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পিএসও, বিএআরআই

বর্তমান যুগ হচ্ছে অবাধ তথ্য প্রবাহের যুগ। বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউটে তথ্যের অবাধ প্রবাহ ও স্বচ্ছতা আনয়নের নিমিত্তে অফিস অটোমেশন সহ ডোমেইন বেইজড ই-মেইল এড্রেস প্রবর্তন করা প্রয়োজন। এই উদ্দেশ্যকে বাস্তবায়ন করার নিমিত্তে অফিস অটোমেশন সহ অন্যান্য কার্যক্রম শুরু করা হয়েছে। এজন্য বিএআরআই এর প্রধান কার্যালয়সহ আঞ্চলিক কেন্দ্র সমূহ এবং মসলা গবেষণা কেন্দ্র ও গম গবেষণা কেন্দ্র সার্বক্ষনিক নেটওয়ার্ক কানেকটিভিটিতে রয়েছে। দ্রুত যোগাযোগের নিমিত্তে ডোমেইন বেইজড ই-মেইল এড্রেস বাস্তবায়ন করা হয়েছে। তাছাড়া ভোক্তাদের চাহিদা মোতাবেক প্রয়োজনীয় তথ্য সরবরাহ করা হচ্ছে। ইতোমধ্যে ICT প্রকল্পের অর্থায়নে মাল্টিইউজার সিস্টেম সফটওয়্যার এর মাধ্যমে personnel, training, financial, project এবং research data management এর কার্যক্রমের তথ্য automation এর আওতায় আনা হয়েছে। ফলে প্রধান কার্যালয়সহ আঞ্চলিক কেন্দ্র সমূহে personnel, financial, training, project and research data management এর তথ্য সার্বক্ষনিকভাবে update করা সম্ভব হবে এবং সকল পর্যায়ে তথ্য available হবে।

#### অটোমেশনের নিমিত্তে কার্যক্রম

- ১। মাল্টিইউজার সিস্টেম সফটওয়্যার উন্নয়ন
- ২। ডাটা বেজ সফটওয়্যার এবং অপারেটিং সিস্টেম
- ৩। তথ্য সংগ্রহ

#### ১। মাল্টিইউজার সিস্টেম সফটওয়্যার উন্নয়ন

মাল্টিইউজার সিস্টেম সফটওয়্যারে একই সময় একাধিক User ডাটা ইনপুট দিতে পারবে এবং একই সময় একাধিক User আউটপুট নিতে পারবে।

পাঁচ মডিউল বিশিষ্ট মাল্টিইউজার সিস্টেম সফটওয়্যার উন্নয়ন করা হয়েছে। মডিউলগুলো নিম্নরূপ:

1. Personnel Management Information System (PMIS)
2. Training Management System (TMS)
3. Financial Management System (FMS)
4. Project Management System (PMS)
5. Data Bank Management System (DMS)

### মডিউলগুলোর বর্ণনা

**PMIS** মডিউল দ্বারা প্রশাসনিক কার্যক্রমের তথ্য দ্রুত সরবরাহ করা সম্ভব। যেমন পদোন্নতি (promotion), বদলি (transfer), বিভিন্ন রকম ছুটি, বাসাবাড়ি বরাদ্দ, বার্ষিক বেতন বৃদ্ধি, লোন সংক্রান্ত বিষয়াদির কাজে তথ্য সরবরাহ করে দ্রুত সিদ্ধান্ত নেয়া যেতে পারে।

**TMS** মডিউল দ্বারা প্রশিক্ষণ/উচ্চতর শিক্ষা বিষয়ে মনোনয়ন দ্রুত দেয়া যেতে পারে। এ ছাড়াও প্রশিক্ষণ ও যোগাযোগ উইং এর অন্যান্য কার্যক্রম যেমন BTV, MoU ইত্যাদি বিষয়ের তথ্য সংরক্ষণ ও দ্রুত প্রতিবেদন তৈরী করা যেতে পারে।

**FMS** মডিউল দ্বারা fund disbursement, salary disbursement, party payment, loan ইত্যাদি বিষয়ে দ্রুত সিদ্ধান্ত নেয়া যেতে পারে। এ ছাড়া মাসিক, ত্রৈমাসিক, বাৎসরিক বাজেট তৈরী, GPF/CPF হিসাব, অডিট report ইত্যাদি বিষয়ে দ্রুত ও স্বচ্ছতার সাথে তথ্য সরবরাহ করা যেতে পারে।

**PMS** মডিউল দ্বারা প্রকল্পের activities, progress ইত্যাদি বিষয়ে দ্রুত তথ্য সরবরাহ করা যেতে পারে। যেমন প্রকল্পের মাসিক রিপোর্ট, ত্রৈমাসিক রিপোর্ট MoA, ERD, IMED ইত্যাদি প্রতিষ্ঠানে দ্রুত দেয়া যেতে পারে।

