



Success Stories on ICT/ICM in AR4D in Asia and the Pacific Region





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**Food and Agriculture Organization of the United Nations
Regional Office for Asia and the Pacific**

**Asia-Pacific Association of Agricultural Research Institutions
Bangkok, Thailand**

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Acronyms

aAQUA	almost All Questions Answered
ACORAB	Association of Community Radio Broadcasters, Nepal
ADB	Asian Development Bank
AI	Agriculture Instructor
AICC	Agriculture Information and Communication Centre
AIS	Agricultural Information Services
AM	Amplitude Modulation
APAARI	Asia-Pacific Association of Agricultural Research Institutions
APARIS	Asia-Pacific Agricultural Research Information System
AR4D	Agricultural Research for Development
ARD	Agricultural Research and Development
ARPA	Agriculture Research and Production Assistant
ASC	Agrarian Service Centre
ATIC	Agricultural Technology Information Centre
AVC	Audio Visual Centre
B2B	Business-to-Business
BARC	Bangladesh Agricultural Research Council
BTV	Bangladesh Television
CARRDEC	Cotabato Agriculture and Resources Research and Development Consortium
CBO	Community-based Organizations
CCTV	Closed-Circuit Television
CDMA	Code Division Multiple Access
CeC	Community eCentre
CEU	Cyber Extension Unit
CICT	Commission on Information and Communication Technology
CPDD	Communication, Publication and Documentation Division
CR	Community Radio
CSC	Common Service Centre
DIL	Developmental Informatics Lab
DoA	Department of Agriculture
DOST	Department of Science and Technology
FAO	Food and Agriculture Organization of the United Nations
FAO RAP	Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific
FAQ	Frequently Asked Questions
FITS	Farmers Information and Technology Services

FM	Frequency Modulation
GBPUAT	Govind Ballabh Pant University of Agriculture and Technology, Pantnagar
GDP	Gross Domestic Product
GPRS	General Packet Radio Service
ICAR	Indian Council of Agricultural Research
ICM	Information and Communication Management
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
ICT	Information and Communication Technologies
ICT/ICM	Information and Communication Technologies/Information and Communication Management
ICTA	Information and Communication Technology Agency
IIIT	Indian Institute of Information Technology
IIM CD-ROM	Interactive Multimedia CR-ROM
IIT-B	Indian Institute of Technology-Bombay
INGO	International Non-governmental Organization
JICA	Japan International Cooperation Agency
KVK	Krishi Vygyan Kendra
KVS	Krishikarma Vyaptha Sevaka
LGU	Local Government Unit
LRSC	Local Radio Support Committee
MISD	Management Information Systems Division
MMS	Multimedia Messaging Service
NAARM	National Academy of Agricultural Research Management
NAIP	National Agricultural Innovation Project
NARC	Nepal Agricultural Research Council
NARS	National Agricultural Research System
NEFEJ	Nepal Forum for Environmental Journalists
NGO	Non-Government Organisation
PCARRD	Philippine Council for Agriculture, Forestry and Natural Resources Research and Development
PhilCeNet	Philippine Community eCentre Network
Q&A	Question and Answer
R&D	Research and Development
S&T	Science and Technology
SAARC	South Asian Association for Regional Cooperation
SAC	SAARC Agriculture Centre
SMARRDEC	Southern Mindanao Agriculture and Natural Resources Research and Development Consortium
SMS	Short Message Service
T&V System	Training and Visit System

UAS Dharwad	University of Agricultural Sciences, Dharwad
UAS Raichur	University of Agricultural Sciences, Raichur
UHF	Ultra High Frequency
UNDP	United Nations Development Programme
UNL/MT	Universal Networking Language/Machine Translation
URL	Uniform Resource Locator
VDC	Village Development Committee
VHF	Very High Frequency
WESVARRDEC	Western Visayas Agriculture and Resources Research and Development Consortium

Foreword


Dissemination of agricultural innovations and technologies plays a crucial role in taking the research results to resource poor smallholder farmers. The demand of farmers regarding knowledge on innovations and technologies has been growing in order to face the challenges posed by climate change, depleting natural resources, food security and safety, market opportunities and value addition etc. The Information and Communication Technologies/Information and Communication Management (ICT/ICM) can offer immense opportunities to the farming communities in the rural areas to update their knowledge and bridge the gap between farmers and the researchers.

ICT/ICM encompasses the broad fields of data/information processing and communication by means of computers, telecommunications, radio, television, internet, satellite, mobile phones etc. It covers all emerging aspects including innovative practices to efficiently manage the digital resources. There are good examples of use and application of ICT/ICM for AR4D in the Asia-Pacific region which will provide better insights into different aspects such as innovative application of new ICTs in rural areas, institutional partnerships; management of digital information resources, socio-economic impact of ICT/ICM, and the role of public and private sector agencies in fostering ICT/ICM for agricultural development.

APAARI has been instrumental in disseminating agricultural innovations and technologies through success stories on important themes with the aim to enable all ARD stakeholders to adopt innovations and technologies for the benefit of resource poor smallholder farmers. Besides popularizing the success stories in agricultural development, APAARI has undertaken documentation of success stories on ICT/ICM for AR4D in the Asia-Pacific region that provides better insights on the use and application of ICT/ICM for empowering the farming community. This publication includes success stories on ICT/ICM in agriculture from five countries, viz., Bangladesh, India, Nepal, the Philippines and Sri Lanka.

These success stories focus on a variety of ICT/ICM initiatives in agriculture that included innovative television program *Moti-O-Manush* in Bangladesh, ICT-enabled information services to farmers through *aAQUA* initiative in India, improving adoption of technologies and marketing in vegetables with the help of *Krishi Community Radio* in Nepal, appropriate use of ICT tools and methods through Farmers Information and Technology Services (FITS) in the Philippines, and Cyber Extension in support of agricultural extension system in Sri Lanka. These success stories highlight the role of ICT/ICM in strengthening the present agricultural extension system in the respective countries for efficient transfer of technologies to the farmers. It provides useful lessons on the use of new information and communication technologies, public-private partnerships in ICT initiatives, impact of ICT/ICM in agriculture, orientation and participation of farmers and mechanisms for better implementation of ICT/ICM initiatives for AR4D.

APAARI is thankful to the authors for their sincere efforts in writing these success stories. We are also grateful to FAO Regional Office for Asia and the Pacific for providing financial support. I am confident that these success stories will be useful to all ARD stakeholders and empower the smallholder resource poor farmers in the developing countries to make the best use of ICT/ICM components in AR4D. I am sure this publication will serve useful purpose for all those engaged in taking results to farmers' fields.



Raj Paroda
Executive Secretary
APAARI

Executive Summary

1. The Information and Communication Technology (ICT)/Information and Communication Management (ICM) offer immense opportunities through a variety of initiatives that foster ICT-enabled agricultural information services to all ARD stakeholders to undertake their roles more efficiently. The potential of ICTs is significant in providing highly targeted and location specific services with the help of emerging technologies, 3G/4G technologies, cloud computing, semantic technologies, web 2.0, social networking, GIS and precision farming applications etc. Different types of ICT technologies and channels have been implemented which range from electronic mass media like television, community radio, mobile phone technologies, web-based information services etc., in order to address specific needs of farming community and other stakeholder in agricultural development process.
2. ICT in AR4D has been identified as an important priority area in the Asia-Pacific region for sharing knowledge and information in order to strengthen research, extension and marketing systems. There are notable ICT attempts in agriculture and rural development which not only provide lessons on connectivity and device development but also offer more insights that indicate how Information and Communication Management (ICM) practices address agricultural challenges in developing countries. Each ICT/ICM initiative provides useful lessons with regard to agricultural content development, end-user needs, policy support, information and knowledge management, application of technologies, role of institutions and their partnerships besides response to agricultural problems and socio-economic impact. This specialized body of knowledge, cutting across disciplines, opens up great learning opportunities for all stakeholders in AR4D and it forms a key component to improve their capacities for leveraging ICT/ICM for AR4D.
3. The present publication attempts to document five cases where ICTs have been harnessed to address different problems in agriculture in five countries viz., Bangladesh, India, Nepal, Philippines and Sri Lanka. Each case describes how ICTs are applied in different situations, how institutional arrangements work, flows of information, impact of ICT interventions along with lessons learnt. The cases also project constraints in the current agricultural extension systems, information services and existing channels of communication in the respective countries as backdrop which necessitated intervention of ICT/ICM to address the problems in agricultural information dissemination.
4. ***aAQUA: ICT-enabled Knowledge Services to Farmers in India*** demonstrates how an online farmers knowledge exchange platform functions by using a variety of technologies that included mobile phones, website and SMS-based services jointly by the Developmental Informatics Lab of the Indian Institute of Technology-Bombay, Vigyan Ashram and KVK Baramati (NGOs) in Maharashtra in 2002 and later supported by agricultural universities like GB Pantnagar University, Dharwad University, Raichur University and other partners. *aAQUA*, which stands for *almost All Questions Answered*, is an online Question & Answer and community discussion forum for creating and delivering information relevant to farmers. It allows members using a web browser on a computer to create, view and manage content in local languages (Hindi, Marathi and Kannada). On *aAQUA*, content is organized in the form of discussion fora based on the types of categories of queries posted by farmer or experts. There are 22 fora comprising 6 categories that included crops, animals, KVK recommendations, farmer schemes and market

information etc. The fora are open to all users for browsing without any charges for non-commercial use. Certified scientists from Krishi Vigyan Kendras, agricultural universities and other public research and extension systems offer their expert advice to farmers free of charge. These certified experts provide unbiased answers to farmers' queries based on the location, season, crop and other information provided by farmers at the time of registration.

aAQUA has uniquely brought together various innovations in technology and usability to address challenges posed by barriers to information access by farmers in the rural areas in India. It provides online key boards in Hindi, Marathi, Kannada, Telugu and Malayalam languages which help farmers to input their queries. It also has features like multilingual retrieval, keyword browser, uploading of multimedia files, off-line access in rural areas, digital library etc., which improve access and availability of information to farmers. aAQUA also introduced SMS, mobile web browser and mobile applications so as to reach farmers in the villages. It supports voice messaging, MMS, remote photo capture and aAQUA feed reader to fully harness innovative ICT applications for information exchange. The case shows how to customize the web-based technologies for creating ICT-enabled knowledge services for farmers in their own languages through pooling experts from the agricultural institutions with the help of online fora and mobile technologies. aAQUA follows farmers-friendly approaches in its interfaces, access to databases, searching through keywords, mobile applications, voice messaging, multimedia content etc., in order to break the barriers to information at the grassroots level which may be followed by many developing countries in the region. The success points of aAQUA are considered in an initiative of "redesigning the farmer-extension-research-education continuum in India with ICT-mediated knowledge management" by ICRISAT that aims to make e-Extension commonplace in India's agricultural universities and extension centres.

5. It is pertinent to mention that there is no single component of ICT which can address the problems in agriculture at the village level. Some technologies and tools may work in some situations where as they may not be useful elsewhere. A blend of traditional and modern ICTs may produce better results. The case of ***Cyber Extension: an ICT initiative for Strengthening Agricultural Extension in Sri Lanka*** illustrates that a combination of different ICT tools and technologies have been proved effective in disseminating information and knowledge to farmers and extension workers. The Ministry of Agriculture through its Audio Visual Centre has pioneered the implementation of Cyber Extension initiative in a phased manner to strengthen agricultural extension in Sri Lanka in order to provide advisory services to farming communities in the rural areas. The Cyber Extension approach uses the power of networks, computer communications and interactive multimedia to facilitate information sharing mechanism with revitalization of agricultural extension cadre and the personnel in the ministry.

In Phase-I, it employs the multimedia CD-ROM technologies for crop-based information, improving skills of extension workers, digital training material and distance learning for field level functionaries. In Phase-II, it exploited the telecommunication and web-based technologies to reach farmers and extension functionaries. Toll free telephone '1920' provides agricultural advisory services to farmers, information dissemination through Agro Technology Park, creation of Wiki Goviya-Agricultural Wikipedia, Agriculture Discussion Forum, Agricultural e-Learning empowered the Cyber Extension staff as well as farmers with latest and up-to-date information and knowledge. The impact of Cyber Extension produced positive results and improved access to Agrarian Services Centres and brought in responsibility among extension and other officers. It provided opportunity to extension personnel to enhance their skills and knowledge to serve

the farmers with latest and relevant information. It paved way for innovative partnerships in establishing Rural Knowledge Centres in the rural areas and encouraged formation of cyber clubs which can play a major role taking forward the Cyber Extension initiatives towards strengthening agricultural extension system in Sri Lanka. It highlighted the constraints such as lack of awareness on use of ICT tools, manpower issues, administrative problems coupled with attitudes of senior management which are crucial for successful implementation of any ICT initiatives in agricultural development.

6. Mass media support to agricultural extension is important in any developing country especially when there are barriers like illiteracy and poor extension mechanism. The case of ***Empowering Farmers through Mass Media: A Success Story of Mati-O-Manush Television Program in Bangladesh*** shows how television has emerged as an important ICT initiative in transfer of technologies. The television program, *Mati-O-Manush*, which means Land and People, has become very popular means of dissemination of agricultural information on technologies, markets, farmers' innovations and non-farm activities in the rural areas of Bangladesh. Though there are several television programs aired by different television channels, the *Mati-O-Manush* program gained popularity among farming community in Bangladesh for more than 30 years because of its focused and relevant content. The program has been launched by the government owned Bangladesh TV (BTV) with the support and inputs from the Agriculture Information Services of the Ministry of Agriculture and other NARS institutions. With the huge success of *Mati-O-Manush*, a sequel by name *Hridoye Mati-O-Manush* (Soil & Men in Heart) has been started on Channel i and which is also successful. These programs are unique in their own way in taking the technologies to farmers and also provide a public platform to raise agricultural issues to the notice of governments and policy makers.

The impacts of *Mati-O-Manush* programs are significant in bridging the knowledge gaps in the smallholder resource poor farmers, farm women and youth who suffer from poverty and illiteracy in the rural Bangladesh. It played important role in promoting homestead farming, rooftop cultivation, seed production and preservation, disease management in livestock, off-farm and non-farm opportunities especially for rural women. Besides other ICT interventions, television programs proved to be highly successful in transfer of technologies in developing countries which are often characterized by language problems, illiteracy, poor education and smallholder farming etc. When television programs are produced in partnership with government departments and NARS institutions, the quality and authenticity of agricultural information improves remarkably and therefore efforts need to be made to promote partnerships in mass media support to agricultural development.

7. Though the advances in mobile technologies and internet are encouraging, access to these technologies is still limited to people in rural areas. It is true in case of countries with varied geographic situations where ICT related infrastructure is poor or even absent. The case of ***Impact of Community Radio on Technology Adoption and Marketing Efficiency of Vegetable Crops in Nepal*** shows that communities take lead not only in addressing their immediate information needs through affordable ICTs but also manage the information centres on their own. Nepal is well known for community radio movement due to its special needs and characteristics. The case tries to capture the success story of *Krishi Radio* stationed in Dharke and the *Radio Palung* stationed in Palung in Nepal, which serve the vegetable farmers in the villages of the two districts. The *Krishi Radio*, established in 2009, is managed by Dhunibeshi Community Agricultural Communication Centre (NGO) and Dhunibeshi Agricultural Cooperative.

The Local Radio Support Committees (LRSC) which were formed in each village to co-work for the radio program in the village, raise funds for the radio, collect relevant content etc.

Krishi Radio depends on Agricultural Service Centre situated in nearby village Khanikhola, NGOs and community radio networks in Nepal for information. It primarily focuses on technology adoption and marketing in eight Village Development Committees (VDCs) of Dhading district which supplies vegetables to *Kalimati* vegetable market in Kathmandu through *Dharke bazaar*. It provides i) vegetable price information, ii) technical problems and solution, iii) organic farming, iv) marketing of local produce, v) *mela parma karyakram* (information on needs of *khetala* (agricultural labour) which helps farmers to communicate with agricultural labour, vi) national and local news and the major headlines of national newspapers. The vegetable farmers of Dharke area experienced a considerable advantage with the radio programs on price information and new technologies on vegetable farming. At present farmers do not harvest and sell anything without getting information from *Krishi Radio* and the farmers deny selling at lower prices. *Krishi Radio* played important role in providing suitable solutions to vegetable farmers for pest control, disease management, fertilizer management etc., besides raising farmers' voices on critical issues like input imports and market control. Community radio combined with modern information technology has been found very effective in bridging the digital gaps and help in the transfer of technology to the marginalized rural communities who were otherwise alienated from the benefit of such technologies.

8. ***Inter-Farmers Information and Technology Services (FITS) Trading through Information and Communication Technology in the Philippines*** illustrates the case of FITS Centres established by PCARRD all over the country. At present there are there are 630 FITS Centres – the one-stop service facilities closest to most farmers, entrepreneurs and other clients. FITS Centres provide farmers and researchers fast access to information and technologies and services in various multimedia formats, exhibits of new products and technologies, Internet, SMS and FITS databases. FITS Centres are supervised by the Regional Consortia. There are 14 consortia around the regions of the country. The FITS is a key role player to K-Agrinet's e-Farm, which focuses on the knowledge-based e-Commerce in the area.

The case presents effective use of ICTs for trading planting material for the Municipality of *Banga* with the active efforts by FITS Managers. The case demonstrates that knowledge workers play an important role in harnessing the ICTs for addressing the immediate needs in agricultural development. It involved lot of personal persuasion and commitment towards serving the farming community. The FITS achieved remarkable results in actualization of K-Agrinet program, saving on purchases of planting materials, gender advocacy and social impact and bridging the last mile. It shows that utilization of ICT equipment, as in this case, enables B2B transactions in an affordable and transparent manner at less cost. Procedures can be executed and documents sent and tracked to ensure an efficient flow with less leakage. ICT opens opportunities for agricultural workers to perform added roles. The knowledge worker knows not only hardware and software but also knows how to spot needs and socio-economic goals; she/he works not just for productivity but also for sustainability; and fosters growth to assist and empower urban and rural communities through ICT.

aAQUA: ICT-enabled Knowledge Services to Farmers in India

Krithi Ramamritham¹, Chaitra Bahuman² and Anil Bahuman³

Introduction

How can we provide rural populations the same access to data, information, experience and knowledge on the Internet that you and me take for granted? It is this question that led researchers at the Department of Computer Science and Engineering, Indian Institute of Technology – Bombay (IIT – Bombay) in 2002 to setup the Developmental Informatics Lab (DIL) – a lab with a capacity of up to 30 full-time researchers with backgrounds in product design, interface design, Indian language search and translation and professionals with experience in databases, web servers, web application design and development and software engineering. In 2002, when young researchers at the lab put themselves in the shoes of someone from a small Indian town or village and ran queries on search engines, they found quickly the total lack of relevant information on the Internet in education, healthcare and agriculture for the Indian context. For example, specific searches on the Internet for information on crops, pests and other common agricultural problems showed results from foreign websites in the English language. That was an easy experiment – it was all but expected that results would come from web pages authored by our western counterparts in English and in a western context. This begs the question: “If today we had a fibre connection to every Indian village, how would they use the Internet?” What followed from that experiment was the “10 year” challenge that the lab took up – building simple tools that would allow Indian professionals to author and contribute authoritative Internet content in common Indian languages.

Several tools, artifacts and approaches to generate (not just develop) relevant content emerged from the lab. One of them stood out, for its quick diffusion within the rural communities (initially Rajgurunagar, Haveli and Shirur Talukas of Pune District via the Vigyan Ashram Internet kiosks) and quick adoption by agricultural scientists and extension workers (initially, KVK Baramati). It used a natural Question & Answer style to generate content by *crowd-sourcing* (i.e., create incentives for people



**Figure 1. Spread of aAQUA in India.
Green circles indicate location of users**

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³ Agrocom Software Technologies Pvt. Ltd., Mumbai.

using the Internet to create the content – do not create the content yourself – thus building the foundation of a scalable system from day one). This was aAQUA, an acronym for *almost All Questions Answered*.