**DMS/RDMS** মডিউল দ্বারা গবেষণা কার্যক্রমের যাবতীয় তথ্য দ্রুততার সাথে সরবরাহ করা যেতে পারে। যেমন experiment এর তথ্য ও ফলাফল, রিভিউ সংক্রান্ত ফীডব্যাক ইত্যাদির তথ্য সংরক্ষণ করা যেতে পারে। এ ছাড়াও উদ্ভাবিত প্রযুক্তির তথ্য সংরক্ষণ ও প্রতিবেদন দ্রুত করা যেতে পারে।

উল্লেখ্য মডিউলগুলো আলাদা ভাবে (Independently) কাজ করতে পারে এবং প্রয়োজনে সংযুক্ত ভাবেও (Jointly) কাজ করতে পারে।

## ২। ডাটা বেজ সফটওয়্যার এবং অপারেটিং সিস্টেম

মাল্টিইউজার সিস্টেম সফটওয়্যারে দুইটি পার্ট রয়েছে (a) Front end (b) Back end

Front end এ রয়েছে Operating System (MS Server 2007) এবং Back end এ রয়েছে Database Software (Oracle)

## ৩। তথ্য সংগ্রহ

এএসআইসিটি বিভাগ হতে তথ্য সংগ্রহের নিমিত্তে personnel information, transfer, promotion, publication, training ইত্যাদির ছক সম্বলিত প্রোফাইল (employee profile) সকল কেন্দ্র/বিভাগ/শাখায় প্রেরণ করা হয়। সংগৃহিত প্রোফাইলগুলির তথ্য সংশ্লিষ্ট মডিউলে (PMIS & TMS) ইনপুট দেয়া হয়েছে। এ ছাড়া সংশ্লিষ্ট অফিস হতে DMS ও PMIS মডিউলে তথ্য ইনপুট দেয়া হচ্ছে।

## ভোক্তাদের চাহিদামত তথ্য সরবরাহ

বিএআরআই ওয়েব সাইটের মাধ্যমে চাহিদামত ভোক্তাদের কৃষি প্রযুক্তিগত প্রশ্নের উত্তর দেয়ার মাধ্যমে ই-কৃষি প্রবর্তনের কাজ বাস্তবায়ন করা হচ্ছে। তাছাড়াও বিএআরআই কর্তৃক উদ্ভাবিত কৃষি প্রযুক্তির তথ্যসহ অন্যান্য তথ্য ওয়েব সাইটে সন্নিবেশিত করা হচ্ছে।

## ডোমেইন বেইজড ই-মেইল এড্রেস

দ্রুত যোগাযোগের নিমিত্তে বিএআরআই এর সমস্ত বিজ্ঞানী/কর্মকর্তাকে ডোমেইন বেইজড ই-মেইল এড্রেসের আওতায় আনার প্রক্রিয়া চলমান রয়েছে। ইতোমধ্যে ৪০০ জন বিজ্ঞানী/কর্মকর্তাকে বারির ডোমেইন বেইজড ই-মেইলের আওতায় আনা হয়েছে এবং অবশিষ্টদের আনা প্রক্রিয়াধীন রয়েছে।

## নেটওয়ার্ক কানেকটিভিটি

বিএআরআই এর প্রধান কার্যালয়সহ আটটি বহিঃ কেন্দ্র নেটওয়ার্ক কানেকটিভিটির মধ্যে রয়েছে। প্রধান কার্যালয়ে ৪Mbps bandwidth ইন্টারনেট সংযোগ রয়েছে যা LAN এর মাধ্যমে ৩০০ কম্পিউটারে ইন্টারনেট ব্যবস্থা চালু রয়েছে। তাছাড়া আটটি বহিঃ কেন্দ্রে 256 Kbps bandwidth ইন্টারনেট সংযোগসহ VPN ব্যবস্থা চালু রয়েছে।



## ভবিষ্যৎ আইসিটি কার্যক্রম

০১. বিএআরআই কর্তৃক উদ্ভাবিত প্রযুক্তি সমূহের তথ্য কৃষক পর্যায়ে সহজলভ্য করার জন্য বাংলায় ই-বুক তৈরি করা।
০২. বাংলায় ভোক্তাদের চাহিদা মত (প্রশ্ন-উত্তর) তথ্য সরবরাহ করা।
০৩. মোবাইল ফোনের মাধ্যমে কৃষক পর্যায়ে ই-কৃষি সেবা প্রদান করা।
০৪. সফলভাবে ই-গভর্নেন্স প্রতিষ্ঠা করে বিএআরআই এর কার্যক্রম Digitize করা।
০৫. কেন্দ্রীয় নেটওয়ার্ক সম্প্রসারণ করে প্রতিষ্ঠানের সকল বিজ্ঞানী/কর্মকর্তাদের ইন্টারনেট সেবা প্রদান করা।
০৬. GIS & RS ভিত্তিক কার্যক্রম এর ব্যাপক ব্যবহার বাস্তবায়ন করা।

## Paper-03

### বাংলাদেশ রাইজ নলেজ ব্যাংক পরিচিতি

ড. মোঃ ইসমাইল হোসেন, এসএসও, বি, গাজীপুর

রাইস নলেজ ব্যাংক একটি কম্পিউটার ভিত্তিক বৈদ্যুতিক জ্ঞান ভান্ডার যাতে আধুনিক ধান চাষ সম্পর্কিত প্রযুক্তি ও কলাকৌশল সন্নিবেশিত আছে। ধান উৎপাদনের সর্বশেষ প্রযুক্তি ও জ্ঞান সংযোজন করে রাইস নলেজ ব্যাংক আধুনিকায়ন করা হয়ে থাকে। ধান উৎপাদন বৃদ্ধির জন্য চাই মাঠ পর্যায়ে আধুনিক ধান উৎপাদন প্রযুক্তির সঠিক প্রয়োজন। আর সেজন্য প্রথমেই প্রয়োজন কৃষকের হাতে আধুনিক প্রযুক্তি পৌঁছানোর ব্যবস্থা নিশ্চিত করা। গবেষণা প্রতিষ্ঠান এবং মাঠ পর্যায়ে ফলন ব্যবধানের অন্যতম কারণ প্রযুক্তি সম্পর্কে কৃষকের জ্ঞানের অভাব। দেশে ধানের ফলন বৃদ্ধির প্রথম শর্ত কৃষক পর্যায়ে আধুনিক প্রযুক্তি সরবরাহের নিশ্চয়তা এবং প্রয়োগের ক্ষেত্রে সহযোগিতা প্রদান। এ ব্যাপারে বাংলাদেশ রাইস নলেজ ব্যাংক (বিআরকেবি) একটি শক্তিশালী মাধ্যম হিসাবে ধান চাষের প্রয়োজনীয় জ্ঞান ও প্রযুক্তি দেশের প্রতিটি কৃষক, সম্প্রসারণকর্মী ও অন্যান্য ব্যবহারকারীদের নিকট পৌঁছে দিতে গুরুত্বপূর্ণ ভূমিকা পালন করছে।

#### উদ্দেশ্য

- কৃষকের কাছে ধান উৎপাদনের আধুনিক প্রযুক্তি পৌঁছে দেয়া
- সম্প্রসারণ কর্মীদের ধান উৎপাদন বিষয়ক হালনাগাদ প্রযুক্তি তথ্য প্রদান করা
- ধান গবেষকদের প্রয়োজনীয় তথ্যের যোগান দেয়া
- ছাত্র-শিক্ষকদের ধান চাষের সঠিক তথ্য সরবরাহ করা এবং
- মাঠে আধুনিক প্রযুক্তি ব্যবহারের মাধ্যমে উৎপাদন বৃদ্ধি করা।
- এতে যা আছে
- প্রযুক্তি সম্পর্কে ছবি ও ভিডিও ক্লিপসহ তথ্যের সংক্ষিপ্ত বিবরণ যুক্ত ফ্ল্যাঙ্কশীট
- বিষয়ক ভিত্তিক বিস্তারিত জানার জন্য রেফারেন্স চ্যাপ্টার
- ধান উৎপাদন প্রশিক্ষণ মডিউল
- কৃষকের জানার জন্য ধান উৎপাদন বিষয়ক প্রয়োজনীয় সামগ্রী।

#### ব্যবহার পদ্ধতি

- ইন্টারনেট : [www.knowledgebank-brri.org](http://www.knowledgebank-brri.org)
- সিডি
- ছাপানোর কপি

## **Paper-04**

### **DOCUMENTATION OF PLANT GENETIC RESOURCES INFORMATION**

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#### **Abstract**

The importance of a proper documentation system for the management of plant genetic resources has been realized for inventory purposes as well as for the utilization of germplasm in breeding programmes. The article describes in brief the database management systems, descriptors and descriptor states, types of information and the need of standards for data preparation. The data standardization should be treated as a pre-requisite for the development of effective information system. Plant Genetic Resources Centre is maintaining 9490 accessions of 129 different agricultural crops in long term and medium term storage and in the field. A good achievement in germplasm collection, conservation, characterization and evaluation, and utilization made by the PGRC have been highlighted. The associated information has been partially computerized in the form of excel and word files. The need to develop national information system based on a network approach, including all the institutions as well as all the crop centres, divisions, regional stations and sub-stations of BARI throughout the country which are involved in germplasm collection, conservation and utilization, has been emphasized.

## Paper-05

# Assessment of Evapotranspiration of Crop and Estimation of Yield of Wheat in Greater Dinajpur Region Using Satellite Data

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### ABSTRACT

The increasing demand of food management, monitoring of the crop growth and forecasting its yield well before harvest are very important. Early yield prediction together with monitoring of crop development and its growth are being identified with the help of satellite and remote sensing images. Studies using remote sensing data along with field level validation reported high correlation between vegetation indices and yield. In recent years, there has been a growing cultivation of cereal crops including wheat in the North West region of Bangladesh especially in the greater Dinajpur region which consists of three districts: Dinajpur, Panchagarh and Thakurgaon. However, it is difficult to quantify the exact area of wheat cultivation using traditional ground based measurements. However, remote sensing can provide most real time information about the wheat coverage area and can estimate the probable yield.