The aAQUA evolved quickly into an online farmer knowledge exchange platform built by young agricultural extension staff who had the vision of what e-Extension can achieve in the days when most people would ask the discouraging, though obvious question – do you think farmers will come online to ask their problems – where will they find Internet access? While the answers ranged from Common Service Centres (CSCs) to eChoupals, an undeniable fact was and still is that ICTs in extension especially over the web is great for extension staff and scientists though several challenges remain unanswered such as lack of computers and internet kiosks, power problems, learning curves for typing in the local language in an English keyboard, learning curves in using Microsoft software that was developed in a US context with several words in US English and lack of awareness about this service.

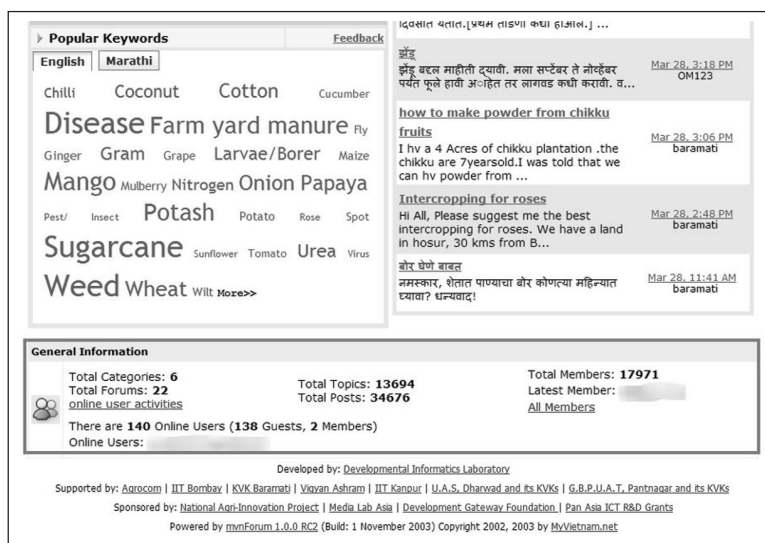


Figure 2. Red box highlights number of aAQUA Posts and Users (IDs have been blurred)

The journey that aAQUA developers and their partners (see Partners for a complete list) attempted to resolve each one of the above challenges. It will be 10 years in March of 2012 for the lab's research that enabled to address the above problems through the following sustainable alternatives:

Problem	Alternative	Verified at what scale?
Lack of computers and e-kiosks	Calling the local extension centre using a phone, computers not required	70,000 farmers from 50 Districts
Lack of Internet	Internet not required, access to a phone is sufficient	70,000 farmers from 50 Districts
Power problems	Not an issue since question can be asked over landline or cellphone	70,000 farmers from 50 Districts
Learning curves for typing in the local language in an English keyboard	Not an issue since questions are spoken naturally and are typed by the data entry operator who receives the call	70,000 farmers from 50 Districts

Problem	Alternative	Verified at what scale?
Learning curves in using Microsoft software that was developed in a US context with several words in US English	Not an issue since the web interface is used by trained data entry operators	80 staff using aAQUA
Lack of awareness among farmers regarding aAQUA Ag-Helpline	Large number of mobile SMS has been made available for free to several extension agencies. Their staff use this to send out Agri-tips along with the helpline contact number in case of additional queries. Queries that come to the local organization are entered onto aAQUA by their operator.	Answers of the leading aAQUA experts were downloaded 2.2 million times till date.

Partners

- IIT Bombay
- Agrocom Software Technologies, Mumbai
- SINE – IITB
- KVK, Baramati
- Vigyan Ashram, Pabal
- Aspik Technologies, Aurangabad
- Kadambh Brothers
- Several Farmer Associations
- ICRISAT, Hyderabad
- GBPUAT, Pantnagar
- UAS, Dharwad
- UAS, Raichur
- IIT Kanpur
- IIIT, Hyderabad
- NAARM, Hyderabad
- ICAR, Delhi

The aAQUA eAgriService was conceived as a problem-solving system that operates in the following manner:

1. Farmers discover aAQUA Helpline through mass media (newspaper article, radio interview), by visiting their local extension organizations or through the mass SMS sent with the courtesy of ICAR.
2. Most farmers ask questions over the phone, a small fraction of users also ask questions online or via e-mail. The service is free to the farmer. They're asked to call back for their answer in 2 days.

3. The question appears in the Inbox of all experts, locations of questions are highlighted
4. Experts answer questions, they first complete questions in their nearby districts and then take up others if they are still pending or if they want to add a second answer to an answered question. Answers to farmers' queries are sent in 24 to 72 hours depending on the difficulty.
5. Answered questions are removed from the pending list, a summary of the number of pending questions by category (Crops, Animals or others) is sent to the head of each organization daily.
6. In some organizations, the expert types the answer, in others an aAQUA data entry operator does this.
7. A telephone operator attends the farmers who call back for their answer and provides the answer.
8. In case of farmers who don't call back, SMS messages are sent out by the operator notifying them.
9. In case of those farmers who don't respond to SMS messages in 2 days, operator calls the farmer to read out the answer.
10. In all cases, operators accept any further clarification questions from farmers and also collect feedback and in some cases ask a few questions from ongoing surveys.

In some organizations a single person does the data entry job as well as the telephone operator job. Experts provide their answers verbatim or as handwritten notes to the data entry operator. In some progressive organizations, experts answer every answer themselves via e-mail or online.

The service is free to farmers and the extension organizations. In some cases, Agrocom Software Technologies pays salary for one expert in the organization to ensure that a dedicated full-time person is always available to answer questions.

aAQUA: Initial Period (2002-2005)

aAQUA was one of the outputs of several projects at DIL, IIT Bombay sponsored by the Government of India via Media Lab Asia, the Development Gateway Foundation and the Pan Asia Network,



Figure 3a. A view of Vigyan Ashram, Pabal



Figure 3b. A view of Krishi Vigyan Kendra, Baramati

a Singapore based development agency. Initially 5-6 IIT faculty contributed part-time for these projects. Vigyan Ashram and KVK Baramati, NGOs near Pune in Maharashtra helped conduct participatory surveys to identify possible uses of aAQUA. The surveys indicated that Question and Answer application has been very useful.

In the initial period, field engineers and kiosk operators used to approach farmers for the problems and fed questions on the aAQUA portal. In due course, the farmers were organized into farmers' clubs to approach the kiosk operators who attend the regular club meeting with their queries. The operator would key in the question online or via e-mail and would send photograph attachments taken from a camera, if required. An informal Kiosk Operators' Association at Pabal (with about 20 kiosks) was also formed by Lab staff to introduce monthly meetings where their issues, new developments, as well as revenue generating services to support kiosk operators' income can be discussed. As requested by kiosk operators, the Lab allowed kiosks to charge for print outs of aAQUA answers (charged at Rs. 10) and allowed one of the kiosk operators with a degree in management to start agri-consultancy charging Rs. 500 per acre. In addition to the activities of the Kiosk Operators, Vigyan Ashram also used its large school network to source questions.

aAQUA: Growth Period (2006-)

aAQUA and its operations were transferred to a newly formed company, *Agrocom Software Technologies Pvt. Ltd.* with the goal of finding financial sustainability for the aAQUA Team. Agrocom received a series of contracts from Nokia, Agrocom, GBPUAT, UAS Dharwad, UAS Raichur and ICRISAT to customize aAQUA for their use and integrate the web platform with a mobile platform – bringing capabilities of text and voice message broadcasts to millions of users.

Large scale testing was completed with over 70,000 households participating over 50 Districts. An average listening time of 72% was recorded over a period of one year (households with usage consistently under 25% were removed from the database). This was possible by integrating into the telecom network and making a large number of phone calls, using the Outbound Dialler. The future of aAQUA is in deeper integration with the telecom networks, partly free services and partly paid services that will help sustain this service.

Business Model

It is believed that sustainability and upscaling have been critical for any social enterprise to generate significant returns and attract investors' capital. Agrocom – a for-profit enterprise – is attempting to reach 50 Lakh farmers with sponsors including farmer associations, banks, agri-industries, telecom operators and institutions and development agencies. Challenges included – mindset of farmer associations and sponsors who think aAQUA is too good to be true – holding the mindset that farmers will not use mobile or Internet for their information needs.

Users' Feedback

aAQUA is currently catering the information needs of about 70,000 farmers of which 50,000 farmers connect over the phone (from 50 Districts) and 20,000 users connect online (from 450 Districts!).

A feedback survey conducted in 2009-2010 from the online users of aAQUA on different aspects (Annexure-I) indicates that the online services of aAQUA are mostly accessed by farmers who own 5-15 acres of landholding; information on crops followed by animal sciences, KVK recommendations

and farmers schemes; the services are mostly accessed from homes rather than kiosks in the village; and the services are mostly excellent in catering the needs of users.

User profiles collected for the 50,000 farmers connecting over the phone indicate a mix of low-income, mid-income and high-income farmers, with a usage of 100% and an average listening time of 72%. Analysis of the questions shows that half of the questions are related to pest control and disease management indicating that there is great need for use of ICTs/Media in these areas.

Impact

Our belief has been that, in the near short term, projects deliver results, over 5 years projects deliver outcomes and over 10 years or longer periods, projects finally show impact. How is aAQUA's impact to be assessed?

1. Longitudinal studies of a sample of regular aAQUA farmers to study their income, their IPM practices, their marketing plans and their awareness of sustainable practices.
2. Average time between questions and similarly, the average time between answers.
3. Quality of answers (or interactions, in case of multiple answers) as assessed by independent experts.
4. Geographical spread of aAQUA, correlating regional spread with period of usage – one would expect higher diffusion of aAQUA in village clusters that adopted aAQUA earlier.

While several studies on results and outcomes have been completed, a long-term impact study is felt necessary to find the impact and to know to what extent the goals of aAQUA have been realised.

Original Goals of aAQUA

In a progressively shrinking global village, the only barrier to widespread dispersal of knowledge is lack of multilingual communication. A large section of the society, particularly the rural population does not have access to the huge knowledge base acquired through scientific development through the centuries. There is certainly an urgent need to establish a framework for knowledge exchange between various communities and cultures. aAQUA is an endeavor towards providing such information and farm advisory services to farmers in their own language and in suitable format through ICT-mediated systems in India. The goals of aAQUA are as following:

1. To create a multilingual communication framework.
2. To provide a language independent knowledge database.
3. To provide an easy to use interface to accommodate even naive users.
4. To provide easy and fast access to reliable information (both through artificial agents and human experts from all over the world)
5. To include multimedia such as voice to text, text to voice, videos, pictures, and images for non-literate or semi-illiterate people.
6. To integrate the agricultural domain of aAQUA with the Agro-Explorer group which uses the UNL/MT fundamentals for performing "Meaning Based Searches" through the available databases.

In retrospect, goals 1-5 have been achieved, while goal 6 is still a work in progress as automatic translation of aAQUA Questions & Answers into various Indian languages does not work very well. This is currently more reliably done by human translators.

Process

The aAQUA has been started as an online expert Question & Answer and community discussion forum for creating and delivering information relevant to the Indian community at the grassroots level. It was initially deployed in Pune District (Rajgurunagar, Shirur and Haveli Talukas) in the state of Maharashtra in India. It allows members using a web browser on a computer to create, view and manage content in local languages (Hindi, Marathi, Kannada etc.). The aAQUA is capable of addressing important challenges encountered in the outreach programs such as geographic reach and customized information advisory to farmers.

Figure 4. A recent screenshot of the aAQUA Home page

Scientists from KVK Baramati, International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), GBPUAT and its KVKs, University of Dharwad and its KVKs and University of Raichur and its KVKs and other public research and extension systems are treated as Certified Experts who offer their expert advice to farmers free of charge. These Certified Experts provide unbiased answers to farmers' queries based on the location, season, crop and other information provided by farmers at the time of registration. The answers provided by the public extension expert carry a Green Colour Logo

Welcome: satish
Last login: 2010-06-14 11:55:14
My Profile Logout

Home All Questions Ask Question All Forums Recent Polls Users My Questions

Member Profile:
pravin2650

Find all posts by this member

This member's profile has been viewed 434 times and has posted 18 messages

Member ID	pravin2650 (Offline)
First Name	Pravin
Last Name	Kadam
E mail	
Place	Pimpri
District	Pune
State	Maharashtra
Phone	
Mobile	9011032797
Country	India

Figure 5. Profile of a farmer with contact details

dharwad

Certified Expert
Raichur
Karnataka
India

UAS
Dharwad Raichur
Advisor

Joined: May 22, 2008
Posts: 1785
Status: Offline

Expert Name: Dr. V. B.
Nargund
Phone Number:
08362744321

Figure 6. Details of Certified Expert with Green Logo

“Salahagar” (in Marathi) or “Advisor” (in English) to show that he/she is Certified Expert to indicate authentication and unbiased nature of advisory service. An aAQUA certified expert possesses required experience in extension services, training farmers in the fields and understand barriers of communication especially faced by farmers. They often encourage farmers to explain their problems so as to provide relevant solutions. Experts from farming community and the agro-industry would also provide services. However their profiles and answers are not accompanied by the green logo.

aAQUA is operational since December 2003. By March 2011, it has received over 34,000 postings in about 14,000 Questions. It has about 18,000 registered members from across 450 Districts in India, 50% of which are farmers. The numbers are still very small due to lack of GPRS penetration and usage among mobile phone users. These numbers are expected to increase rapidly as a result of aAQUA integration with mobile operators.

How does aAQUA work?

On aAQUA, content is organized in the form of discussion fora based on the types of categories of queries posted by farmer or experts. There are 22 fora comprising 6 categories that included crops, animals, KVK recommendations, farmer schemes and market information etc. The fora are open to all users for browsing without any charges for non-commercial use. Registration on the website, however, is required for posting a question. A question may be posted either by a registered farmer user directly or by other agri-professionals seeking industrial, financial or legal advice regarding agribusinesses. The user's profile provides details such as location, weather forecast for the location etc. This provides an appropriate context for the question aiding the expert in providing location and climate-specific reply to the farmer's query. If the question is clear and complete, the experts provide a detailed answer to the question, attaching images or documents, if necessary. If the question is incomplete, the user is requested for clarifications about the problem. Since this is an open discussion forum, there could be more than one reply to a question. A simple technique to identify the certified expert through a special green logo and the assignment of expert logins are regulated by the aAQUA administrator. The Figure 7 shows screenshots of typical profile of a farmer with his question and the answer of the certified expert with green logo.



Figure 7. A thread on aAQUA showing profile of the farmer and his question (left) and the expert's answer (right) with a green logo

The answers are composed based on acquired knowledge of the experts or by reference to standard crop and animal management practices in books and manuals or by consultation with other fellow experts. Special attention is paid to the language used by the expert. Use of technical jargon is generally avoided, for e.g., instead of prescribing measurements in parts per million (ppm) or grams, common measurements such as the teaspoon are used. However, brand names of fertilizers, pesticides or insecticides shall not be recommended by the experts due to a directive from the Indian Council of Agricultural Research (ICAR) which forbids them from endorsing any brand names.

The aAQUA experts are time-bound to reply within 48 hours and pending questions can be monitored through the aAQUA interface itself. SMS updates are sent regularly to the head of the organization with a summary of pending questions and answered questions. This helps the head of the KVK in monitoring the effectiveness of the experts thereby implementing a transparent expert evaluation system. The experts are ranked based on to the number of answers provided by them.

Alternatively, Agrocom helps extension organizations to run telephonic helplines through which farmers can contact the telephone operator for asking a question. These operators write the questions down. The same operator or another data-entry operator then puts the questions on aAQUA by e-mail or web in the name of the farmer. The farmer usually calls back in two days time for the answer; else the operator sends out SMS reminders. If there are no responses to SMS reminders, the operator calls the farmer with the answer and collects feedback.

The complementing telephone-online system evolved with the inputs of agricultural extension staff. Traditionally, contact numbers of all experts are published in Krishi Diaries or booklets and distributed *en masse* among farmers. Experts get calls any time of the day from farmers and in some cases they have to repeat answers to the same questions. aAQUA's experience clearly demonstrates that experts prefer the online mode for answering queries over a call centre approach as they get adequate time to formulate their answers better, consult books and research, fellow experts and plan

the rest of their work with less interruptions. They can also reuse existing answers when they are online. Technically speaking, experts prefer an asynchronous communication over synchronous communication (live answering) due to large number of calls that they get. This perhaps explains the challenges faced by the Kisan Call Centres and ATIC Centres in getting adequate support from extension staff and experts.

At the end of all this there is no archive or encyclopedia of all the questions they receive unless the experts maintain meticulous records. In few cases where this is done, there is lack of standardization since each expert chooses to record what he/she expects to be important. These records are slowly being transferred online in different formats ranging from HTML, Word documents, PDF downloads etc. with no categorization, keywords or instant search capabilities. Technically speaking, experts prefer an archive of Questions & Answers that can be retrieved at will and compiled in various formats such as CDs, printed books or newsletters etc.

Architecture of aAQUA

The project was organized around three core themes: (i) Interfaces – text input and user interaction, (ii) Content – content of immediate use to farmers and (iii) Connectivity – robust data transfer on slow connections. The aAQUA employs a three tier web architecture (Figure 8) using Java Server Pages/Servlets, Oracle and MySQL databases. It is based on the standard MVC (Model View Controller) architecture, and runs on a Tomcat web server. The system uses Unicode UTF-8 compliant databases and a Unicode-compliant search and indexing tool called Lucene. The aAQUA server is integrated with bulk SMS gateways, e-mail servers and telecom OBD servers (not shown in diagram).

Features of aAQUA

The aAQUA has uniquely brought together various innovations in technology and usability to address challenges posed by barriers to information access by farmers in the rural areas in India.

a. Easy to get Started

In order to enable end-users of the aAQUA system, ranging from semi-literate rural folks to progressive educated Internet savvy farmers, the design of aAQUA has been kept simple and intuitive. Without employing pull-down menus, ubiquitous in interface design today, it uses an “Inverted Pyramid Approach” to give the maximum relevant results with minimal inputs from the users. The most commonly accessed information is made available on the home page and from here the user is led to other sections of the portal, where more information is shown. Icons are used to depict various sections of the home page. The content has been organized into virtual fora for easy search. An online Devanagari keyboard has been added to allow users to type in Hindi and Marathi. Online versions of Kannada, Telugu and Malayalam keyboards have recently been added. The layout of these keyboards has been designed primarily for novice users with the keys laid out in the order in which the alphabets of the native language is learnt.