In this context, this study has been carried out to estimate crop yield of wheat at field level using remote sensing data for the greater Dinajpur region of Bangladesh. The main objectives of this study are to identify spatial coverage area of wheat using remote sensing data and validate it through field based survey, to estimate evapotranspiration of wheat during the growing period and detect the crop water deficit, to develop relationship between vegetation indices such as Normalized Difference Vegetation Index (NDVI) and yield to predict regional yield of wheat. Field data of wheat for the growing season from November 2007 to March 2008 were collected from the farmers through successive field visits in the study area in collaboration with Bangladesh Agricultural Research Institute (BARI). A total of 40 farmers were interviewed and their fields were digitized. A hand held GPS was used to digitize fields and for ground-truthing of the wheat fields. Data on crop information was collected from the Department of Agricultural

Extension (DAE) at Sadar Upazila of Dinajpur district. Climatic data was collected from Bangladesh Meteorological Department (BMD).

Surface reflectance and land surface temperature data of the Moderate Resolution Imaging Spectroradiometer (MODIS) were used. A time series data product of MODIS with a temporal resolution of 8 days and a spatial resolution of 500m for spectral band and 1 km for thermal band data were used to study yield and evapotranspiration of wheat. A total of 13 images were downloaded from December 2007 to March 2008 during the growing season of wheat. Integrated Land and Water Information System (ILWIS 3.4) software was used for image processing and spatial analysis. Images were geo-referenced using software MODIS Re-projection Tool (MRT). MODIS images were validated for wheat area from bare land, settlement, water bodies, agricultural crops, etc. through establishing mean wheat growth curve using data from selected 40 farmers' fields. The chronological changes of vegetation indices (e.g. NDVI) after wheat plantation were studied through spatial and temporal distribution for the study area. Using the NDVI indicator developed from time series MODIS satellite images, the phenological growth of wheat has been monitored during the Rabi season (November to March) for the crop year 2007-2008 for the greater Dinajpur region of Bangladesh. The median value of NDVI for different Upazila varies from 0.563 to 0.603 with a mean of 0.584 during the growing season. The wheat fields have been successfully delineated (masked) using the chronological changes of vegetation indices (NDVI) from the selected farmers' field. This information was used for estimation of evapotranspiration of the crop and its yield.

As mentioned above, satellite images provide a powerful tool for the identification of crops and determine crop water requirement which is effective for land use and water management. The estimation of evapotranspiration using remote sensing data is another very important component for effective water management. The exchanges of radiative heat and moisture fluxes affect the biosphere and various irrigation processes, estimation of crop water demand and the rate of evapotranspiration. This study has been conducted to estimate the daily evapotranspiration through remote sensing for the greater Dinajpur region of Bangladesh. Surface Energy Balance Algorithm (SEBAL) has been used to estimate evapotranspiration by balancing all energy components such as sensible heat flux, net radiation, soil heat flux and latent heat of evaporation. The average values of evapotranspiration for the study area using SEBAL and Penman Monteith

methods are found 2.7 mm/day and 2.44 mm/day respectively. The actual evapotranspiration calculated from the SEBAL method is compared with the theoretical ET of reference crop using the Penman Monteith method. Crop coefficient,  $K_c$  is determined during the growing season of wheat by comparing ET from the above two methods. This study has successfully demonstrated the capability of estimating evapotranspiration and crop coefficient of wheat using remote sensing data which can be used as useful tool for crop water management.

An attempt is undertaken to correlate the crop health using NDVI indices with the yield. Using the Upazila wise yield data from the Department of Agricultural Extension (DAE), a correlation has been developed between yield of wheat and maximum values of NDVI. In the study area, the yield of wheat varies from 1.04 ton/ha to 2.5 ton/ha with a mean value of 2.19 ton/ha. A strong correlation is found ( $R^2=0.71$ ) between the wheat production and satellite represented wheat area. It can be inferred that satellite data can be used as effective tool for crop monitoring and yield estimation of wheat. However, the results of this study can be improved by using high resolution satellite images, continuous collection of evapotranspiration data through Lysimeter experiments, installation of more meteorological stations for weather parameters and collecting production and yield from farmers' fields etc.

## Paper-06

# Opportunities of Information and Communication Technology for Agricultural Development in Bangladesh

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### Abstract

The Information and Communication Technology for Development (ICT4D) has become a key strategy to support poverty reduction activities in developing country. Different ICT initiatives including telecenters have remarkable achievement for agricultural development. In this context, most of the telecenters are seen as a tool to bring the benefits to locations that have so far been suffering from their remoteness and lacking connectivity to the world's information society. Telecenters are working in Bangladesh as information center, knowledge center, and information resource center, multi-purpose community centers and Union Information and Service Center. As most of the studies on telecenters movement to date have focused on operational and sustainability issues mostly using the theory of diffusion of innovations. Bangladesh Government has taken an initiative to make the nation as Digital Nation of Digital Bangladesh" and started establishing telecenter at every Union Council Office as "Union Information and Service Center (UISC)". The initiative aims to make every center successful and make the center independent from external support and subsidies. Some other government and non-government organization provides their services using ICTs in Bangladesh. Most of these initiatives are tend to provide agriculture information to the end-users. Agriculture information services (<http://www.ais.gov.bd/>), E-krishi (<http://www.ekrishi.com/>), National Infokosh (<http://www.infokosh.bangladesh.gov.bd/>), E-Krishok (<http://www.ekrishok.com/>), Village Information Center (<http://www.pallitathya.org.bd>), Our Village (<http://www.amadergram.org/>), etc are very promising initiatives those are providing agriculture information to the farmers. Nowadays ICT is widely using to monitor and getting real time agriculture data using different sensor based technology specially field server.

## Paper-07

### Utilization of ICT in agriculture by Agricultural Information Service (AIS)

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Agriculture Information Service (AIS) is one of the core agencies under Ministry of Agriculture (MoA) which have been dedicatedly delivering the information services among the farmers and different allied stakeholders since its inception in 1961. Presently AIS is performing the pride responsibilities of 'Focal point' under MoA regarding media based agri information dissemination.

AIS has the conceit experiences in print and electronic media for agi information dissemination. Besides to implement the vision of the present democratic government making 'Digital Bangladesh' which is the part of 'Vision 2021', several initiatives have been taken. It is our privilege to mention few of that right here.

- **Website:** AIS has launched the largest Bengali website in Bangladesh. This is endowed with huge content on agriculture. It is being update regularly. Production technology, market, weather, contemporary issues etc. The web address is [www.ais.gov.bd](http://www.ais.gov.bd). The most unique feature of the website is, any interested persona can get reply of his/her query within 24 hours thorough this website. The website has got the champion award in 'Digital innovation fair 2011' by the MoSICT.
- **AICC:** To bridging the gap between urban and rural people and to establish a 'one stop service center' 95 nos. Agriculture Information and Communication Centres (AICC) have been established in the rural areas. Another 150 numbers will be established very soon. These centers are fully operated by the farmers. These are well equipped with ICT materials and trained personnel.
- **Community Radio:** To reach the unreached people AIS has established Community Radio (CR) at Amtoli upazilla in Barguna district with technical and financial assistance from FAO. This CR is well known as '*voice of the voiceless people*' to the concerned area.
- **Mobile based agri information dissemination:** AIS has started information dissemination through mobile phone. At present we have been sending SMS amongst the farmers, officials from the headquarter to block level and other related department on the present 'to do' advice. Shortly we are planning to start IVR, MMS, VMS and other services.



- **Online *Krishok* TV:** AIS has started online based TV (*Commonly known as IP TV*, which has enabled farmers/interested people to watch/download the agricultural TV programs (both BTV and Pvt channels).
- **E-Book:** AIS has prepared the 'E-Book' on different agricultural technologies with the fusion of text, video, audio with unique multimedia features which not only filling the thirst of the illiterate farmers rather very effective for the all sort of interested people. This e-book or multimedia book already gained huge popularity amongst the concerned personnel.
- **Content providing to Bangladesh Betar (BB):** AIS has been providing agri content to the BB for their agricultural program transmission both for central and regional stations.
- **Connection with Television:** AIS has been preparing programs of 'Mati O Manush' for BTV which is being transmitted 5 days/week. Besides, creating different talk show, film, filler, documentaries etc. by its own media house.
- **Mobile cinema van:** Introducing different new technologies among the rural people AIS is continuously using mobile cinema van through its regional offices across the country.
- **Call Centre:** Mobile phone has been playing a significant role in our daily life. To utilize this powerful but tiny device in agricultural development, AIS has launched a Call Centre at AIS headquarter with the assistance of Practical Action, an international NGO. Any person can call to 09633123123 for getting advice on agriculture, fisheries and livestock from 10 am-2pm each day except Friday.
- **Future planning:** ICT is the most effective tool for the rapid information dissemination. Keeping this into mind, we have been trying to create some new windows in the relevant field. Among these farmers database, online local content repository, connectivity of the field offices through VPN etc are the imperative one:

## Discussant's Comments on Key Note Paper

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Paper presented here are undoubtedly a very good and informative one. However in absence of the author, the presenter focused so many things nicely and attractively. Although she had some time limitation but the audience was happy with this. Here are some comments to improve the paper for further multiplication.