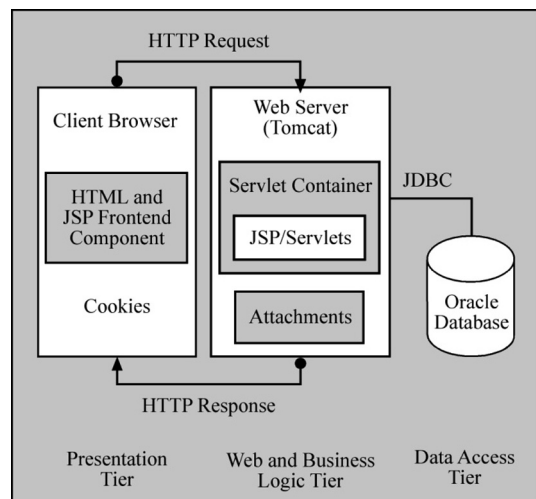


Figure 8. Architecture of aAQUA

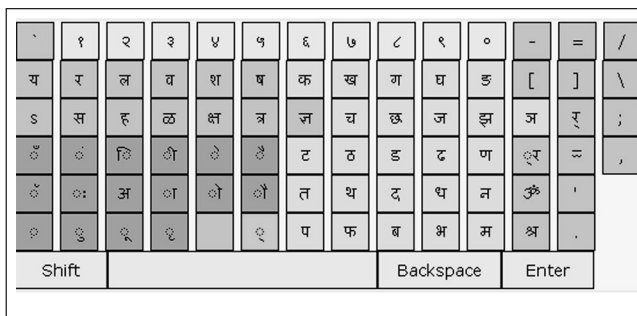


Figure 9. Online Devanagari keyboard (soft keyboard)

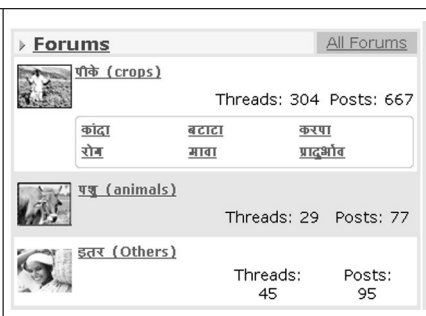


Figure 10. Virtual Fora

The aAQUA gives users a personalized and customized view of the data. Once the user logged into aAQUA, he/she is presented with a slightly different view of the home page along with his most recent queries.

The aAQUA provides access to an important online application *Bhav Puchiye* (which means “ask for the price”) developed by the Lab which intended to provide price information of agricultural products in the nearby *mandis* (i.e., wholesale markets). This empowers agricultural producers with information that will allow them to make informed decisions to get better profits for their produce and avoid exploitation by middlemen. Figure 11 shows the screenshot of *Bhav Puchiye* web page depicting the maximum, modal and minimum prices of commodities in the markets through graphical presentation for easy understanding.

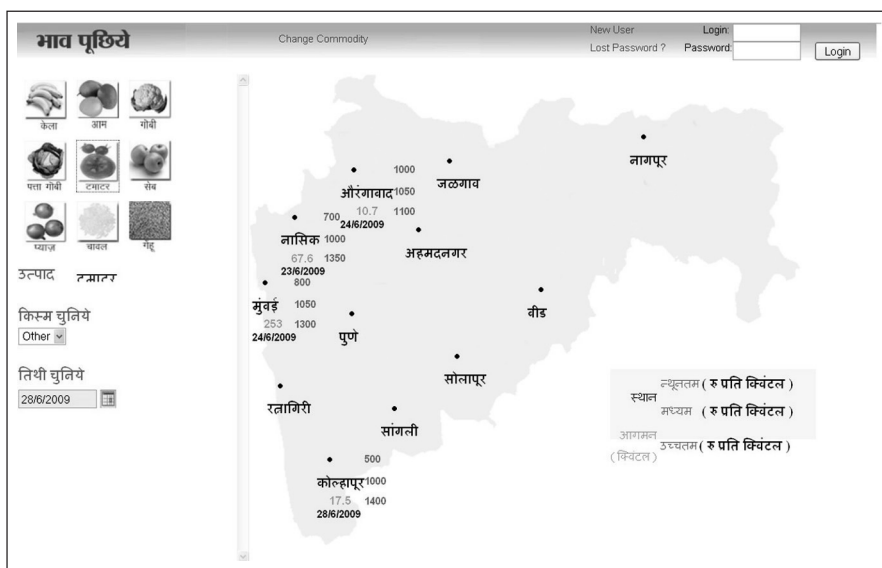


Figure 11. A screenshot of *Bhav Puchiye* (ask for the price) web page

b. Multilingual Ready

The aAQUA is capable of multilingual retrieval in three languages viz., Marathi, Hindi and English allowing the users to search and/or select agricultural keywords on the database. The multilingual categorization is useful for users who are fluent in two or more languages. Language specific

stemmers and indexers for the three languages mentioned above have been incorporated into aAQUA, which allows users to search in their own language and retrieve content in other languages. For e.g., a search on the term “Onion” would also yield answers from “*kaanda*” and “*pyaaz*”, which are Marathi and Hindi equivalent words for “onion”. (See Figure 12). The framework supports any Unicode text input hence it allows scale up to support any other Indian language.

The screenshot shows the aAQUA web portal interface. At the top, there is a header with the aAQUA logo and the tagline "almost all questions answered". Below the header is a navigation bar with links: Home, All Questions, Ask Question, All Forums, Recent Polls, Users, and Register New User. A search bar is located below the navigation bar, showing the search result count: "Total threads found in this searching : 482". Below the search bar is a table of search results.

Threads	Forum	Last Post
<input type="checkbox"/> कांदा/Onion आमची जमिण काळी माती असलेली आहे तर त्या जमिनीमध्ये कांदा हे पिक चां...	पौक (crops)	Jan 28, 6:17 PM by baramati
<input type="checkbox"/> कांदा/Onion कांद्यावर पडणारे थिप्स याच्यावर उपाय सांगा पिक - कांदा जमिनीचा ...	पौक (crops)	Jan 28, 5:31 PM by baramati
<input type="checkbox"/> औषधिक वीज प्रकल्पात कोळशापासून सध् zwj; या महाराष्ट्र zwj; दा गाजत असलेल zwj; या औष zwj; णि zwj; क वीज प्रकल् zwj; पात कोळशापासून तया...	वातचीत (discussion) (no Answer given)	May 6, 9:32 AM by raaj
<input type="checkbox"/> कांदा खते/Onion Fertilizers. कांदा पिक दुसरी खुरपणी केल्यावर कुठली खते वापरावीत.	पौक (crops)	Mar 18, 11:25 AM by baramati
<input type="checkbox"/> onion seeds sir, I would like to know the procedure for producing onion seeds. please give the detailed procedure ...	पौक (crops)	Aug 14, 12:53 PM by baramati
<input type="checkbox"/> दुध प्रक्रिया प्रकल्प नमस् zwj; कार., मला प्रति दिन २००००० लिटर क्षमतेचा खानगी संगणकयुक्त zwj; त दुध प्रक्रिया प्रकल् zwj; प उभा...	के.वी.के.सल्ला (KVK Recommendations)	Jan 4, 11:48 AM by baramati
<input type="checkbox"/> कांदा सर कांदा लागवड करण zwj; याअगोदर राडल zwj; डफ मारल zwj; यास कांदा पिक जमेल का ?	पौक (crops)	Oct 9, 12:14 PM by baramati
<input type="checkbox"/> आधुनिक दुध प्रक्रिया प्रकल्प व गायी उद्दशी दुधपालन प्रकल्प महाशय, मला सांगली जिल् zwj; ह zwj; यातील जत व कवठेमहांकाल भागामध् zwj; ये आधुनिक दुध प्रक्रिया प्रकल्...	पशु (animals)	Jan 8, 11:19 AM by baramati

Figure 12. Web page of aAQUA Multilingual Search for the word “Onion” as shown under the words “*kaanda*” (Marathi language) as well as “*pyaaz*” (Hindi language)

c. Multimedia Ready

The aAQUA allows users to upload attachments as part of the question (see Figure 13). The farmer can upload an image or a video or a sound clip or a combination of these to explain the problem at hand. The experts find it easier to answer a question with an image and can choose to respond using the same mode or through a regular text post. This is beneficial to farmers who are just functionally literate or are unable to spend extra time and money on posting a detailed question. The experts supplement questions that have minimal text with tags so that it is still searchable.

d. Searchable and Reusable

A review of the aAQUA portal usage logs has indicated that unlike a typical forum search is not used as frequently on this portal. Given the profile of the audience addressed by aAQUA, the most possible reason for this could be lack of exposure to search tools. The “Keyword Browser” was

Author
yogeshmahida

Member
Vaso
Gujarat
India

Joined: May 28, 2009
Posts: 7
Status: Offline

[e-mail this thread](#) | [Add To My Favorites](#) | [Watch this Thread](#)
6 Replies 157 Views

[reply](#)

Banana --problem

Dear Friends,

I have some banana plants, which are 1-2 month old. they have streak on lower side of leaves and leaves are also curled.

What would be the reason behind this. Is it because of any viral infection or any nutrient deficiency. I have attached here pictures with these symptoms.

Regards

0 [symptoms- Banana.jpg](#) (376500 bytes) (Download Count: 87) (I have marked symptoms with Arrow)

[Zoom In](#) | [Zoom Out](#) | [Normal](#)

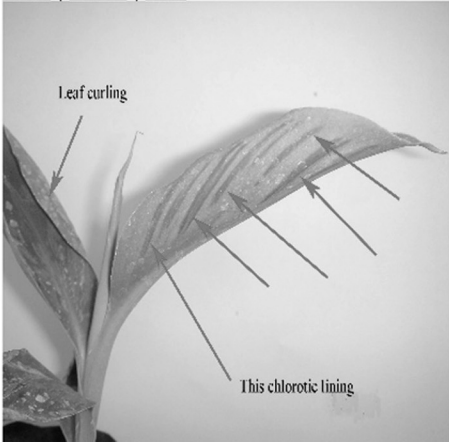
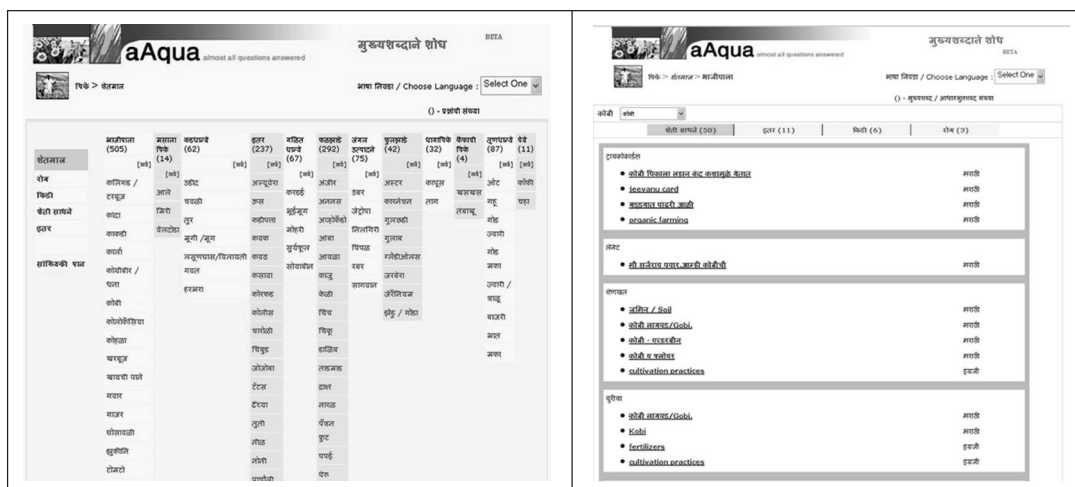


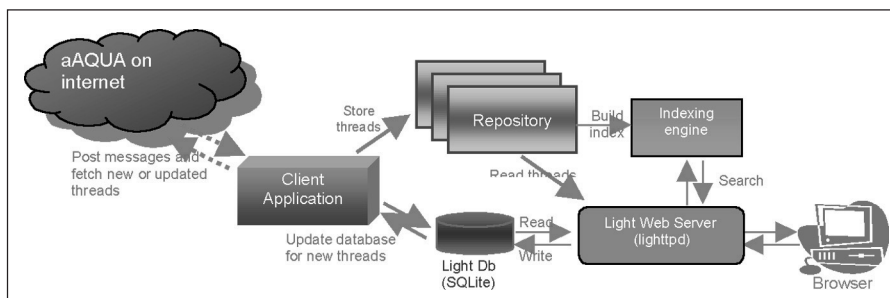
Figure 13. Image of the infected banana leaves uploaded by farmer

motivated by this observation. Keyword Browser employs a mapping mechanism through which related keywords are grouped and linked to a particular question. An analysis of the number of keyword combinations yielding relevant answers on aAQUA revealed that a combination of two keywords was optimal and hence keyword linkages up to two levels are presented to the user on keyword browser.

At the time of posting the answer, an expert assigns a keyword to the type of commodity, disease, pest or farm input. These are further categorized into sub-types and associated to a thread. Automatic taggers are now in place to choose keywords for a thread, but these are added to the database only after confirmation from the expert since sometimes a potential keyword may not be part of the text of the posting. Though, initially intended to augment the search facility, it is now used extensively by experts before answering a question. Experts refer to URLs to provide answers to repeated questions. Automated answering has been attempted before but has proved to be challenging, since in most cases, farmers want precise answers to imprecise questions. Figure 14 shows typical web pages that display search mechanism on aAQUA through important keywords.



e. Available and Accessible



An offline version of a digital library has also been developed. The documents in the digital library locally archived and indexed are distributed to agri-practitioners in the form of CDs. The digital library was built by using open source digital library software called *Greenstone*. Figure 16 shows a screenshot of the digital library developed by using Greenstone software.



Figure 16. Screenshot of the offline digital library

Greenstone was one of the tools explored for storing and retrieving aAQUA documents in offline mode. When files are added or updated at the server, the index is rebuilt and then the indexes as well as files are transferred to the local machine. Sending small updates is quite expensive due to high payload of index transfer. Greenstone is a preferred approach when the content of the website can be represented in the form of a digital library and updates can be batched together to a considerable size.

f. Relevant

Information on aAQUA is customized to make it more relevant to the location. Apart from weather details, information of the user's location is made available to the expert at the time of answering the questions so that the advice given could be relevant to the current weather conditions in the farmer's field. The expert is also equipped with a map of soil type and general geographical information of the district/state that the farmer belongs to. When a user logs in, a separate view of the user's question is displayed. The most recent questions are presented on the home page to dynamically display only the latest information and all search outputs are sorted in reverse chronological order to ensure that the latest information is shown to the user.

Mobile aAQUA – Taking aAQUA to the farmer

Internet usage in rural and even in many evolving towns is limited due to lack of accessibility to internet centers/personal web-enabled devices, insufficient power supply and relatively high cost of equipment. Statistics indicate that the penetration of mobile phones, in comparison to PCs, is remarkably higher in India, both in rural and urban areas. Mobile phones are regarded as a new breed of next generation computers. They also provide mobility to the user at a price lower than that of other mobile devices such as PDAs and laptops. Besides, falling prices of mobile handsets with

advanced features have made them ubiquitous. Most people including those in remote villages, now consider them as a necessity rather than a luxury. Although there is no dearth of mobile services today, there are very few services that can be of immediate relevance to farmers. A handful of service providers are providing SMS based services for information such as weather, market prices etc. Yet, a lot remains to be done to bring benefits of the mobile boom to this section of users.

After Agrocom was formed in September 2006, it offered the first mobile subscription services to 200 farmers in Nasik in November 2006. The farmers received daily weather alerts which were appreciated. Farmers calls the customer service number on cloudy days to check the forecasts. The customer services number would also receives several calls if the SMS are not sent on time. In order to meet the demands of farmers, Agrocom office opens at 6 am to start sending SMS messages to their customers who got up early in the morning and expect SMS service in time. Encouraged by the feedback received by the SMS service and the growing interest in the farming community toward mobile-based solutions, aAQUA was further made available on the mobile through the following services:

a. SMS-based services

Short Messaging Services are slowly gaining popularity in rural areas already due to its low cost. Based on increasing requests from the users, aAQUA runs different SMS-based services as follows:

- Registered users can post questions to the forum and receive short replies on their mobile phone. This reply, however, is a shorter version of the detailed reply and the user will need to access the forum to be able to view the detailed reply to his/her question. The answers are sent in transliterated form (English) in the language of the question. This works well with users who are seeking short answers.
- Experts can use aAQUA as an interface (Figure 17) to send SMS to farmers in the neighbourhood. aAQUA allows the expert to organize and manage farmers contacts using their expert logins. They can also view status reports of message delivery etc. A simple interface is provided for experts to compose the message. Online SMS credits are assigned to experts based on their usage requirements. This is currently implemented as

The screenshot shows the 'aAqua' web interface. At the top, there's a header with the logo and text 'almost all questions answered'. Below this is a navigation bar with tabs: Home, All Questions, Ask Question, All Forums, Recent Polls, Users, and My Questions. A search bar is located on the right. The main content area is titled 'Send BulkSMS' and includes a section 'Enter SMS Here'. This section contains a text input field for the message, with labels for '*Message:', '*Your Current Credit : 142', '*Customers in your list: 1', and '*Message will not be sent To:'. There is also a 'Send' button at the bottom of this section.

Figure 17. Simple interface for sending messages to farmers

a free service to farmers. The SMS cost is incurred by project funding from several agencies and expert organizations.

- Agrocom sends daily SMS tips to farmers in Maharashtra, Uttarakhand and Karnataka in Marathi and Hindi languages. This service was carried out for a period of two years, under the National Agricultural Innovations Project (NAIP). The contacts of farmers were collected by DIL and Agrocom teams through various agricultural fairs held in these three states and through KVK partners in these states. The content in these SMS alerts pertains to crop diseases, tips on pest management, new forms of livelihood, livestock related tips and some general news on farmer schemes among other things.
- **Voice aAQUA:** This voice-based service was initiated to reach farmers on their phones via voice calls. The service called “Voice aAQUA” provides short one minute voice clips with information tips on crop management being played out to the farmer on his cell phone or fixed line phone (land lines). Given the large user base, it was difficult to create an absolute profile of the user for customizing the information. Hence the tips were customized by crop patterns based on the location (state) of the user. About 9.9 Lakh audio messages were played for about 26,000 farmers every 3 days in 33 Districts in 2 languages.
- **Weather Recordings:** Localized weather information consists of a limited set of keywords and data brought together based on the forecast. Production of audio messages was automated by writing software. Messages were sent once a day.

b. Web-enabled services

Though SMS is a useful tool to reach farmers due to its low cost, simplicity and support on handsets, it lacks the ability to carry rich multimedia content and multilingual data. Delivery of multilingual data is still a challenge since we can represent fewer characters in Unicode format (which is a standard for representation of non-English content) in a standard SMS text of 160 characters. As a solution to this problem, the aAQUA team used the English script for composing the messages in the native language of the user since most of the farmers who could use SMS indicated that they were comfortable reading their mother tongue in English script.

MMS services for delivery of multimedia content were also tested but it did not catch up in large numbers due to higher cost and limited support by service providers and handsets (older handsets do not support MMS) at that point of time. To create interactivity of web-enabled services through mobile, web pages with smaller footprint and payload were specially designed by the aAQUA team for use on a mobile web browser. The design has been kept minimal with access to core functions performed on aAQUA such as posting, forum view, and view response to one's query, search and registration. A similar mobile version of keyword browser and a utility for guided Google search using keywords is also available on www.aaqua.org/m. Figure 18 shows mobile web version of aAQUA.

c. Innovative Experimental Services

aAQUA has conducted a study to understand the usage of mobile phones by progressive farmers with the sponsorship of Nokia. The study covered grape farmers (holding less than 2 acres to more than 100 acres of land) of Nasik area in Maharashtra in India. The study found that there is a need for rugged phone sets; vernacular mobile applications; devices for location mapping, tracking, soil content measurement, atmospheric nitrogen; multimedia applications for disease control and management; and updates or feeds from popular agricultural information sources. Based on these

findings and after consultations with agricultural experts, the following applications were designed and developed:

- **aAQUA Photo Capture:** This application allows a user to upload photos from his field to the aAQUA server and request diagnosis by the aAQUA expert. The user can tag a few keywords to the image at the time of uploading to identify key characteristics of the problem statement. These tags are stored along with the images at the server. The expert can see the uploaded images, along with the tags, mapped onto Google Earth/Google maps. The server generates this mapping data from the location tag of the image. The images can be searched by tags at the server.
- **aAQUA Feed Reader:** There are a number of popular services like weather forecasting, *Bhav Puchiye* and aAQUA threads, which are of interest to users. But a user interested in all of these has to access them separately, which is very cumbersome. aAQUA Feed Reader pulls contents from diverse sources and aggregates and allows users to access favorite feeds for specific parameters such as location, date, commodity etc., in order to access more customized information at one place without difficulty.
- **Remote Photo Capture:** This is a variant of the aAQUA Photo Capture that allows remote monitoring of a scenario. This application, when installed on the phone and stationed in the field serves as a low cost CCTV. The application automatically clicks the photo and sends it to the server at periodic intervals. When stitched together these images can serve as a sequence of activities that occurred on the field for providing advisory services by the experts.



Figure 18. Mobile Web version of aAQUA

The Way Forward

ICRISAT chose aAQUA (its promoters Development Informatics Lab (DIL) and Agrocom) as partner for their ambitious project: “Redesigning the farmer-extension-agricultural-research-education continuum in India with ICT-mediated Knowledge Management” that aims to make e-Extension commonplace in India’s agricultural universities and extension centres. ICRISAT brought in several other partners – the University of Agricultural Sciences (UAS) at Raichur and Dharwad in Karnataka, Govind Ballabh Pant University of Agriculture and Technology (GBPUAT) at Pantnagar in Uttarakhand, NAARM (Hyderabad), IIIT (Kerala) and IIT Kanpur as collaborators. This has brought good visibility for aAQUA and its best practices within ICAR, and it is likely to be considered in the 12th Five Year Plan.

Bibliography

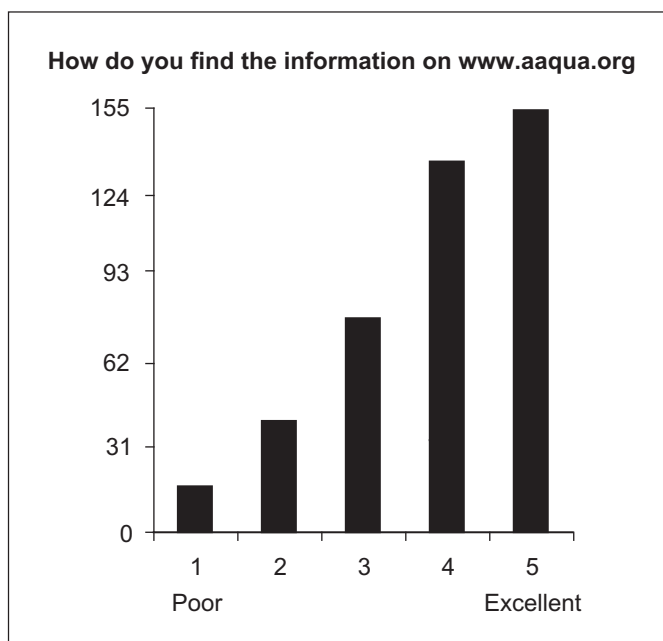
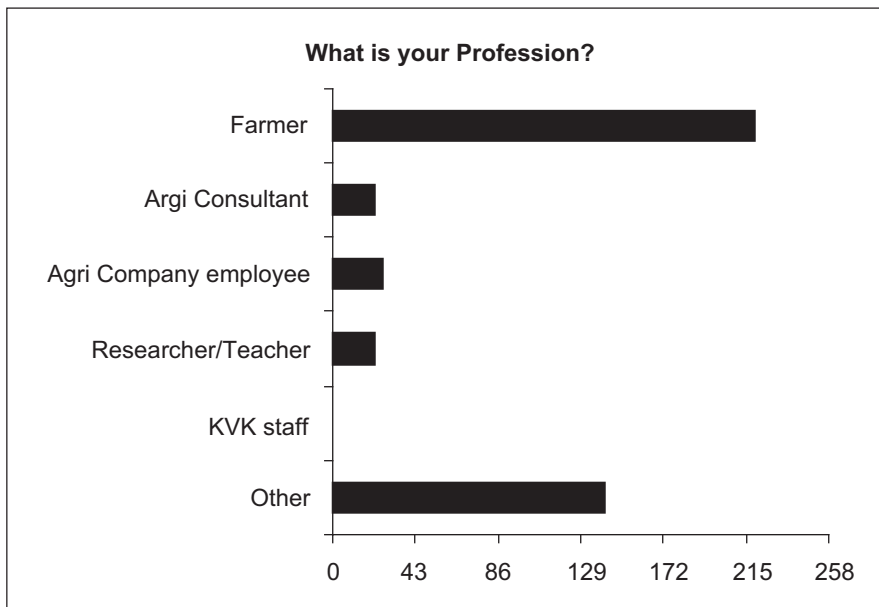
www.aaqua.org

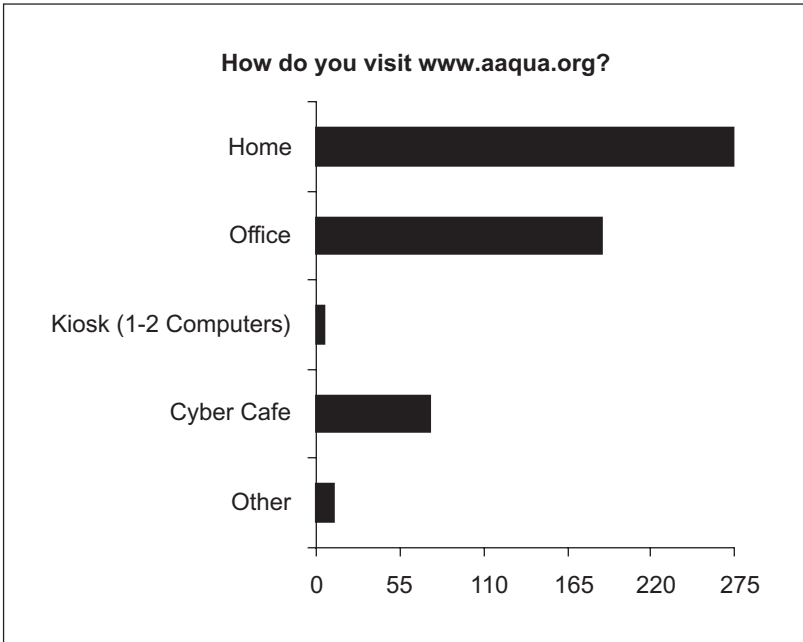
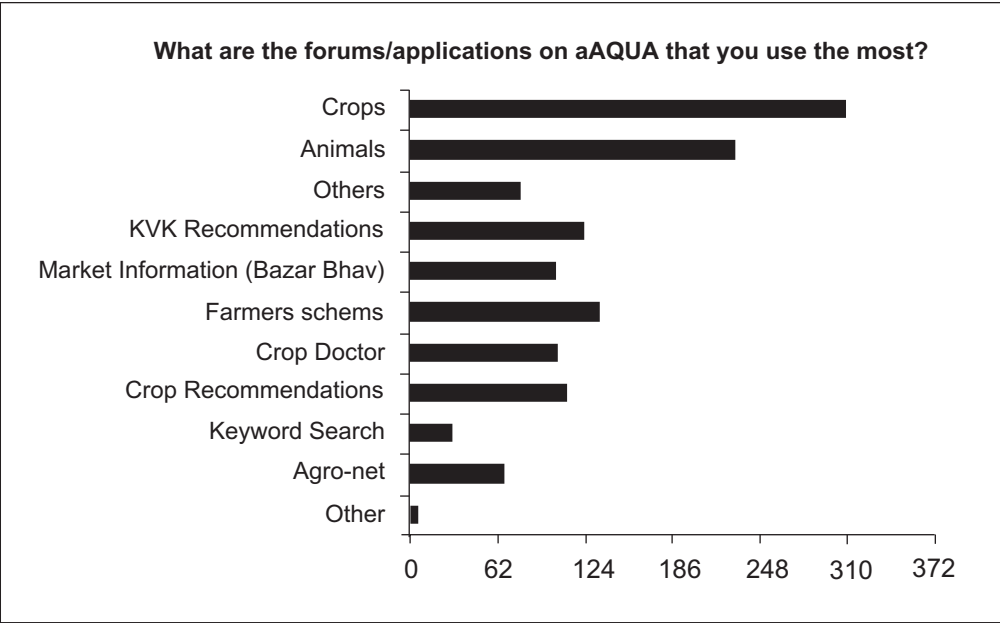
www.agrocom.co.in

Project Report on *Business opportunities through Rural Communication*. Submitted by Soumya Donkade to the S.J. Mehta School of Management, IIT-Bombay, under the guidance of Prof Shishir Kumar Jha, April 2008.

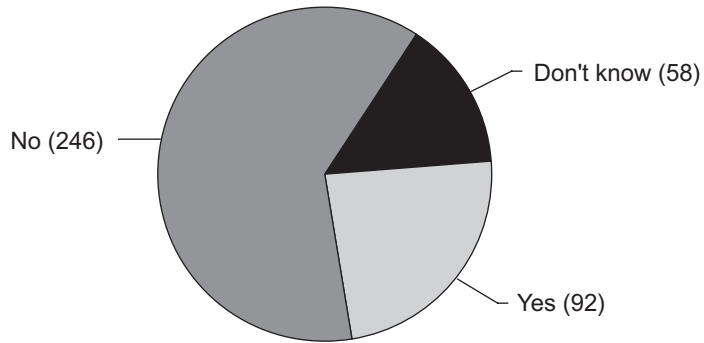
Project Report on *Business Critical Success Factors for Rural ICT Projects in India: A study of n-Logue Kiosk Projects at Pabal and Baramati*. Submitted by Vivek Dhawan to the S.J. Mehta School of Management, IIT-Bombay, under the guidance of Dr. Bishnu Pradhan, Media Lab Asia (Maharashtra Hub), KReSIT, IIT-Bombay, June 2004.

Feedback from aAQUA users – 2009 to March 2011

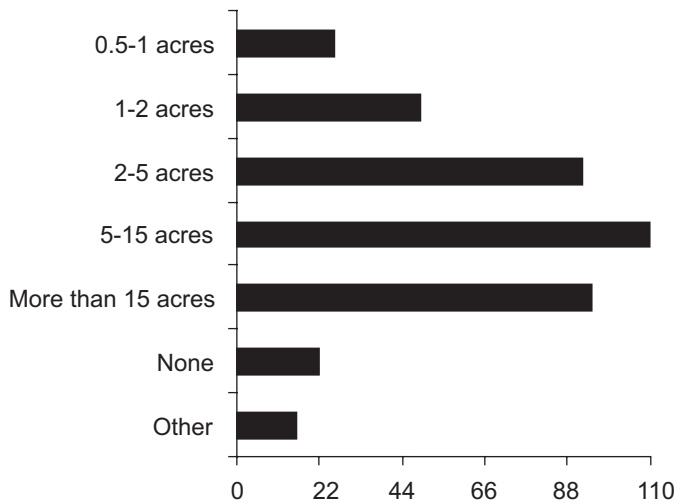




Do you have Kiosk in your village/town?



How much land do you own?



Cyber Extension: An ICT Initiative for Strengthening Agricultural Extension in Sri Lanka

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Introduction

Information and Communication Technologies (ICTs) are well established means of sharing and disseminating information in the modern day world. It has enormous potential in improving the livelihoods of the marginalised rural community by providing essential services with low cost. Access to information plays a greater role in improving the living conditions of the poor and ICT can be adopted effectively to integrate the isolated communities into the national and global economies. As in the case of many developing countries, Sri Lanka is not an exemption in utilizing the advantages of ICT by adopting it to various sectors such as education, health, marketing, public services, agriculture etc.

As agriculture is becoming knowledge-intensive, the role of ICTs is gaining importance in agricultural research and extension systems. Use of ICTs is continued to expand due to the diffusion and increased availability of communication infrastructure with relatively low cost. Adopting ICT innovations for agriculture is increasingly gaining importance to take the research results to farmers and improve exchange of information and knowledge among different stakeholders in agricultural development. An efficient agricultural communication or extension strategy supported with a variety of innovative ICT services ensures the rural and agricultural development. The Department of Agriculture (DoA) in Sri Lanka integrated the ICT innovations into the regular agricultural extension mechanism in order to improve the extension services as well as to serve the farmers in a much better manner. This success story describes the experiences of Cyber Extension by the Department of Agriculture (DoA) in Sri Lanka.

Constraints of Agricultural Extension System

Agriculture is considered as the backbone of the Sri Lankan economy since it contributes significantly to the export earnings. However, Sri Lankan agriculture is mainly based on small-sized family-owned dispersed units. In Sri Lanka, Training & Visit System has significantly contributed to agricultural development during the early stages after its introduction. It was instrumental in increasing the rice yield in major irrigation schemes, crop diversification in paddy land especially during the *Yala* season and crop protection measures in rice cultivation etc. But in the later stages, it was found that the system was unable to address the needs due to various reasons. Primarily, this was a top-down approach of extension system rather than the bottom-up approach. Moreover, attention was mainly paid to the contact farmers neglecting other farmers which resulted into poor extension services to entire farming community. Due to heavy workload of *Krishikarma Vyaptha Sevaka* (KVSs) coupled with rigidity of the system, agricultural extension has suffered and yet times failed to meet the expectations of the farming communities.

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Major political and administrative changes such as trade liberalization, withdrawal of agricultural extension workers from extension activities, devolution of powers to provincial councils have been some of the reasons for the deterioration of agricultural extension system in the country. It hampered regular information flow from research station to farmers and back to researchers, from farmers to planners, from executors to farming community, from the trader to the farmers and back and so on and so forth. The weak inter-organizational as well as intra-sectoral linkages among extension, research, training and service sectors like marketing network, financial organizations etc., further widened the gap between farming community and the various agencies.

ICT Situations in Sri Lanka

In July 2003, the Government of Sri Lanka created the Information and Communications Technology Agency (ICTA) through an Act of Parliament to not only spearheads the implementation of the **e-Sri Lanka initiative** but also as an apex body of all ICT development in the country. The ICT Agency's core mandate was to create a national ICT Plan that is both visionary in the long term and realistic in its implementation. The second function of this program area is to encourage the mainstreaming of ICT into decision matrices of the leadership of Sri Lanka – both public and private sectors.

The vision of e-Sri Lanka is *“to take the dividends of ICT to every village, to every citizen and to every business and transform the way government thinks and works”*. Specific objectives of e-Sri Lanka includes: more effective, citizen-centred and transparent government; empowerment of the rural poor, women and youth through increased and affordable access to information and communication tools; development of leadership and skills in ICT; employment creation through ICT industry; IT enabled services, and enhanced competitiveness of user industries and services. Targeted beneficiaries of e-Sri Lanka practically cover every citizen of Sri Lanka. It aims to create thousands of job opportunities while empowering the rural communities through enhancing the access to ICT. Important components of the e-Sri Lanka that promote use of ICTs in the rural areas included establishment of '*Nenasalas*' (knowledge centres) and e-Society Development Initiative which aimed to provide access to information sources and services to diverse community groups throughout Sri Lanka, empowering them and providing opportunities to develop their knowledge, skills and capabilities.

Cyber Extension

In response to the government efforts to use ICT for development of every citizen and especially the development of rural people, the Ministry of Agriculture and the Department of Agriculture (DoA) in Sri Lanka have envisaged to harness the new innovations and developments in the cyber world for improving agricultural extension system and services. As an ICT initiative, for the first time in Sri Lanka, “Cyber Extension” mechanism was implemented by the Audio Visual Centre (AVC) of DoA in 2004 as an appropriate information exchange mechanism which seemed affordable and convenient to rural farmers in satisfying their information needs.

Cyber technologies offer powerful ICT tools and technologies which can be harnessed for dissemination of agricultural information to all stakeholders in agricultural development including farmers most effectively. Cyber Extension is an agricultural information exchange mechanism over cyber space, being the imaginary space behind the interconnected computer networks through telecommunication means. It utilizes the power of networks, computer communications and interactive multimedia to facilitate information sharing mechanism (Wijekoon, 2003).

ICT Initiatives under Cyber Extension

The traditional extension system that was in operation for many decades in the country has its own strengths in respect of strong infrastructure and capacities. The Cyber Extension initiatives have been merged with the traditional systems with minor structural changes so as to strengthen the agricultural extension system that function more efficiently with the use of cyber power.

In 2003, e-government index of Sri Lanka was only 0.92, which was well below the global mean e-government index of 1.62 implying that the e-government capacity of Sri Lanka was poor (Kumarawadu, 2003). By this time, country had a very small number of Personal Computers (PCs) and that amounted to a mere 56 out of every 10,000 people, and only six out of every thousand were enjoying facilities of online connection. A web-based research (Kumarawadu, 2003) covering government institutes revealed that 30% of the ministries in the country did not have websites. Thirty eight percent of the ministries by this time were in the infant stage and information available in web pages was not being updated often and the number of pages was also limited to few web pages. Only about 17% of ministries offered interactive web contents, where users had the access to regularly updated information and could communicate through e-mail to download government documents through the Internet. This slowed down the progress of e-government solutions. After considering the poor tele-density and the poor e-government solutions in Sri Lanka, web-based ICT initiative was not introduced quickly with the Cyber Extension project in the year 2004.

Implementation Process

Due to limitations in the institutional readiness, the Cyber Extension project was planned in phases giving time for the telecom system to get rooted in the society first. This was the time when almost all were set for a major change in terms of infrastructural development for the enhancement of the required telecommunication facility for people. With such developments round the corner, Cyber Extension Program was thus planned and implemented in two phases. Phase-I: An alternative approach to Cyber Extension by following appropriate Digital/Wireless extension strategies and Phase-II: Real Cyber Extension with Telecommunication and Internet facility.

Phase-I: An Alternative Approach to Cyber Extension

In the absence of the basic telecom facility throughout the country, appropriate Digital/Wireless Extension Strategies were considered as an alternative approach to Cyber Extension. The first ever project was established during the period from 2004-2006, and 45 Cyber Extension Units (CEUs) were established at Agriculture Instructors' Offices, *at Govijana Seva Madyasthanaya* (Agrarian Service Centres) in 20 administrative districts in the country. Each Cyber Extension Unit was equipped with a computer complimented with other facilities like scanner, laser printer, digital camera, uninterruptible power supply unit (UPS) along with required office facilities to function. The CEU was managed by a trained Agriculture Instructor (AI), and continuous computer training programs have been conducted at the Audio Visual Centre (AVC) of the Department of Agriculture to improve computer skills of the AIs. In Phase-I, multimedia e-learning strategies were implemented effectively by using Interactive Multimedia CD-ROMs (IMM CD-ROMs) produced by the AVC to disseminate information to farmers, extensionists as well as to improve capacities of extension workers. Following are the important digital extension strategies implemented in Phase-I:

2. Improving Skills of Extension Workers:

Two CD-ROMs were designed and developed, to improve presentation skills of Agriculture Instructors and distributed them to all CEUs. As a result, with the assistance of these materials, extension workers were able to produce low cost audio visual aids with locally available material. These two CDs with an instructional manual titled “presentation technology” were acknowledged and reprinted by the SAARC Agriculture Centre to distribute to other SAARC countries (Figure 3).



Figure 3. Training Manual and IMM CD-ROMs on Presentation Technology

3. Website on CD-ROMs:

The DoA website (www.agridept.gov.lk) presents most of the agricultural related technical information as well as agricultural statistics, news, recently published books etc. This website was awarded as the best government website in the year 2008 by the Information and Communication Technology Agency (ICTA), which is the apex Institute for ICT in Sri Lanka. The Cyber Extension project established a mechanism to distribute DoA website on IMM CD-ROM to all CEUs to enable them to access information even without Internet facilities.

4. Development of Digital Training Material:

IMM CD-ROMs produced by the National Centre may not give answers to all location specific problems. The extensionist attached to the Agrarian Service Centres would be in a better position to produce location specific extension material like ‘powerpoint’ presentations, desktop publications in the form of simple handouts, leaflets, pamphlets etc., by using the facility of CEU for their extension services and training. The staff at CEUs is expected to compile a visual database on all aspects related to agriculture in each cropping season (*Yala* and *Maha*) so that researchers, trainers and others would be able to make use of it for further investigation, training and other purposes. The creation of such digital training material helped immensely in the Cyber Extension activities.