- a) In introductory chapter, the author in his last paragraph, mentioned about the use of ICT in Agriculture in two ways. 1) Research Institution and 2) Farmer/ user community. I think, between the farmer and users there are some intermediate roll player, we called them as 'Extension agent'. ICT can also enlighten these people.
- b) In the chapter 'Phases of ICT Development' the author mentioned four phases including the last 'strategic' phase. In fact, Strategic phase is a continuous system. It needs from start to finish. As there is no end, so it becomes the input of restart. He also mentioned the immediate, short term, midterm and long term agenda for this phase; those can be rescheduled with other phases. However, in our NARS system, we achieved up to midterm target. Similarly, 'capacity building' is also started with the starting of the system. This is in fact, are ongoing. However, he rightly pointed out the importance and control.
- c) In the chapter 'Issues for ICT use', He mentioned three important ideas
  - 1) Connectivity – This is still now very costly and low speed in the country. Because, rural people are still using the connection of mobile based network.
  - 2) Content – content should be connected with all handy devices like mobile phone
  - 3) Capacity building – In this issue, quality control is the major thing to be ensured
- d) Use of ICT in agricultural research and development chapter, the author nicely mentioned few paragraphs on research, education, extension, organization management and administration, advisory services, risk management and collaboration and partnership. Here the roll of ICT was discussed as a resource, communication tool, learning media, guide and so on.
- e) After that the author mentioned nicely but very briefly about the scenario of ICT usages and facilities in Bangladesh. There was the scope to enlarge the list. Although he added a long list of international services on e-agriculture. In other point, mobile based services are now the mobile based business for the mobile companies. There should be a policy to reduce the call rate. I know, In India this service is toll free.
- f) Finally, the author very nicely made some recommendations.

In conclusion, we are now moving towards the use of smart devices. So, all our efforts should be based on this technology. █

## Reporteur's Reports

### A. House Comments on Key Note Paper

1. Strategic phase for ICT development should be focused
2. Besides ICT infrastructure development, capacity building should be increased in agricultural research
3. Conditional Cell for ICT is a must for development.
4. Internet connectivity should be enhanced alongwith reduce re-arrange connectivity cost
5. Content generation should be increased alongwith through radio, TV, mobile phone, internet and other ICT devices
6. Research information should be web enabled through data base
7. Information (Agricultural, ICT related) should be freely distributed or telecast or broadcast by electronic device
8. Smart device should be used for agricultural extension

### B. House Comments on Implementation of BARI Automation Software

1. Internet facility should be increased at outer stations of BARI
2. BARI domain based email should be user-friendly
3. Internet facility should be available upto junior level of scientists for research work

### C. House Comments on বাংলাদেশ রাইজ নলেজ ব্যাংক পরিচিতি

1. How do farmers receive information from BRKB
2. What is the way to know the farmers' reaction of their query

### D. House Comments on Documentation of Plant Genetic Resources Information

1. PGRC data base should be accelerated through web site for the scientists' benefit
2. Data base software should be developed with the collaboration of ASICT and PGRC
3. BARI variety lists (Including destroyed variety) should be updated with the collaboration of all research centres or divisions for end users