5. Distance Learning for Agriculture Research and Production Assistants (ARPAs):

Agriculture Research and Production Assistants (a cadre of field level facilitators, recruited by the government, who have no knowledge in agriculture) attached to Agrarian Service Centres needed a professional in-depth training in agriculture to improve their performance and to serve the farming community. Training of large number (9,000) of such a cadre effectively within a reasonable period of time is not practically possible due to the limited facility of existing face to face training mechanism. To address this issue, most of the CEUs have been asked to use IMM CD-ROMs to train ARPAs on all aspects of agriculture. This strategy helped the government to use CD-ROMs as distance learning materials for improving knowledge of field level facilitators to achieve desired goals.

Phase-II: Real Cyber Extension with Telecommunication and Internet

In this phase, considering the development in telecommunication facility and rapidly grown dynamic e-government situation in Sri Lanka, original online Cyber Extension was introduced for maximum utilization of connectivity. During 2007-2008, the number of Cyber Extension Units was increased to 85. CDMA (Code Defined Multiple Access) telephone and Internet facility were also provided in the CEUs in the project.

1. Expanded use of online Resources: Using facilities at CEUs, users could gain access to a wide range of information related to agriculture by browsing local and international websites of organizations. Technical assistance is sought through e-mail queries with visual attachments. For instance, during the outbreak of a new pest or diseases, visuals of pests either by digital camera or by scanning the live specimen with the scanner are sent to the Subject Matter Specialist (SMS) or the Researcher who are far away at different Research Stations for necessary action.

2. Farmer Database for e-Marketing: Sri Lankan farmers currently face a wide range of problems in marketing their agricultural produce. It is a frequent phenomenon that low prices being offered to farmers for their produce during harvest times. Marketing problem of tomato and big onion farmers (during July/August), marketing difficulties faced by lime and orange cultivators (during January/February) as well as pumpkin and potato farmers are few examples. It is known fact that farmers lack guidance on the decision making pertaining to what to grow, when to grow, how much to grow and where to sell. In other words, farmers lack very vital information on crop planning, harvesting and marketing opportunities. Taking this as advantage, the market intermediaries exploit the farmers and put them to loss. It is also true that all the market force, particularly the wholesale traders do not have information base of farmers giving updated information on who is growing what and wherefrom they come etc., which hinder them to directly deal with the farmers and offer better price to the produce.

Even policy makers are facing difficulties in arriving at correct decisions on imports and exports of agricultural products, due to absence of correct information. As such, farmers become victims of unfortunate eventualities like importing similar products from other countries when they harvest their crops. This situation may be very difficult for making a decision in favour of farmers in absence of information on agricultural products, their quantities and availability etc. Hence there is a need for continuously updating statistics and information on farmers and farmers' products to address the above problems as well as to empower farmers with market information for getting maximum income for their produce. Therefore, a farmer database of each CEU (with details of name of the farmer, type of crop, expected yield etc.) was introduced to the network of information repository of the DoA website in early 2007. In addition, daily price information from the Dedicated Economic Zone (main vegetable wholesale market) at *Dambulla* is collected by the CEU, established at this centre in the year 2007, and now shared on the DoA website. This service can now be extended to other places as well.

3. Toll Free Agriculture Advisory Service: Recently, a Toll Free Agriculture Advisory Service with a dedicated hot line number "1920" was established at the Audio Visual Centre. This service became very popular within a short time among farming community and general public in Sri Lanka. Table 1 shows that the number of calls have been progressively increased during 2006-2010. Out of all the calls, majority of the calls were made for enquiries on vegetables followed by fruits and other crops (Table 2). A database comprising Frequently Asked Questions (FAQs) is being developed every week to analyse current problems of farmers in that week and then design weekly television programmes to address these issues.

Table 1: Number of telephone calls received

	2006	2007	2008	2009	2010	Total
January		2,875	4,874	3,596	2,678	14,023
February	831	2,737	4,609	3,161	3,355	14,693
March	2,661	2,875	4,363	3,836	4,035	17,770
April	1,627	1,744	3,545	2,818	2,054	11,788
May	2,125	2,840	3,663	2,675	3,506	14,809
June	2,734	3,250	4,389	4,098	4,251	18,722
July	3,375	3,050	4,493	4,087	4,326	19,331
August	3,073	3,304	4,109	3,319	4,281	18,086
September	2,712	4,229	662	3,918	4,125	15,646
October	2,719	4,898	972	4,178	4,110	16,877
November	3,599	4,911	2,987	4,068	4,264	19,829
December	2,784	4,272	3,168	3,657	4,143	18,024
Total	28,240	40,985	41,834	43,411	45,128	199,598

Table 2. Details of calls by crops

Category	2006	2007	2008	2009	2010	Total
Export Agriculture Crops	1,517	2,144	2,383	2,575	3,190	11,809
Field Crops	1,387	2,307	2,690	2,955	2,957	12,296
Floriculture	1,553	1,625	1,181	1,117	1,245	6,721
Forestry	129	177	154	178	133	771
Fruits	6,743	10,297	8,632	10,598	12,550	48,820
Medicinal plants	132	216	196	89	133	766
Paddy	2,363	2,400	3,772	4,112	4,425	17,072
Plantation Crops	2,000	2,241	2,684	2,404	3,023	12,352
Root and Tubers	413	658	919	803	807	3,600
Vegetables	6,399	11,438	11,439	10,181	9,259	48,716
Livestock	585	462	386	499	544	2,476
Other	5,019	7,020	7,398	7,900	6,862	34,199
Total	28,240	40,985	41,834	43,411	45,128	199,598

4. Information Dissemination through Agro-Technology Park: As a quick information dissemination strategy, the first Agro-Technology Park was established by the Audio Visual Centre in the year 2005 at Gannoruwa Agriculture Complex (Figures 4 and 5) which is the Main Agriculture Complex in Sri Lanka and the second was established at Hambantota in the year 2007. A wide range of information and communication strategies (live field demonstrations, self explaining field instructional boards, facilitators for each demonstration sites, instructional leaflets, IMM CDs, VCDs, DVDs etc.) are introduced here for disseminating agricultural information to all those who visit these



Figure 4. Entrance of Agro-Technology Park at Gannoruwa



Figure 5. Cyber Unit (one-stop-shop) of the Agro-Technology Park at Gannoruwa

sites daily in thousands. Each park is provided with a one-stop-shop which consists of a Cyber Agriculture Information Unit, Seeds and Planting Material Sales Centres, Books/CD sales centres etc., to cater to the needs of visitors. The main objective of the park is to demonstrate current recommendations of the Department of Agriculture, Department of Export Agriculture, Department of Animal Production and Health, Forest Department, Department of Indigenous Medicine and enable Faculties of Agriculture to educate farmers, school children, students and general public in an aesthetically pleasing environment.

5. Cyber Agriculture Wikipedia: The latest ICT initiative known as *Wiki Goviya* is a participatory and interactive web tool developed for agriculture development in Sri Lanka through the participation of Agriculture Community (AC). This is a common meeting place of farmers, experts, academia, students and general public interested in cultivation or agriculture. This is a read-and-write web rather than the traditional read only website and it is available at www.goviya.lk (Figure 6).

Wiki Goviya consists of three major components to cover needs of majority of the AC. They are: Agriculture Discussion Forum, Agriculture e-Learning and Wikipedia on Agriculture.

i) **Agriculture Discussion Forum:** This is a discussion forum (Figure 7) open to all members of the agricultural community and the discussions are held on Sri Lankan agriculture policies, current issues etc. Initially, priority has been given to the *Api Wawamu Rata Nagamu* program implemented by Ministry of Agriculture. Therefore, the discussion will be based on the 21 crops selected under this program.



Figure 6. Home page of the Wikigoviya website



Figure 7. Discussion Forum of the Wikigoviya website

[illegible]

Figure 8. A page from e-learning component of the Wikigoviya website

iii) **Agripedia:** A web-based encyclopedia for Sri Lankan agriculture has been developed and now it is continuously updated and nourished by the agricultural community. The *Agripedia* (Figure 9) is expected to develop into an encyclopedia on almost all the aspects of Sri Lankan agriculture. Presently, nearly 155 articles have been posted in Agripedia section by different users.

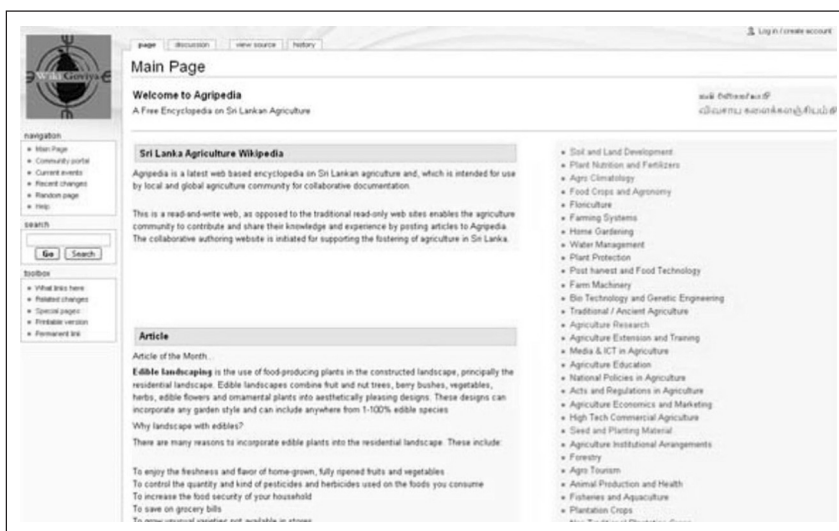


Figure 9. Agripedia

6. Agriculture Web Portal – (Krushi Lanka Gateway) – www.krushilanka.lk

An integrated approach of agriculture and veterinary extension services system is necessary as far as farmers are concerned. Therefore, an internet-based agricultural extension program was initiated to support the farmers. A pilot agriculture and veterinary extension services were initiated through information and communication technology in rural areas with the establishment of an Agriculture Web Portal (Figure 10) in a user-friendly interface which facilitates the farmers to get the agricultural information. The pictorial links allow the field extension agents and farmers across the island to access a real-time question and answer service, agriculture publications, instructional videos, technical information, price data, market linkage and other related information. The website is easy to navigate without extraneous links and text.

Impact of Cyber Extension

- **Access to Agrarian Service Centres:**

The Agriculture Instructor's Office of the Agrarian Service Centres is opened for public only on Wednesdays. Public can visit AI and consult him/her on Wednesdays only for any need in office during the office hours. With the provision of cyber facility at AI's office, arrangements have been made to keep the Cyber Extension Unit and the AI Office opened for all working days in a week. Agriculture Research and Production Assistants (ARPAs) and field extension workers are required to be present and manage the CEU, while the AI is away, and extend services to farmers. This arrangement helped the farming community to visit Agrarian Service Centre on all working days for help and necessary advisory services.

- **Upgrading skills of Rural Agriculture Extension Officers:** AVC has been organising regular training programs for cyber staff since three years to improve skills of rural extension officers in the CEUs on producing digital instructional material. Majority of staff in the CEUs have now gained skills to produce quality learning materials on their own. They are now capable of producing powerpoint, multimedia presentations, print media materials etc., for the extension and training related activities efficiently. With the improved skills and resources, CEUs which spread in 20 administrative Districts are now able to work as satellite stations of the National Audio Visual Centre (AVC) at *Gannoruwa* and link up with the national centre to extend their services very effectively and efficiently to the farming community throughout the country.
- **New Partnerships in ICTs:** Having accomplished significant success in the field of Cyber Extension Mechanism of the DoA, joint ventures are now being considered in partnership with other Rural Knowledge Centres (*Nanasala* of ICTA, *Vidhatha* of the Ministry of Science and Technology, Telecentre of *Sarvodaya*) especially to address the development issues and future needs. Some of the innovative projects which are being implemented in partnership with other organizations included: i) Establishment of *Nenasala* at the CEU at *Dambulla* wholesale market. ii) Two *Sarvodaya* telecentres (Anuradhapura and Nuwara Eliya) that function as Agri Clinics. iii) The World Vision assisted CEUs at *Govijana kendraya* in *Kalpitiya*. iv) Three CEUs established by JICA in their project areas (Kandurugasdamana, Kimbulvanaoya and Rajanganaya Left Bank Agrarian Services Centres).
- **Establishment of Cyber User Groups:** With the establishment of CEUs, an interest has been expressed in some areas to form Cyber Groups (user groups) to take forward the use of ICTs for agricultural and community development in the rural areas. It is envisaged to register these bodies as Cyber Clubs like Young Farmer Clubs of the DoA in order to facilitate them to participate and improve their role in the cyber extension activities and through it to strengthen the agricultural extension mechanism. The cyber villages of *Biso Bandara* and *Mandalagiriya* of



Figure 10. Krushi Lanka Gateway

Madirigiriya, CEUs of *Hathamuna* and *Siriketha* in *Hingurakgoda* are some of the villages, which have been given special attention to cyber extension mechanism.

Success Factors

Cyber Extension has been a new dimension in agricultural extension in Sri Lanka to cater the needs of rural farmers, beyond the geographical and language barriers, through the establishment of quick information sharing mechanism with relevant information repositories at grassroots level. The project enabled the farmers and village level extension officers to access timely and relevant information on agriculture with absolutely no cost through the latest ICT initiatives implemented by the DoA. Many Cyber Extension Units adopted their own means and strategies with the facilities provided to them for strengthening of present extension system. The success factors and lessons learnt are as follows:

- **Toll free service ‘1920’ to farmers:** Due to the penetration of mobile phone networks in the rural area of Sri Lanka, Toll Free Agriculture Advisory Service has become a popular ICT initiative among farmers. It plays an important role in strengthening the present extension system at village level. A wide group of farmers ranging from commercial farmers to homestead level contact the toll service for knowing new information and find instant solutions for their field level problems. The service is free of charge and available in local language which made it very popular among the farming community.
- **Crop based information to farmers:** Crop based information repositories in the form of Interactive Multimedia CDs in Cyber Extension Units are more popular among farmers and officers since each IMM CD provides a complete collection of information on crop cultivation at a mouse click with a user-friendly interface which do not require much computer skills to browse. IMM CDs are frequently used as a self learning tool and they plays a great role in agriculture trainings by the AIs. CDs on paddy, papaya, banana, micro-irrigation, vegetable cultivation and floriculture are more popular not only among farmers but also among general public. Cyber Extension Unit located at *Rassagala* Agrarian Services Centre effectively used the IMM CD collection by establishing an Agriculture Information Library for farmers, out of which majority of them are vegetable cultivators. They learnt latest vegetable cultivation techniques, latest varieties, environmental friendly pest control techniques, post harvest handling of vegetables and value addition of vegetables through the IMM CD library with the assistance of the AI. To provide information at the doorsteps of farmers, copies of the CDs are also provided to farmers on request.
- **Increase in the rice yield:** *Wileyaya* village comprises of 52 acres of paddy land owned by nearly 18 farmers in *Ridiyagama*, which comes under the purview of *Ambalantota* Cyber Extension Unit. The Agriculture Officers observed that the paddy yield was stagnated for a long period and they have identified that the problem can be solved by the adoption of latest technologies used in paddy cultivation such as use of straw, paddy husk charcoal and better water management system. Therefore, CEU staff conducted several training programs for the farmers and the village level officers involved in agriculture during the year 2005 to bridge the knowledge gap on the technologies and latest innovations through use of cyber extension methods. As a result of this intervention the yield of paddy has gradually increased in the next seasons and it continued to perform well.
- **Production of low cost learning materials:** One of the strategies introduced through the Cyber Extension mechanism has been to promote the production of low cost audio visual aids/media materials for field level farmer trainings. This helped some of the CEUs to

produce relevant training and extension material even with less technical capacities. In absence of computer and telecom networks during war period, *Mannar* Cyber Extension Unit which comes under the security area could reach the farmers through low cost learning material (flip charts, presentations, CD-ROMs) to conduct training sessions and provide extension services.

- **Formation of Farmers Groups:** Cyber Extension Units in the villages of *Biso Bandara* and *Mandalagiriya* of *Madirigiriya*; *Hathamuna* and *Siriketha* in *Hingurakgoda* were instrumental in motivating farmers to form into farmers groups on paddy seed production to address their problems of non-availability of quality paddy seed in the sowing season. Cyber extension mechanism played a major role for the cyber villages in their information and training requirements. Similarly, *anthurium* growers in *Sravasthipura* under the CEU in *Aradhapura* District formed as a group to safeguard their common interests in *anthurium* cultivation. The CEUs have played an important role in transferring technologies to these farmers groups through CDs and online information sources.
- **Farmer database for agriculture marketing:** Agriculture Management Information System (AgMIS), a web-based database (known as farmer database) was first initiated at the *Marassana* Cyber Extension Unit in Kandy District and later in other CEUs. *Marassana* and *Maspenna* CEUs have been regularly updating the databases, whereas the other units were not able to continue regular updation of data due to inadequate Internet facility and lack of manpower.

Lessons Learnt

1. Lack of awareness: Lack of awareness was identified as one of the main reasons for not using the cyber facilities of the Agrarian Service Centre. Even though farmers have seen the computer facilities in the office of the Agriculture Instructor, they usually think that the facilities are not meant for farmers at all. To overcome the problem, a name board and a poster have been installed at the office entrance to inform people that computer facility is available for farmers. (Figure 11). The project management has launched a new communication awareness initiative known as Information Days. It uses a multiple media approach at the Cyber Extension Unit to create awareness on the use of cyber extension and current agricultural issues in the region. A street drama (Figure 12) muppet show, mobile cyber exhibition stall and banners are used as media strategies in addition to face-to-face dialogues of farmer-extensionist-researcher for specific agricultural technical issues in the area and use of cyber extension services. Four such Information Days were organized at *Marassana*, *Rassagala*, *Polonnaruwa* and *Buththala* in 2007.

Politicians, administrators, farmer leaders, school children and teachers in the area were invited for the Information Day. After this awareness program, number of farmers and especially, school children visiting the CEUs has been increased. The mobile exhibition unit of AVC also took lead to create awareness on Cyber Extension in the country.

2. Manpower problems: Since existing staff (Agriculture Instructors) of the DoA are utilized for Cyber Extension, considerable effort was given to improve their computer skills. It was noticed that young officers who showed more enthusiasm than the older officers in gaining digital knowledge. It was also found that some of the Agricultural Instructors have neglected the maintenance of farmer database due to hectic workload. To address this issue, some of the older Agriculture Instructors of the CEUs were replaced with younger officers who were recruited recently. The digital approach to



Figure 11. A Cyber Extension Unit



Figure 12. A Street Drama demonstrating use of IMM CDs

extension has enhanced effectiveness and credibility of the extension system and upheld the pride and dignity of the extension staff of the DoA.

3. Administrative issues: The project encountered administrative constraints and obstacles in running the CEUs. Lack of administrative support and backing from higher officers, insufficient financial resources, transferring of trained cyber staff, and misuse of some of the digital facilities have been some of the problems. In order to solve these issues to certain extent, a senior officer at the provincial and inter provincial level has been appointed to co-ordinate Cyber Extension activities at inter-organizational as well as intra-organizational levels.

4. Attitude of senior management: Some senior managers seemed to have opinioned that ICT is too advanced for developing countries like Sri Lanka. Therefore, considerable lobbying has been done to convince and bring about necessary changes in the mindset of senior level people. Politicians, policy makers and senior administrators were involved in the opening ceremonies of Cyber Extension Units to gain their support and cooperation which helped to sustain the Cyber Extension initiatives. As a result, some of the Provincial Ministers have taken steps to open new CEUs, similar to DoA Units, in the Agrarian Service Centres in their provinces. For example 31 units were established by the Eastern Provincial Council.