১২/০৩/১৩ তারিখে অনুষ্ঠিত

**Application of ICT in Agricultural Research and Development** শীর্ষক কর্মশালায়

উপস্থিত বিজ্ঞানী/কর্মকর্তাদের তালিকা

স্থান: সেমিনার রুম, বিএআরআই, গাজীপুর

ক্র. নং	অংশগ্রহণকারীর নাম ও পদবী	প্রতিষ্ঠান/কেন্দ্র/ বিভাগের নাম ও ঠিকানা
১.	ড. মোঃ খালেদ সুলতান, পরিচালক	উদ্যানতত্ত্ব গবেষণা কেন্দ্র, বিএআরআই, গাজীপুর
২.	ড. মোঃ সাখাওয়াৎ হোসেন, সিএসও	গবেষণা উইং, বিএআরআই, গাজীপুর
৩.	ড. মোঃ লুৎফর রহমান, সিএসও	প্রশিক্ষণ ও যোগাযোগ উইং, বিএআরআই, গাজীপুর
৪.	সুফিয়া বেগম, পিএসও	প্রশিক্ষণ ও যোগাযোগ উইং, বিএআরআই, গাজীপুর
৫.	মোঃ মিজানুর রহমান, এসও	প্রশিক্ষণ ও যোগাযোগ উইং, বিএআরআই, গাজীপুর
৬.	ড. তপন কুমার পাল, সিএসও	পরিকল্পনা ও মূল্যায়ন বিভাগ, বিএআরআই, গাজীপুর
৭.	সুরাইয়া ইয়াসমীন, সিএসও	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
৮.	ড. মোঃ আজিম উদ্দিন, পিএসও	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
৯.	ড. মোঃ সাইফুল ইসলাম, পিএসও	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
১০.	কাজী ছাইদুর রহমান, এসও	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
১১.	মোঃ মুখলেছুর রহমান, এসও	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
১২.	নূর মোহাম্মদ, এসও	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
১৩.	জুবায়ের আকন্দ, এসও	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
১৪.	এ.এফএম, তারিকুল ইসলাম, এসও	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
১৫.	মোঃ আতিকুর রহমান, সহকারী নেটওয়ার্ক প্রকৌশলী	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
১৬.	মোঃ মোস্তাফিজুর রহমান চৌধুরী, সহকারী সফটওয়্যার প্রকৌশলী	এএসআইসিটি বিভাগ, বিএআরআই, গাজীপুর
১৭.	ড. মাহবুবা বেগম, এসএসও	কন্দাল ফসল গবেষণা কেন্দ্র, বিএআরআই, গাজীপুর
১৮.	ড. বীরেশ কুমার গোস্বামী, সিএসও	কন্দাল ফসল গবেষণা কেন্দ্র, বিএআরআই, গাজীপুর
১৯.	মোস্তাক আহমেদ, এসও	অনিষ্টকারী মেরুদণ্ডী বিভাগ, বিএআরআই, গাজীপুর
২০.	মোঃ আরিফুর রহমান, এসএসও	অনিষ্টকারী মেরুদণ্ডী বিভাগ, বিএআরআই, গাজীপুর
২১.	ড. মুহাঃ আতাউর রহমান, পিএসও	গম গবেষণা কেন্দ্র, বিএআরআই, গাজীপুর
২২.	মোঃ মোশাররফ হোসেন, এসএসও	গম গবেষণা কেন্দ্র, বিএআরআই, গাজীপুর
২৩.	আব্দুল হান্নান, এসএসও	বীজ প্রযুক্তি বিভাগ, বিএআরআই, গাজীপুর
২৪.	আনাম এনামুল করিম, এসএসও	বীজ প্রযুক্তি বিভাগ, বিএআরআই, গাজীপুর
২৫.	মোঃ আমিরুল ইসলাম, এসও	খামার বিভাগ, বিএআরআই, গাজীপুর
২৬.	মুহাম্মদ শামসুল হুদা, এসও	খামার বিভাগ, বিএআরআই, গাজীপুর
২৭.	মোঃ মাহমুদুল্লাহ, এসও	কীটতত্ত্ব বিভাগ, বিএআরআই, গাজীপুর
২৮.	আফরোজা বেগম, এসও	কীটতত্ত্ব বিভাগ, বিএআরআই, গাজীপুর
২৯.	ড. ফিরোজা খাতুন, পিএসও	তৈলবীজ গবেষণা কেন্দ্র, বিএআরআই, গাজীপুর
৩০.	ড. ফেরদৌসী বেগম, পিএসও	তৈলবীজ গবেষণা কেন্দ্র, বিএআরআই, গাজীপুর
৩১.	ড. মোঃ আমজাদ হোসেন, সিএসও	পিজিআরসি, বিএআরআই, গাজীপুর
৩২.	ড. মোঃ সুলতান আলম, পিএসও	পিজিআরসি, বিএআরআই, গাজীপুর
৩৩.	ড. মোঃ তারিকুল ইসলাম, পিএসও	পিজিআরসি, বিএআরআই, গাজীপুর
৩৪.	ড. মোঃ মতিয়ার রহমান, এসএসও	উদ্ভিদ প্রজনন বিভাগ, বিএআরআই, গাজীপুর
৩৫.	সাজেদুল করিম, এসও	উদ্ভিদ প্রজনন বিভাগ, বিএআরআই, গাজীপুর

ক্র. নং	অংশগ্রহণকারীর নাম ও পদবী	প্রতিষ্ঠান/কেন্দ্র/ বিভাগের নাম ও ঠিকানা
৩৬.	মিঃ রাজিব পোদ্দার, এসএসও	ডাল গবেষণা উপ-কেন্দ্র, বিএআরআই, গাজীপুর
৩৭.	মোহাম্মদ গোলাম হোসেন, এসও	ডাল গবেষণা উপ-কেন্দ্র, বিএআরআই, গাজীপুর
৩৮.	বুমানা ইসলাম, এসও	উদ্ভিদ রোগতত্ত্ব, বিএআরআই, গাজীপুর
৩৯.	বুমানা মমতাজ, এসও	উদ্ভিদ রোগতত্ত্ব, বিএআরআই, গাজীপুর
৪০.	ড. মোঃ আব্দুল মতিন, পিএসও	কৃষি অর্থনীতি বিভাগ, বিএআরআই, গাজীপুর
৪১.	শায়লা খন্দকার, এসও	কৃষি অর্থনীতি বিভাগ, বিএআরআই, গাজীপুর
৪২.	মোঃ হাবিবুর রশিদ, এসএসও	মৃত্তিকা বিজ্ঞান বিভাগ, বিএআরআই, গাজীপুর
৪৩.	মোছাঃ বিলকিস বানু, এসও	মৃত্তিকা বিজ্ঞান বিভাগ, বিএআরআই, গাজীপুর
৪৪.	ড. মোঃ নূরুল আমিন, এসএসও	এফএমপিই বিভাগ, বিএআরআই, গাজীপুর
৪৫.	মোহাম্মদ এরশাদুল হক, এসএসও	এফএমপিই বিভাগ, বিএআরআই, গাজীপুর
৪৬.	মোঃ জুবায়ের হাসান, এসএই	এফএমপিই বিভাগ, বিএআরআই, গাজীপুর
৪৭.	ড. মুসী রাশীদ আহমেদ, পিএসও	উদ্যানতত্ত্ব গবেষণা কেন্দ্র, বিএআরআই, গাজীপুর
৪৮.	ড. এস. এম. শরিফুজ্জামান, পিএসও	উদ্যানতত্ত্ব গবেষণা কেন্দ্র, বিএআরআই, গাজীপুর
৪৯.	ড. মোঃ জালাল উদ্দিন, সিএসও	সরেজমিন গবেষণা বিভাগ, বিএআরআই, গাজীপুর
৫০.	ড. অপূর্ব কান্তি চৌধুরী, পিএসও	সরেজমিন গবেষণা বিভাগ, বিএআরআই, গাজীপুর
৫১.	ড. এএসএম মাহবুবুর রহমান খান, পিএসও	সরেজমিন গবেষণা বিভাগ, বিএআরআই, গাজীপুর
৫২.	অপূর্ব কুমার চাকী, এসও	সরেজমিন গবেষণা বিভাগ, বিএআরআই, গাজীপুর
৫৩.	মোহাম্মদ মিজানুর রহমান, এসএসও	পোষ্ট হারভেস্ট টেকনোলজী বিভাগ, বিএআরআই, গাজীপুর
৫৪.	মোঃ হাফিজুল হক খান, এসএসও	পোষ্ট হারভেস্ট টেকনোলজী বিভাগ, বিএআরআই, গাজীপুর
৫৫.	ড. মোঃ আনোয়ার হোসেন, এসএসও	সেচ ও পানি ব্যবস্থাপনা বিভাগ, বিএআরআই, গাজীপুর
৫৬.	বুলবুল আহমেদ, এসও	কৃষিতত্ত্ব বিভাগ, বিএআরআই, গাজীপুর
৫৭.	ড. মাহমুদা খাতুন, এসএসও	জীব প্রযুক্তি বিভাগ, বিএআরআই, গাজীপুর
৫৮.	এ, কে, এম, জোনায়েদ-উল-নূর, এসও	আরএআরএস, জামালপুর, বিএআরআই, গাজীপুর
<b>অন্যান্য প্রতিষ্ঠানসমূহ</b>		
৫৯.	ড. মোঃ কামাল হুমায়ন কবীর, মহাপরিচালক	বিএসআরআই, ঈশ্বরদী, পাবনা
৬০.	জনাব মো. সাইদুর রহমান, রিসার্চ অফিসার	বাংলাদেশ বন গবেষণা ইনস্টিটিউট, চট্টগ্রাম
৬১.	ড. সমজিৎ কুমার পাল, সিএসও	প্রশিক্ষণ ও প্রযুক্তি হস্তান্তর বিভাগ, বিএসআরআই, ঈশ্বরদী, পাবনা
৬২.	জনাব মো. মুনির হোসেন, এসও	প্রশিক্ষণ ও প্রযুক্তি হস্তান্তর বিভাগ, বিএসআরআই, ঈশ্বরদী, পাবনা
৬৩.	ড. মোঃ শাহজাহান কবীর, সিএসও,	কৃষি পরিসংখ্যান বিভাগ, বাংলাদেশ ধান গবেষণা ইনস্টিটিউট, গাজীপুর
৬৪.	ড. মোঃ ইসমাইল হোসেন, এসএসও,	কৃষি পরিসংখ্যান বিভাগ, বাংলাদেশ ধান গবেষণা ইনস্টিটিউট, গাজীপুর

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01. Dr. Md. Mukhlesur Rahman, Director (T&C)
02. Suraiya Yasmin, CSO
03. Dr. Md. Azim Uddin, PSO
04. Dr. Md. Saiful Islam, PSO
05. A.F.M. Tariqul Islam, SO

### **Registration & Room Decoration Committee**

01. Sultana Nasrin, SSO
02. A.F.M. Tariqul Islam, SO
03. Zobaer Akond, SO
04. Md. Atiqur Rahman, Network Engineer
05. Mrs. Shamima Akter, Labour

### **Food Committee**

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02. Kazi Saidur Rahman, SO
03. Nur Mohammad, SO
04. Md. Mostafizur Rahman, Asst. Software Engr.

### **Transport & Accomodation Committee**

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02. Dr. Md. Saiful Islam, PSO
03. Md. Mukleshur Rahman, SO
04. Kazi Saidur Rahman, SO

### **Rapporture's**

01. Md. Mukhlesur Rahman, SO
02. Nur Mohammad, SO

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কৃষি পরিসংখ্যান এবং তথ্য ও যোগাযোগ প্রযুক্তি বিভাগ  
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