The Way Forward

The concept of Cyber Extension has been provided a new dimension to agricultural extension services to farmers in Sri Lanka. It has strengthened the present extension system to respond to immediate needs of farmers, extension workers and researchers. Policy makers have realised that there is a need for an agricultural information network that comprises of grassroots level institutions managed by a centralized National Agriculture Information Centre with the support of latest ICT tools, which has been identified by the head of the country and included in the National Agriculture Policy of Sri Lanka. Government of Sri Lanka has taken initiative to establish Cyber Extension Units in all Agrarian Service Centres (ASCs) after realising the value of farmer database by the Strategies and Perception Committee of the Presidential Secretariat. Therefore, a project proposal was submitted to the Presidential Secretariat to scale up the Cyber Extension Project. To support the Cyber Extension initiatives, an island wide network will be established with the assistance of Telecom which will

provide unlimited Internet facility to all CEUs with enough bandwidth to support use and application of latest ICT tools and the AVC will bear the running cost on behalf of entire cyber units of the country. It is hoped that with these interventions, Cyber Extension approach would further strengthen the agricultural extension system to provide better advisory services to farmers in the country.

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Empowering Farmers through Mass Media: A Success Story of *Mati-O-Manush* Television Program in Bangladesh

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Introduction

Agriculture is the backbone of Bangladesh economy. It provides employment to about 58 percent of the total labour force. About 1.79 million farm families in the country, which are estimated to be 65 percent of total population (MoA, 2008) are employed in agriculture for their livelihood. There has been a marked decline in the share of agriculture to the GDP from 50.4 percent in 1984-1985 to the current level, estimated at 21 percent. It is confronted with the paradox of the increasing demand for food keeping in pace with the growing population while cultivable land is gradually shrinking due to rapid industrialization and urbanization. The projected population by 2030 will be about 190 million and about 40 million tons of rice would be required to feed the population. Other challenges included pests and diseases or climatic hazards like submergence, salinity, drought, heat, cold, soil toxicity etc., and produce more rice with less land, less water, fewer chemicals and less labour in the context of global climate change.

Globalization and market liberalization present both opportunities and challenges to Bangladesh agriculture. Climatic conditions favour growing of a wide range of high value crops that potentially can be taken up for alleviating poverty and increasing farmers' incomes. But given the recent experience of global food crisis, releasing rice lands to high value crops may jeopardize food security. On the other hand, the potentiality of high value crops in increasing income and profitability of smallholder farmers also needs to be explored for sustaining agriculture.

Agriculture is a dynamic sector in Bangladesh which needs regular adaptation of new technologies in order to meet the growing demands for food. For this, dissemination of appropriate technologies and innovations is very essential for adopting the technologies by farmers to minimize the yield gaps.

Agricultural Technology Generation and Dissemination

The Bangladesh Agricultural Research Council (BARC) which was established in 1973 to coordinate agricultural research activities by government agencies. There are eleven institutions comprising National Agricultural Research System (NARS) mandated to conduct research on different commodity and non-commodity areas. There have been about 40 institutions involved in the agricultural research including faculties of universities. BARC is the apex body of agricultural research and it is responsible for formulation of research policy and quality enhancement. The Agricultural Information Centre (AIC) in BARC is responsible for dissemination of research output through various means including ICT.

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Bangladesh Agricultural Research Institute (BARI) is the largest multi-crop research organization, mandated to carry out research on a wide variety of crops. Other important institutes included: Bangladesh Rice Research Institute (BRRI), Bangladesh Jute Research Institute (BJRI), Bangladesh Institute of Nuclear Agriculture (BINA), Bangladesh Sugarcane Research Institute (BSRI), Bangladesh Fisheries Research Institute (BFRI), Bangladesh Forest Research Institute (BFRI), Bangladesh Livestock Research Institute (BLRI), and Bangladesh Tea Research Institute (BTRI),

Bangladesh Council of Scientific and Industrial Research (BCSIR), under the Ministry of Science, Information and Communication Technology (MSICT) comprises three research laboratories and five research institutes encompassing fundamental and industrial research, related to food and nutrition, biotechnology and tissue culture, aromatic and edible oils. Bangladesh Academy of Rural Development (BARD), the Rural Development Academy (RDA), the Bangladesh Institute of Development Studies (BIDS) and BRAC in the NGO sector are involved in agricultural research and dissemination of technologies to the end users.

Agricultural Extension

Extension system is organized into different public sector agencies viz., Department of Agricultural Extension (DAE), Department of Fisheries (DOF), Department of Livestock Services (DLS) and Department of Forestry. DAE has extensive network of service up to grassroots level of the block, manned by Sub-Assistant Agriculture Officer. Each block covers 3-4 unions serving about one thousand households. Addressing new challenges on sustainability, fragmentation of holdings, threats and opportunities from opening up of agricultural trade and making explicit impact on poverty would require extension systems to embrace roles beyond disseminating technologies to individual farmers.

The use of ICT in agricultural extension and rural development is significant, especially now as it has witnessed an upsurge in almost all areas of rural life where it has provided a medium to access agricultural information, despite the persisting problems of access, connectivity, literacy, content and costs. Use of ICT provides the opportunities for both the innovator and practitioner to disseminate the innovations in the agricultural sector and gain knowledge and skills to practice the innovations. ICT in the modern age is the preferred channel to transfer new technologies to different types of stakeholders.

Use of ICT

Information and Communications Technology (ICT) has become a very important feature in the Bangladesh agricultural sector in contemporary times. Even though it is still a new concept, an increasing number of professionals are appreciating its use for development work. Extensionists are important stakeholders in the development of agriculture in Bangladesh. It is therefore pertinent that the extensionists should be abreast of modern information and communication technologies so as to discharge their duties more effectively.

Agriculture is getting more knowledge-intensive, market oriented and demand driven. Therefore, extension is required to follow a systems perspective from production to consumption in a value chain mode. Conventional systems of technology transfer are inadequate in the fast changing agricultural scenario. The application of Information and Communication Technology (ICT) to accelerate extension delivery system is increasingly gaining importance. ICT includes any communication

device or application, encompassing: telephone, radio, television, cellular phone, computers, networks, satellite system, hardware and software, the internet and its application.

The history of ICT use in Bangladesh agriculture is not so old. In Bangladesh, private sector operators are the main providers of ICTs (mobile phones, computers and internet, television channels, radio, and fixed-line telephony on a limited scale), whereas the state operates the fixed-line telephony and two national TV channels and 10 radio centres. The government also formulates and implements ICT policy. The majority of Bangladesh and international NGOs working with ICTs are developing community information centres to facilitate information dissemination to rural people. Some NGO partners included – Gonokendras of BRAC, D.NET-Pallitathaya Kendra, Hridoye Mati-O-Manush by Channel i, GP-Communication Information Centre, Dam (Gonokendra), Coast Bangladesh, Ghat-Rural ICT Centre, YCMC (Youth Community Multimedia Centre), RTC of Practical Action, Amader Gram of BFES, BNNRC, Bangladesh Computer Council, RDA (Bogra), AIS of Ministry of Agriculture, etc. are involved in ICT for agricultural development. The Department of Agricultural Marketing (DAM) with support from the Food and Agriculture Organization (FAO) has been working together to make agricultural market information available.

Mass Media Support to Agricultural Extension

Print media such as newspapers, magazines, leaflets, booklets, posters and handbills are widely used in technology transfer. However, the lack of literacy among the farming people is a major limitation of the print media, and also the access to print media by the rural people is not always easy. In the contrary to that, electronic media can reach a large number of people at a faster rate. AM and FM radio, as well as VHF and UHF television thus became the most effective means of technology transfer to the farming community in Bangladesh. Among the modern communication systems, the use of mobile phones and computer is increasing rapidly and these technologies are growing faster than older forms of ICTs such as television, radio, mainline telephones and newspapers. It may, however, be noted that Internet use remains low in less developed countries where the use of radio and television remains more prevalent.

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, March-April 2007*).

Popularity of Television

The electronic mass media has been found most effective to transfer agricultural technologies. Television programs and short films are most effective means of dissemination of information as they have plenty of visual elements, which are easy to reach low educated or illiterate farmers. Due to the availability of low-cost TV sets and spread of electrification, rural people are being exposed more by television programs, which are widely used for entertainment and educational purposes.

The mostly used medium in Bangladesh is terrestrial television. The Bangladesh Media and Demographic Survey (Table 1) reveals that about 64% of the population has access to the terrestrial television and it is important to note that more than 55% of the rural population has access to television programs which make the television the most important and preferred channel for disseminating agricultural information and knowledge to farmers in the villages.

Table 1. Media reach in Bangladesh

Reach/usage	Internet	Newspaper	Cable TV	Terrestrial TV	Radio
All	1.2%	24.5%	12.4%	64.2%	22.5%
Rural	0.2%	15.9%	1.5%	55.5%	24.8%

Source: Bangladesh Media and Demographic Survey, ACNielsen, 2005.

Among the television channels, five 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 2 gives list of channels and titles of agricultural programs.

Table 2. Agricultural Television programs

Channel	Title of the program	Duration	Frequency
BTV (Public)	Mati-O-Manush	30 minutes	5 days in a week including a repeat
	Krishi Katha	25 minutes	Fortnightly
	Krishi Dibanishi	25 minutes	Weekly
	SAARC Krishi	25 minutes	Monthly
	Krishi Sangbad	5 minutes	Daily
Channel i	Hridoye Mati-O-Manush	25 minutes	Weekly
	Hridoye Mati-O-Manusher Dak	25 minutes	Weekly
Bangla Vision	Shyamol Bangla	25 minutes	Weekly
Channel 1	Krishi-O-Krishok	25 minutes	Weekly
ATN Bangla	Matir Shubash	25 minutes	Weekly
Digonto	Khet Khamare	25 minutes	Weekly
Rtv	Amar Desh	25 minutes	Weekly

Realizing the strengths and popularity of television, several television based agricultural programs have been started by government owned television broadcasting centres as well as private television companies in Bangladesh. Out of the agricultural programs, *Mati-O-Manush* started by the Government owned Bangladesh Television (BTV) has been very popular among farming community in Bangladesh. The following sections describe the success story of *Mati-O-Manush* television program, its mechanism, role and expansion and its contribution to agricultural development in Bangladesh.

Mati-O-Manush

Mati-O-Manush, meaning Soil and People, is a popular television program of the state-run Bangladesh Television (BTV). It has been the longest running television show on agriculture being telecast six days a week with 30 minutes duration and has had more than thousand episodes aired so far since 30 years. This TV show changed the traditional outlook on agriculture by focusing on crop diversification, non-farm sectors for income generation and still the most watched show by the rural farmers.



Figure 1. *Mati-O-Manush* program on TV (earlier and present)

Following the glorious success of the program of *Mati-O-Manush*, a number of private channels have introduced agricultural programs. The Channel i has started a revised version with the name *Hridoye Mati-O-Manush* which is now rated most popular program in Bangladesh in terms of content, design and presentation. In a survey majority of the people opined that *Mati-O-Manush* of BTV as the most popular and acceptable programs on agriculture and rural development in Bangladesh.

Mati-O-Manush has been a pioneering television program in the history of Bangladesh television. Starting from the mid 1980s, it brought revolution to the agricultural sector of Bangladesh. It was known as “*Amar Desh*” (My country) until 1985. Agricultural Information Services (AIS) of the Ministry of Agriculture has been playing a key role in providing technical support to BTV in planning, designing developing and telecasting *Mati-O-Manush* program. It was originally hosted by Mr. Shykh Seraj along with Mr. Dewan Shiraj.

Mr. Shykh Seraj, a media and agricultural development activist, has been the person behind the popularity of *Mati-O-Manush* program. His efforts, as a presenter of 588 episodes, have made the program highly successful and played key role in raising the awareness among farming community in Bangladesh. After he became the Director & Head of News of Impress Telefilm Ltd./Channel i in 1999, as a response of media in support of farmers welfare, he started three brand new programs based on the conceptual lines of *Mati-O-Manush*. These included: *Hridoye Mati-O-Manush* (Soil & People in Heart) on Channel i; *Hridoye Mati-O-Manush Daak* (The Post of Soil & People in Heart) on Channel i; and *Krishi Dibanishi* (Agriculture Round the Clock) on the only state-run terrestrial Bangladesh Television. All these programs are considered as extension of *Mati-O-Manush* program, strive to telecast relevant agricultural programs to farming community and raise the farmers concerns from time to time.



Figure 2. Shykh Seraj anchoring the *Mati-O-Manush* programs

Uniqueness

Mati-O-Manush program has received attention of all walks of life due to its unique program organization, presentation and contents. Question and Answer session in the program contains relevant issues of farming including agro-business. The routine question and answer session is managed by the Agricultural Information Services (AIS) of the Department of Extension (DoE), where number of experts in research and extension are involved. The program has made positive contribution in the research-extension-farmer linkage.

As the program produces number of success stories on different technological innovations, it has been successful in developing entrepreneurs. The program also successfully raises the location specific production constraints in different fields of agriculture. The constraints have been identified as good resources for research priority at the institute level.

The international experiences of technological innovations in the program have provided good exposure to the local level business opportunity. Interview of the experts, scientists and successful agro-business personalities made multiple effects in the production environment. Professionals are



Figure 3a. Moiz Uddin, a farmer from Pabna who earned 12 million Taka in one season for onion, jujube, garlic and other spices



Figure 3b. Zamir, a progressive farmer from Sylhet, who is producing tomato from last 15 years and earning about 20 lac Taka per year

highly motivated by the interview sessions. Science based entertainment made the program most successful. Interviews by the presenter Mr. Rezaul Karim Siddique (seen in Figure 3a & b) with Mr. Moiz Uddin, Pabna (Figure 3a) – a farmer who earned 12 million Taka in one season for onion, jujube, garlic, other spices and Mr. Zamir (Figure 3b) – a progressive farmer from Sylhet, who is producing tomato from last 15 years and earning about 20 lac taka per year are good examples that captured the success stories of farmers.

The program has been instrumental in motivating the policy makers in developing favourable policy support in agriculture. It also attracted the attention of city dwellers on agricultural concerns due to its unique presentation format.

Program Development and Role of Partners

Bangladesh Television (BTV), a state owned TV organization, started transmission in late 1964 with the objectives of dissemination of information, extension of education, motivation for development activities and entertainment. It telecasts news, views, music, drama, films, documentaries, games and sports to fulfill the recreational demand and to create awareness of the people through its programs. BTV has a terrestrial coverage of 95% population through 14 relay stations. Its transmission time is around 17 hours terrestrial and 24 hours through satellite on a day. In 1978, BTV has started *Mati-O-Manush* program on agriculture and it is being continued without any break in collaboration with different agricultural organizations and several resource persons from development partners who work for welfare of farmers.

Agricultural Information Services (AIS) of the Ministry of Agriculture develops programs for BTV and for this effect there has been an MOU signed by the two agencies for fifty years during February 2010. Programs are developed for three months for all media including TV involving all stakeholders. It usually organises its three monthly program meeting based on Bangla calendar where NARS institutes, agricultural universities, extension departments, public input distribution agency and many other relevant agencies participate. Upon discussion in the meeting, the programs are developed considering the issues of agricultural practices being followed in that season.

After identification of the priority programs, the producers and presenters develop detailed program schedules. AIS undertakes shooting, recording, and editing of the programs and gives the final products to the BTV. Selection of the sites, technical direction and preparation of the scripts are also undertaken by the AIS. Initially the program was started with the name *Amar Desh* in 1977-1978 on a weekly basis. The programs initially included crops, fisheries, livestock, small and cottage industry. During 1985, there have been some basic changes in the program to cover agriculture programs alone. Both public and private sector representations are ensured in development of the programs. The Agricultural News and answering questions through mail were introduced. Folk songs, drama and puppet show were presented relevant to agriculture. In 1986, the coverage was further enhanced with the launch of weekly programs and events.

With the overwhelming success covering post flood agricultural rehabilitation programs embedded with technology, *Mati-O-Manush* attracted attention of all walks of life. In 2001, the program got further enhanced in broadcast time covering relevant issues of fertilizer management, distribution of inputs, and other relevant issues. Also the capacity of the AIS was enhanced focusing TV program with the addition of Betacam Unit and editing panel. With the facility, BTV could produce large number of programs relevant to agriculture. In recognition of the success, AIS has been awarded Bangabandhu Agriculture Prize (distinguished national award) in 2010.

Hridoye Mati-O-Manush

Only a few of the country's TV programs have a history of revival. *Mati-O-Manush* program of the BTV has got this rare record with its continuation as a very successful sequel with the name *Hridoye Mati-O-Manush* on Channel i from 2004. Channel i is the first digital Bangla channel. It runs 24 hours a day since launching in October 1, 1999. Channel i with the slogan "*Hridoya Bangladesh*" (means Bangladesh in its heart) has been acclaimed as one of the leading educational and entertainment Bangla channels.

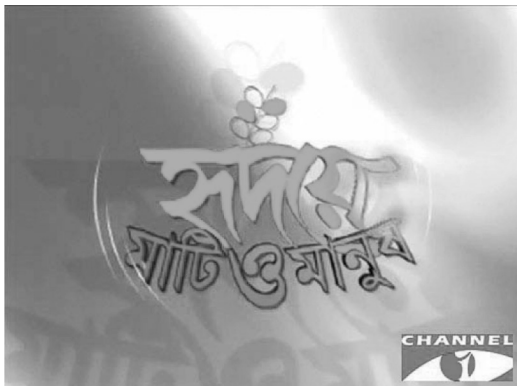


Figure 4a. *Hridoye Mati-O-Manush* TV program



Figure 4b. Presenter Shykh Seraj with a farmer in one of the *Mati-O-Manush* programs

Mr. Shykh Seraj (Figure 4b), who was initially associated with the *Mati-O Manush* program, has been instrumental to telecast a new program titled "*Hridoye Mati-O-Manush*" (Soil & Men in Heart) on Channel i with new innovative ideas. This program is aimed at economic development, poverty alleviation targetted to farmers, local leaders, business community, stakeholders, policy makers, donor organizations, UN Agencies, civil society, entrepreneurs and developers in the country. On 21st February 2004 (International Mother Language Day), Mr. Shykh Seraj started a 25 minute program *Hridoye Mati-O-Manush* on Channel i. It has been able to attract the attention of the audience much like its earlier version *Mati-O Manush* on Bangladesh Television. Now the *Hridoye Mati-O-Manush* program is headed by Mr. Shykh Seraj with a team of dedicated and well-trained professionals to produce effective television programs for farmers. The program covers the following aspects:

- Development activities of the Government
- Success stories in the socio-economic development
- Activities on agricultural development
- Market research on agricultural produce
- Farmers involvement in the production and financial return
- Village problems and probable solution
- Different steps toward attaining self-sufficiency
- Modern innovative technologies in agriculture and in different field of activities
- Development of small-scale entrepreneurs
- Agro-processing industries
- Different activities for poverty elimination

The programs try to bring the concerns of farmers and agricultural challenges to the notice of the policy makers and others who matter in agriculture. These programs also reflect the ideas of researchers, extension department and policy makers regarding the increasing population, and forthcoming food demand, specifically in the least-developed and developing countries.

On 25th June, 2007, in an outstanding *Hridoye Mati-O-Manush* program on Agriculture & Farmers Budget of Bangladesh: Problem, Possibility and Things to be done, Shykh Seraj presented 21 recommendations to the Finance and Planning Ministry, based upon the information and experience, gathered from the field-level research conducted by him and his research team members. In that program, advisers, eminent economists, education and planning specialists and farmers from were present. This program made significant contribution to provide useful feedback from farming community to the policy makers and administrators.

Hridoye Mati-O-Manush has been quite successful in its commitment so far. After it focused on the problems of marketing tomatoes produced by the farmers of Moulabhibazar (Sylhet), the Ministry of Agriculture of the Government of Bangladesh has taken initiatives to market the huge amount of tomatoes. Similarly, in an episode, the program documented how pineapples are being wasted in the country just due to absence of processing plants or juice factories for pineapple. As a result, “private companies have come forward in this sector,” informs Seraj. Already 200 episodes of this program were telecast and there are more to come in the future. Now *Hridoye Mati-O-Manush* is a weekly program being telecast each Saturday at 9:35 PM (BST) and repeat telecast on next day (Sunday) at 11:30 AM (BST) on Channel i.

Impact of *Mati-O-Manush*

Mati-O-Manush program raised the awareness of farmers on latest technologies, market opportunities and improved their decisions to make higher profit margin for their crops, and access to information that improves their productivity. It has created great impact in the society and helped to increase income through technology intervention. Mostly the unemployed youth have been inspired by the *Mati-O-Manush* program. A number of initiatives have been taken up by the individuals and communities in Bangladesh. The outstanding interventions are as follows:

Homestead farming: After the intervention of *Mati-O-Manush* program, farmers have started effectively utilizing the open spaces, partially shady places and boundaries of the homestead, which were previously remained either unutilized or underutilized. Now farm families are growing different varieties of vegetables throughout the year in their homestead area with modern management practices. They are successfully cultivating vegetables such as bitter gourd, ribbed gourd and papaya as fenced crops during winter on homestead boundaries. They are utilizing partial shady place for zinger and turmeric with proper management. Female farmers, who do most of the activities for homestead gardening are able to produce 450-550 kg of different vegetables from 2-3 decimal of homestead area per year which secured them nutritional security to family members and also generate income from the sales of marketable produce round the year.

Rooftop farming: Growing creeper vegetables on rooftop is highly profitable for landless, marginal and small farmers. The television programs raised awareness on the rooftop farming which motivated the target farm families to utilize their rooftop properly for creeper vegetable production with good quality seed and management techniques. It is observed that the farm families who have one rooftop could easily grow bottle gourd, ash gourd or BARI Seem 1 – sweet gourd for generating incomes.

Important Achievements

- The Daudkandi floodplain aquaculture development model comprises conversion of unproductive 8,000 ha of land that remained under water to productive fisheries development. The project successfully organized local stakeholders to culture fisheries and able to enhance income of the local community.
- Social forestry program by an NGO (Prashika) in northern District of Bangladesh in roadside tree plantation organized by destitute women community.
- Changing of socio-economic pattern in the Mymensingh District towards income rising through rabbit rearing involving rural woman made significant contribution.
- Urban rooftop vegetable gardening made household self sufficient in vegetable supply throughout the year.
- Floriculture in Jessore District made a positive change in the cropping pattern in the locality and developed a value chain system.
- Garlic cultivation in the depressed area without tillage helped to produce the crop with less cost.

Seed production and preservation: The television program greatly influenced farm families to produce seeds of different vegetables easily. Female members of the family do most of the activities like seed collection, cleaning, drying and preservation. Now the farm families are exchanging their seeds to each other and sometimes selling seeds also.

Field crops: Use of improved varieties, better quality seeds and recommended production practices have increased the yield of different crops of the farm substantially. Total productivity of the field crops increased significantly. The increased production came mainly through potato, vegetables, rice and jute due to the use of better quality of seed and optimum management by the framers.

Potato-Boro rice-T. Aman rice is a dominating cropping pattern followed by Potato-Jute-T. Aman and Potato-vegetable-T. Aman of the project site in Rangpur. About 80% farmers of are following Potato-Boro rice-T. Aman rice cropping pattern. After the intervention of *Mati-O-Manush* program, the target farm families adopted to produce potato and rice with modern variety and proper management specially balanced dose of fertilizer and pest control. They followed recommended fertilizer dose for potato production but 50% less amount of TSP and MP of total requirement for following Boro and T. Aman rice. As a result, production cost of those crops becomes lower but the yield of said crops increased to 15-20%. Also, the income increases 20-25% more from this cropping pattern with the use of quality seed and proper management.

Livestock sector: The programs created good impact in the livestock sector and promoted introduction of beef fattening, goat rearing, broiler rearing, pigeon rearing, vaccination of local poultry bird, deworming of cattle and improved management to increas the meat, milk and egg production. It has created a positive impact among the farm families. This has contributed for better nutrition, income generation and effective participation of the women members of the family.

Off-farm and non-farm activities: The television programs have played a key role in increasing the awareness on off-farm and non-farm income generation activities for the livelihoods of rural poor in the villages. After receiving proper training, the resource poor farmers, especially the women members of farm families have taken up income generation activities such as boutique, blocking,

stitching, tailoring and many other activities that helped them to support their families and gained social status.

Besides the increase of knowledge and awareness on agricultural topics, the *Mati-O-Manush* programs have contributed for the overall development of rural population. The programs have played a key role in providing education on need for good health, dietary, nutritional security, sanitation, clean drinking water, children education etc., among rural poor in Bangladesh. In recognition of its immense contributions for the development of agriculture and the welfare of Bangladesh farmers, the *Mati-O-Manush* program has been rewarded with several prizes and awards by national and international organizations. Mr. Shykh Seraj bagged several awards for *Mati-O-Manush* program, of which important ones included: Rotary International Award, 1989; President's Award on Agriculture, 1995; Ekushey Padak, 1995; Young Asia Television Award, 2002; Bangabandhu Gold Medal, 2005; Honoured by Sir William Beveridge Foundation, 2008; World Food Program Media Award, 2006; UNESCO Bangladesh Journalism Award, 2009; SAARC Award 2009 etc.

Conclusion

Mati-O-Manush program has been pioneer in disseminating agricultural information through electronic media in Bangladesh for agricultural research and development. It has been successful not only in creating mass awareness among the farmers on the appropriate farm technology but also stimulating policy makers and media professionals to capture the enormous opportunity in entrepreneurship development in different fields of agriculture. The program made multiple benefits to the society which resulted in opening of television programs on agriculture and rural development in number of TV channels in Bangladesh. As a result of competitive environment in TV broadcasting, the quality of service including content has improved significantly. Special news bulletin on agricultural development in private TV channel has been introduced following the success of *Mati-O-Manush*. Several agriculture graduates are now interested to choose media as a promising profession.

Other important contribution of the program has been establishment of public private partnership in agricultural development. The linkage with Agricultural Information Service with the TV channels is more pronounced today. The program also made stronger research-extension-farmer-market linkages through its collaborative approach with all stakeholders in agricultural development in Bangladesh.

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Impact of Community Radio on Technology Adoption and Marketing Efficiency of Vegetable Crops in Nepal

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Introduction

Nepal is situated between 26° 22' and 30° 27' north latitude and 80° 4' and 88° 12' east longitude along the southern slope of the Himalayas. It occupies an area of 147,181 km² with an extreme varied topography ranging from 60 m above sea level in the southern plain (Terai) to the highest point in the surface of the earth (8,848 m) in the north. It is divided into five distinct physiographic regions (Terai, Siwalik, Middle Mountain, High Mountain and High Himalayas) from north to south. However, from agro-ecological point of view the country is divided into three broad regions viz., Terai, Mid-hills and Mountain

Agricultural sector has been the most important contributor of Nepalese economy although its share is decreasing over the years. At present, this sector contributes about 32.4 percent to the Gross Domestic Product (GDP) and employs about 65.6 percent of the economically active population and 20 percent of export earnings (MOF, 2010). About 80 percent of the industries are based on agriculture. Thus economic development of the country mainly depends on agricultural production and productivity.

Agronomical crops, livestock, and horticulture are the three leading components of agriculture in Nepal. According government statistics (MOAC, 2009), agronomical crops account for about 45 percent, followed by livestock (26%) horticulture (21%) and others, in the total Agricultural Gross Domestic Product (AGDP).

Vegetables Production in Nepal

The Tenth Plan (2002-2007) and Three Years Interim Plan (2007-2010) which were based on Agriculture Perspective Plan (APP) have identified poverty reduction as the main goal with the highest priority to agriculture sector. One of the major emphases of APP was to exploit north-south and east-west road corridors for year round vegetable production. Guided by such national policies, development organizations (GOs and NGOs) have given high priority on vegetable farming because vegetables are highly profitable and help reducing malnutrition persisting in rural areas of the country. Diverse topographic features and climatic conditions in Nepal permit the successful production of a large number of vegetables round the year. At present, more than two hundred vegetable species are grown in different climatic zones of Nepal, of which about fifty species and their varieties are grown on commercial basis.

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The common vegetables grown in Nepal included: cabbage, cauliflower, broccoli, Chinese cabbage, brinjal, tomato, yam, colocasia, radish, turnip, carrot, potato, onion, garlic, ginger, turmeric, french bean, cowpea, broad bean, asparagus bean, pea, cucumber, pumpkin, squash, bitter melon, sponge gourd, ridge gourd, wax gourd, pointed gourd, bottle gourd, snake gourd, watermelon, broad leaf mustard, cress, spinach, coriander, lettuce, Swiss chard, okra, asparagus etc. In terms of area, production and value of production, cauliflower is the most important vegetable in the country, followed by cabbage. Other important vegetables in terms of area and production include tomato, radish, broad leaf mustard, eggplant, okra, peas and beans (VDD, 2009).

Transfer of Technology and Adoption

Government of Nepal has identified technologies as one of the priority inputs for agriculture development (NPC, 1995, NPC, 2007). For technology generation, Nepal Agricultural Research Council (NARC) was established in 1991 as an autonomous apex body for agricultural research for development. NARC generates demand based agricultural technologies through its research networks located at different agro-ecological regions of the country. Technologies generated in the on-station research are further verified at farmers' fields through outreach programs and released/recommended for commercial use. Released technologies are handed over to Department of Agriculture (government's extension network) and NGOs for further dissemination through workshops, seminars, trainings, technical working group meetings and publications. Furthermore, Communication, Publication and Documentation Division (CPDD) of NARC compiles the technologies developed from different research stations, develops contents for different user groups and disseminates at earliest to the clients through electronic (radio, TV, website) and print media.

Department of Agriculture (DoA) under Ministry of Agriculture and Cooperatives (MoAC) is the public organization responsible for transfer and dissemination of technology developed by research system. District Agriculture Extension Offices (DAEOs) under the DoA provide agriculture extension services through the grassroots level organization-Agriculture Service Centers (ASCs) to farmers. The role of public sector extension is changing owing to the involvement of different agencies particularly I/NGOs, CBOs, Cooperatives, seed companies, pesticide dealers, professional organizations etc. The government has already introduced policy reform to promote public-private partnership with beneficiary groups and community organizations. Policy of contracting out extension programs to private sector has been introduced.

More than 80 percent of Nepalese population live in rural areas and depend on farming and agri-business for their livelihood. Agriculture in Nepal is dominated by smallholders with average holding size less than one hectare. There is little or limited scope for area expansion for agriculture. Therefore, enhancing agricultural productivity from the limited land is apparently the only option open for increasing the income level and improving the living standards of rural people. New and improved agricultural technologies and knowledge developed by Agriculture Research Institutes and even by the farmers themselves, have to be disseminated among the farmers efficiently and effectively for increasing productivity and overcoming hunger and poverty. Farmers exposure to technological and market information is an important factor influencing their technology adoption behaviour.

Though several approaches such as introduction of Training & Visit System of extension during 1970-1980s and involvement of Farmers' Group Approach (FGA) for technology dissemination produced some results. These approaches could not cover all the farmers of the community, especially the resource poor farmers. Most farmers in Nepal are not organized in groups or in cooperatives. The settlements especially in the hills and mountains are very scattered in remote and

difficult terrains. A survey has revealed that only 3-2% of households have been visited by the government or non-government agricultural extension workers respectively and on an average only 10-12% of the farmers have direct access to public extension service (Sharma, 2010). The dissemination process is constrained due to weak research-extension linkages. Print media often used for disseminating agricultural technologies and market information are not effective for Nepalese farmers mainly because of lack of literacy among farming people (literacy in Nepal is 69% for male and 36% for female) and poor access to print materials by the rural people. To overcome such problems, appropriate and new ICTs would offer opportunities for providing accurate, timely, relevant information and services to the farmers, thereby facilitating an environment for more remunerative agriculture.

ICT Scenario in Nepal

ICT in agriculture and rural development is an emerging field in Nepal. Given the overall development scenario in Nepal, ICT movement is still evolving. There is wide disparity between urban and rural areas within Nepal on accessibility and use of ICTs. In this regard, Government of Nepal has recognized information and communications as an indispensable sector for overall development of the country and taken several initiatives to enhance its utilization in rural sector. Announcement of Information Technology Policy (2000) has been a milestone for laying down a comprehensive framework for the development and utilization of IT sector in the country. A High Level Commission for Information Technology (HLCIT) and the National Information Technology Centre (NITC) were established to provide strategic directions, policy support, implement and monitor ICT activities. Several projects have been initiated with the aid and support of different agencies to make ICTs work for poor rural communities and improve access to ICTs at the grassroots level. Important initiatives included: ICT Development Project with the aid of Asian Development Bank (ADB) meant for developing rural e-community; Rural Info Centres (www.telecenters.org.np) initiated to establish tele centres in all 3,900 Village Development Committees, with the support of donors like ADB, UNDP and others to provide agricultural information to farmers for raising crop productivity, nutritional status of rural people and environment protection; Nepal Wireless Networking Project- an initiative by Mr. Mahabir Pun (winner of Magsaysay award 1997) in his village Nangi that later connected more than 40 mountainous rural villages of Nepal through affordable technologies which provided access to education, agriculture, tele-medicine and e-commerce by villagers. As a result of several initiatives undertaken by government as mentioned above, ICT indicators of Nepal have improved remarkably over the years (2000-2007) especially with regard to Network Readiness Index gone up from 108 to 127 and E-Government Readiness Index from 130 to 150 (ADB, 2008).

Why Radio

Although densities of modern forms of ICTs (cellular phones, computers, internet etc.) are increasing, access to these facilities is yet limited to very small portion of Nepalese population mainly in urban areas. In the context of Nepal, newspaper could not be used for direct communication with rural communities where literacy rate and per capita income is extremely low. The Internet is in its infancy in Nepal and only a tiny portion of the population of intellectual elites has an access to it. In Nepal, density of television is increasing. It is the second most preferred (35%) source of information and entertainment after radio (Equal Access, 2009). However, for agricultural technology communication, television too has some limitations in the context of Nepal which included: (i) low area coverage in hill and mountain regions, (ii) high cost of television set for poor communities, (iii) high cost for program development, (iv) low priority given by city-centered and profit oriented television channels

on agricultural programs and (v) farming communities need to spare time to view television. Considering all pros and cons of different media, radio appears to be the best for the rural communities of Nepal. Radio is very cheap, available and accessible in more than 85% Nepalese households and also most preferred source of information by Nepalese people. Apart from the well-known characteristics of radio, such as its ability to beat distances and literacy barriers, as well as its immediacy and individualistic touch, it is the only medium of mass communication with which the rural communities are familiar. In Nepal, among the radio bands FM is the most preferred (87.7%) frequency band followed by Medium Wave (44.6%) and Short Wave (16.5%). As a result of high preference towards FM radios among Nepalese people, there has been remarkable increase in community radio broadcasting stations since 1997 when the first community radio went on air.

Community Radio Movement in Nepal

Nepal has about 60-years of radio broadcasting history. In 1950, the Nepali Congress Party, fighting against the then autocratic *Rana* ruler, started radio transmission called Prajatantra (democracy) *Nepal Radio* from Biratnagar, an eastern city in Nepal. This program was used to broadcast their activities as well as other information which encouraged the general people to support their movement against the Rana rulers. When Nepali Congress's campaign succeeded, the new government shifted the radio program to Kathmandu. Later, it was renamed as Nepal Radio and it ultimately became Radio Nepal. Until 1995 government owned 'Radio Nepal' was the only radio station in Nepal transmitting its broadcast in Short Wave (SW) and Medium Wave (MW). The National Media Policy of 1992, which included a provision for private sector media and the National Broadcasting Act of 1993, paved the way for the establishment of independent radio; the National Broadcasting Regulation of 1995 defined the process and methods necessary for establishing FM stations in Nepal.



Figure 1. People listening radio while walking in rural area of Nepal

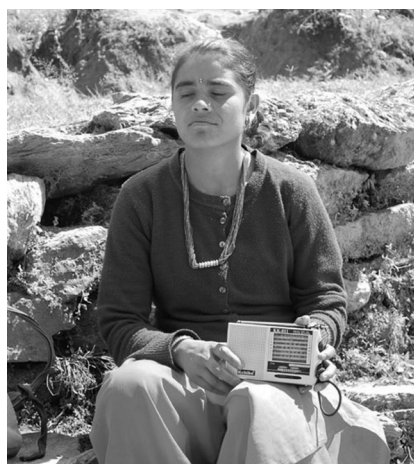


Figure 2. Rural woman enjoying radio program

The first FM station in Nepal was FM Kathmandu, which went on air on 16 November 1994 without having obtained a license. The frequency was provided to the state-run Radio Nepal with programming provided by private broadcasters who leased blocks of time. Radio Nepal applied for and received an FM license for FM Kathmandu in December 1994, after the service had begun broadcasting

(Pringle and Subba, 2007). Nepal Forum of Environmental Journalists (NEFEJ) applied for a broadcast permit on 24 October 1992; however, it was five years before they would have a license. Even after the launch of FM Kathmandu in 1994, NEFEJ continued to struggle with successive government over permission to broadcast. On 31 March 1996, the station that would become *Radio Sagarmatha* aired its first test signals on FM 102.4 Mhz without a license. When NEFEJ finally received a broadcasting license on 18 May 1997, *Radio Sagarmatha* became the first fully independent radio station in the country and marked an important achievement for civil society in Nepal.

As *Radio Sagarmatha* broke new ground, the movement for community radio gained momentum outside Kathmandu valley. More FM licenses were granted and in early 2000, two new community stations joined the airways; the first *Radio Lumbini* in Rupandehi District, a cooperative which raised the funds for its establishment locally, and the second, *Radio Madanpokhara* in the adjacent District of Palpa, licensed through the Village Development Committee. During the same time, NEFEJ created the Community Radio Support Centre (CRSC) to support the development of the sector, and in 2002, the Association of Community Radio Broadcasters (ACORAB) was established as a representative body for community radio in Nepal. As new stations started to broadcast, production groups like Communication Corner, Antenna Foundation Nepal, Equal Access Nepal, Ujyaalo National Network began to share contents and programs, at first using telephones link-ups and cassette, then gradually moving to CD and satellite as full-fledged production houses and distribution networks started to emerge.

By 2005 there were some 56 FM stations on the air with more than one third of these operating on non-profit basis, the basic criteria to be considered as community radio in Nepal. After the success of the People's Movement of 2006 against Monarchy, which resulted in the promulgation of a new constitution, FM licenses were issued *en masse*. Some 188 new licenses were granted between April 2006 and July 2007, including more than 90 to non-profit groups. As of April 2010, a total of 374 FM stations have obtained license for broadcasting (MoIC, 2010).

The output capacity (transmitter power) of most of the FM stations is either 100 or 500 Watts. Among the licensed FM stations, 229 are regularly broadcasting their programs. At present, most of the FM stations are distributed in mid-hills and Terai area and central parts of Nepal. However, NGOs and local communities of mountain and trans-Himalayan region have also taken initiative in recent years to establish community radio stations in their localities. Only one station has so far dropped-out in the history of community radio in Nepal.

Community Radio in Vegetable Farming

Against the background of importance of vegetables farming as means of regular income generation activity as well as achieving nutritional security for farmers in the rural areas, it was felt necessary to promote vegetable farming with proper information support for better technology transfer and more importantly the better decision making in marketing of vegetables which plays a key role for getting maximum incomes to farmers. The role of community radio is very important in adoption of technologies and taking market decisions by farmers so as to face challenges of new pests, climate changes and especially to avoid exploitation of middlemen in the markets.

An exploratory study has been conducted by the authors to capture the success story of *Krishi Radio* stationed in Dharke of Dhading District and the *Radio Palung* stationed in Palung of Makawanpur District in Nepal, which serve the vegetable farmers in the villages of the two districts. The following

sections describe detailed account of the mechanism of Krishi Radio, its role and impact on farming and marketing of vegetables in the region including results of *Radio Palung* programs.

Krishi Radio

“*Krishi Radio 105 Megahertz*, established in August, 2009 is the first agricultural radio in Nepal” claims Mr. Saroj Prasad Paudel, the station manager. *Krishi* means agriculture in Nepali language. A group of young journalist including Mr. Paudel has been doing journalism for the years in Dhading District. They thought to use their knowledge of journalism for the welfare of villagers through modification of working style of their business and set up the Krishi Radio. Major programs of Krishi Radio 105 Megahertz included: i) vegetable price information, ii) technical problems and solution, iii) organic farming, iv) marketing of local produce, v) *mela parma karyakram* (information on needs of *khetala* (agricultural labour) which helps farmers to communicate with agricultural labour, vi) national and local news and the major headlines of national newspapers.

Krishi Radio covers eight Village Development Committees (VDCs) of Dhading District. VDC is a political and developmental unit at local level. This area supplies vegetables mainly to *Kalimati* vegetable market in Kathmandu valley, the capital city of Nepal. *Kalimati* is the main vegetable market of Kathmandu. Out of the total transaction of the market, 18 percent goes from Dharke bazaar. Vegetables are collected in Dharke and the businessmen carry it to Kalimati by bus or trucks. The collection centre and the radio station are side by side.



Figure 3. Krishi Radio Dharke

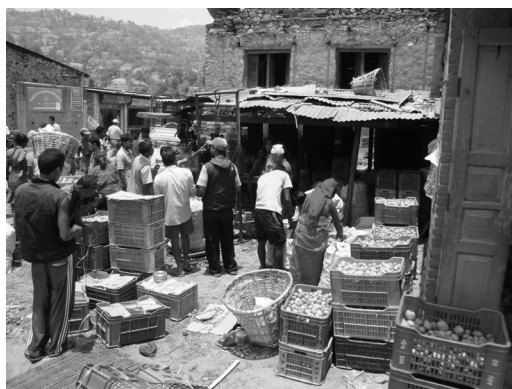


Figure 4. Vegetable collection centre (market) at Dharke

Krishi Radio can be heard from most of the district and some areas of adjoining districts. Some farmers from Tistung of Makawanpur District reported that this radio was also their source of agricultural related information. But actually, eight VDCs southeast of Dhading District i.e., Kewalpur, Jivanpur, Chatredeurali, Bhumesthan, Tasarpu, Thakre, Naubise and Goganpani are targeted by the initiative. The reason for selecting these eight VDCs is because that these VDCs are coming forward for commercial vegetable farming in the district. About 95 percent of farmers of this area are dependent mainly on vegetable farming for making their livelihood and meeting their daily needs and other requirements.

The radio has been facing many managerial and financial constraints and is not yet able to fulfill all expectations of the farmers. The reporters stationed in the respective villages have been provided minimal incentive which hardly covers two meals and one *khaja* (daytime snacks). The most important financial source is voluntary donation till date. For example if a farmer sells 50 kg of rice (1 *muri*) and he donates some part of the sale as *muthidaan* to the community radio. The contribution to radio depends upon the status of the farmer, the amount of services he/she is getting and ultimately willingness of the farmer.

How Krishi Radio Works

To involve the community in the radio activities, Local Radio Support Committee (LRSC) were formed in each village. LRSC is a group of farmers from each village who want to unite and co-work for the radio program in the village. The committee works in coordination with local level already existing farmers group, youth forums, cooperatives, forest user groups, maternity groups, other local organizations etc. The committee selects the reporters and decides their terms of conditions. This committee consists of at least five members. One of the members of this committee works as a representative in the radio operation committee. Young farmers, experienced farmers who have been working in agriculture for a long time, people interested in communication and innovations, and social workers can be the members of the committee. Nobody is barred from its membership. The work of LRSC is completely voluntary. The main responsibilities of this committee are to:

- collect and compile the important agricultural related information at the local level and make it available to the radio station management.
- collect local songs, music, and cultural and traditional songs and *bhajan* (religious poems in local language with full of local slangs) and make them available to the radio station management. These songs and *bhajans* are performed in special occasions in Hindu society of the hills of Nepal.
- recruit full time workers for the operation.
- collect financial support from villagers e.g., *muthidaan* (regular donation of a handful of grains) or the nominal amount of vegetable sale and avail this to the radio operation committee.
- work for public support at the local level.

It is considered to organize LRSCs in all the wards in each VDC. A ward is a further division of VDC into nine parts. They have completed formation of support committees in four VDCs. There will be a 7-member support committee in each ward. The committee members send agricultural information to the station. This committee also gains support from the village for the operation and management of the radio. The radio cannot be heard from some of the low lying areas of VDCs that are situated in the shadow of radio waves. They are setting a new transmission station in higher elevation of the area so that the radio can be heard clearly from each ward of all eight VDCs. The radio also targets the backward societies like *Chepang*, who are indigenous hill farmers and ultra poor; they do not have radio sets. It is now proposed to distribute small radio set to bring them under radio coverage.

Twenty eight radio stations can be heard from Dharke bazaar where *Krishi Radio* station is located. But the difference is that *Krishi Radio* speaks about rural livelihood, their technology needs, and helps in their marketing, unlike commercial FM radios based in Kathmandu which talks about some other business suitable to Kathmandu people. The reason behind the popularity of the *Krishi Radio*, is that its programs are deep rooted in the culture: what farmers do in the morning, in the *mela* time

(working time in the field), and in the evening after coming back home from the field, how they prepare for their work, what they eat throughout the day etc. Farmers feel glorified to talk in radio in their own voice. Everything is broadcast in local language and tones. All the staff are also from the same village and mostly they are sons or daughters of the farmers. All this has made the radio their own.

Linkages

At present the radio is managed by Dhunibeshi Community Agricultural Communication Centre (Dhunibeshi Samudayik Krishi Sanchar Kendra), an NGO. The NGO is not mandated for raising share capital. Therefore, Dhunibeshi Agricultural Cooperative Society (Dhunibeshi Krishi Sahakari Sanstha) has been established to achieve financial sustainability. Each farmer can invest from one Rupee to as much as he/she wants after the sale of their produce as a share capital. Both the organizations – Dhunibeshi Agricultural Communication Centre and Dhunibeshi Agricultural Cooperative Society will work in coordination for running of the radio (Figure 6).



Figure 5. Program broadcasting from the studio of Krishi Radio Dharke



Figure 6. Organizational linkage of Krishi Radio

The initiative has no commercial motive. It is envisaged to work in full potential in all eight villages but to the satisfaction of the farmers rather than making the initiative to cover a wide geographical area and make a mess. Krishi Radio is accessible to all the target farmers and it ensures access of farmers to the communication network of the radio in order to provide access to market information, technology, service providers and policy makers in Kathmandu through radio network with ACORAB.

The access among farmers is also facilitated, for example some farmers may have goat to sell, some may have tomato, and some may have turmeric etc. Radio service helps to find/create market in the village itself. Needy farmers get information and directly contact the seller farmer. Suppose a farmer in Kewalpur Village Development Committee has organic cauliflower to sell; the radio give message and mobile phone number of the farmer. The farmer may be directly contacted through mobile phone to buy that cauliflower. Generally this service is free of cost. But if the seller farmer is not a member, a certain percent of the sale is charged as a service fee. Generally such fee is charged in kind, e.g., if a non-member farmer sells 30 kgs. of vegetables, he/she sends 1-2 kg to community radio.

Information Sources

Data of more than 2,500 farm households have been collected including telephone numbers and other contact details. When farmers come to sell vegetables in market, their problems are recorded in their own voice which is broadcast in the evening. Radio station does not have its own agricultural

technicians. They are getting technical support free of cost from already existing agricultural institutions such as Agricultural Service Centre situated in nearby village called Khanikhola and Development Centre Nepal – an NGO. For more complicated problems which cannot be solved by local experts, they use telephone call to connect experts from the capital. Getting technical support from these institutions is based on interpersonal relationship, rather than official agreement. Farmers having the opportunity to talk by themselves in radio feel glorified and excited and also take ownership of radio initiatives.

Due to the radio programs, the job of agricultural extension personnel has been eased for the formal sector and now they do not have to visit the village to provide information, but can use radio to reach the community. Before the initiative, the access of farmers to these formal service providers was limited, only those who can meet technician in the bazaar area in Dharke used to get some limited service like small cereal seed packets. The station does not have formal linkage or Memorandum of Understanding (MoU) with any government organizations like NARC for obtaining agricultural technologies. They have the list of subject matter specialists to directly contact them for high level technical inputs. The station management opines that a formal MoU can ensure a better partnership in transfer of technologies.

Networking of radio stations via satellite or Internet has been very effective in linking local level farming communities to service providers and policy makers. Most of the community radios of rural areas are linked to one or the other program producer or FM station in Kathmandu. Mainly there are three networks which link community radios to Kathmandu. The first is Community Information Network (CIN) operated by ACORAB. It has link with more than 125 member stations. Second is Ujyaalo FM operated by Communication Corner, Kathmandu having its own satellite and has link to 100 community radios. Third is Nepal FM, Kathmandu has networking with 64 radio stations. Through such network linkage, the problems, needs, social disparities, corruption, mismanagement, demand-supply situation, local knowledge, success stories etc. at community level are reached to service providers and policy makers at top level for timely action. Likewise, government plans, programs, kind of services, incentives and other interventions undertaken by Government and Non-Government Organizations at top level can be accessed to local community. Daily market information of vegetable crops from collection centres and wholesale market help farmers, wholesalers, retailers as well as consumers. It has created a fair business environment with win-win situation for all stakeholders in the value chain.

Results

Market Information: The radio has been broadcasting price information regularly. In the morning, the price information of *Kalimati* bazaar and in the evening the price information of *Dharke bazaar* are broadcast. This helps farmers to make harvesting decision. If they feel that they can get satisfactory price in *Dharke bazaar*, in the evening they make decision whether to harvest the produce or not. They can make decision in the morning on the basis of price information from *Kalimati bazaar*. The radio is using multiple sources of price information: i) from toll free number provided by Kalimati bazaar management office, ii) price information given by the businessman and iii) *Nagarikdainik*, a national newspaper. If the sources report different prices, they cross check and broadcast the real price. Businessmen are not happy with the radio and claim that whatever price the radio broadcast in the morning does not prevail in real market.

The farmers of Dharke area experienced a change in marketing channel after the establishment of the cooperative and considerable advantage with the radio programs on price information and new technologies on vegetable farming. The cooperative mediates the sale of vegetables in the collection centre and collects 1% sales charge.

Better price for famers: Maintaining price uniformity in *Dharke bazaar*, unlike in the past, is the most important achievement of the radio program. Market price information has increased farmers incomes for their produce. At present farmers do not harvest and sell anything without getting information from *Krishi Radio* and the farmers deny selling at lower prices. Thus *Krishi Radio* has been successful to shift large share of profit from businessmen to real producer farmers in the village. When asked about the reaction from a businessman, he reported that “the radio do not care for the businessmen” and claims that it works only for farmers’ welfare. The businessmen engaged in unfair trade and getting unusual profit were probably not happy with the price information provided by the community radio.

Mr. Shyam Chandra Acharya, an innovative farmer in Dharke village, reported some of the impacts of *Krishi Radio*. He said, he started harvesting brinjal after ensuring that he would get price of Rs. 18 per kg of brinjal in the market. Thus, his harvesting decision was based on the price information from *Krishi Radio*. It was informed that it helped him to counter the businessmen who exercise some monopoly in market price determination. In general, he found a 20% price difference with and without *Krishi Radio*. Also, after the establishment of the radio, he started getting agricultural information easily and timely from the radio and able to increase his income from vegetable farming by 20%.

Technology Adoption: Mr. Shyam Chandra Acharya reported that he is getting information on pest control, availability of training, manure management, polyhouse etc., for his vegetable farming as and when needed. Other important information he got is about insect trap in brinjal, foliar spray of urea in cucumber, bean and cauliflower. He reported that with foliar spray, 13 kg of urea is adequate in place of 250 kg as in soil application which clearly shows that the radio programs have considerably improved the knowledge and adoption of better agricultural practices in vegetable farming.

Input supply: There is another recent example on how farmers problems are solved as a result of community radio broadcasting. In the first week of June 2010, chemical fertilizer was not available in vegetable growing areas of Dharke. It was the main season for fertilizer application to rainy season vegetables and rice. *Krishi Radio* raised the issue strongly in local news several times. But there was no solution. There is no chemical fertilizer industry in Nepal. Government owned Agriculture Input Company imports chemical fertilizer in Nepal. Government provides price subsidy on imported fertilizer. Government had target to import 100,000 metric tons of fertilizer in 2009 for which one billion Nepalee Rupees was allocated. All the fertilizers targeted for 2009 were already imported and distributed and the programs for 2010 were not started yet. This was the reason given by local government agency for unavailability of fertilizer. But farmers were not satisfied with the answer since their crops need fertilizers. The problem was again raised by local radio and also in Kathmandu. As pressure from FM stations increased through their news, views and interaction programs, government managed fertilizers to the vegetable farmers from the stock available in other parts of the country and made decision for immediate import of additional 100,000 metric tons of chemical fertilizers for the season.

Community Radio Palung

A study of Community Radio Palung reveals that how community radios can impact on generation and adoption of new innovations. Palung valley, situated at about 1,800 m altitude, is famous for cultivating of off-season vegetables mainly cauliflower and cabbage to supply in Kathmandu and Terai during rainy season.

In 2005, the farmers of Palung and nearby areas of Daman and Tistung areas noticed a new disease in cabbage and cauliflower. The disease started spreading, but the farmers as well as the local extension people did not have any idea to control it.



Figure 7. Community Radio Palung

Here comes the central role played by Community Radio Palung. The radio Palung continuously broadcast news about the disease and the loss it had caused to the farmers. The news was also shared by the FMs at Kathmandu which attracted the attention of politicians and policy makers. As a result, MoAC asked NARC to identify the problem and explore the solution immediately. NARC launched a research project under the leadership of Dr. Ram Devi Timila, Senior Scientist of Plant Pathology Division. The researchers identified that the problem was caused by a disease 'clubroot'. A research project for disease management was implemented. To begin with, radio message was broadcast (live by Dr. Ram Devi Timila) from Radio Palung about the disease and its management. It was repeated several times. The recommendations broadcast from the radio were: use of healthy seedling grown in disease free areas, application of lime to increase soil pH, maintenance of drainage system in the field and crop rotation with non host plants like maize or rice. The farmers of the areas immediately adopted the recommendations because they have almost stopped cultivation of cabbage and cauliflower, very remunerative crops for them since two years. Now, cabbage and cauliflower mono-cropping system has been completely replaced by crop rotation. Each and every farmer now uses crop rotation of cabbage or cauliflower in the sequence with maize or rice and also adopts other simple and practical recommendations. Now the area has been free from clubroot disease.



Figure 8. Cauliflower damaged by clubroot disease



Figure 9. Farmers adopting crop rotation to control clubroot disease

“Clubroot disease in cruciferous vegetables like cauliflower, cabbage and radish now has come under control in Palung area due to the concerted efforts of Community Radio Palung, research scientists, and extension personnel” reports Ms. Babita Dhakal, News chief of Community Radio Palung. Ms. Dhakal now comments “once swept with cauliflower and cabbage, now a separate look with diversity of crop plants including cabbage, cauliflower, maize and rice”.

The message given by community radio *Palung* could draw the attention of the farmers from other area. Later the disease was reported from other vegetable growing districts such as Ilam, Dhading, Nuwakot and Kavre. The clubroot disease management research has been continued in NARC for exploring effective chemicals to control it. Nebijin (Flusulfamide, 0.3 DP) has been found highly effective and recommended for import to private sector. Once it becomes available in the market farmers will be informed through FM radios (Personnel communication with Dr. Ram Devi Timila, project leader).

Lessons Learnt

Reasons of success: In Nepal, community radio combined with modern ICTs has been found very effective in bridging the digital gaps and help in the transfer of technology to the marginalized rural communities who were otherwise alienated from the benefit of such technologies. Radio is the most preferred media as source of information and entertainment among Nepalese people. The key considerations behind the choice of radio for information are: easy accessibility, low operating cost and opportunity of listening radio while doing tasks. FM is the most preferred and most reliable source of information. Public affairs programing on community radio stations across the country has denounced corruption, and questioned the use of public funds and the implementations of projects. The success of investigative and ‘watchdog’ public affairs is contributing to transparency and accountability in governance. Because of diversity of programs, all section of society including farmers, traders, service providers, policy makers, students etc., are benefited from FM programs.

Code of conduct: Along with fast quantitative rise in FM stations, need of ‘code of conduct’ was also realized for sustainability and qualitative improvement of programs. ACORAB in consultation with all stakeholders developed and adopted the “Code of Conduct for Community Radio Broadcasters 2008” that contain do’s and don’ts for community radios. All the community radios affiliated to this association should uphold this Code of Conduct faithfully which ensured unbiased services to the community development.

Community participation: Community members are program producers as well as consumers. Community radio stations have listeners’ club and *Friends of Radio* in many villages. Because the station cannot afford to send its own correspondence to each village, members of the club and *Friends of Radio* send news or information concerning their village that they want to broadcast. Community radio stations, in turn do not charge any fee for public service announcement to the community members. In most cases, there are no holders to make profit from the station; the profit if there is any, is used for further development of the station. Community and radio station work for mutual benefits.

Resource generation: Community radios collect resources from various sources including members of Village Development Committees (VDCs), District Development Committee (DDC) and from membership. These local level government organizations have realized the importance of community radio and allocate certain portion of their budget for establishment and/or operation of community radio. Other income sources are the NGOs and INGOs. Some community radios have generated

resources by organizing religious programs where people donate money in the name of God. Likewise, cultural shows (dance, song, caricature etc.) have also been used for resource generation. The money collected in this way is used for the establishment and/or operation of community radio.

Networking and content sharing: There are good examples of networking among radio stations in Nepal, including content sharing, program distribution, national and sub-national training workshops and exchange of information among stations. For example, Communication Corner (CC) in Kathmandu has been working with community radio stations for exchange of news, current affairs and other radio magazine programs. CC has its own FM station (Ujyaalo FM, Kathmandu) and satellite link with 100 radio stations of different parts of the country. Daily 30-minutes news and current affairs program of CC is simultaneously broadcast by 70 radio stations in the morning. This program includes news stories from leading national newspapers which are not available on time in rural areas. This program helps FM stations' listeners outside Kathmandu to listen to the news stories before the Kathmandu's elite read. This program, thus, helps to overcome geographic and transportation barriers for timely delivery of newspapers as well as financial burden for people to buy a newspaper. The program is very valuable for bringing the voice of deprived rural communities to the notice of policy makers and service providers in Kathmandu and other administrative centres. The radio stations which do not have their own satellite system share contents using satellite of other institution (Nepal TV, Nepal Telecom), Internet, telephone or CD. Community radios have also been airing programs from external sources, most prominently the BBC's Nepali service.

The Way Forward

Nepal has achieved most remarkable success in community radio movement in recent past. After 2006, the number of community radios has been increased very rapidly in rural areas. Altogether 374 licenses have been issued, 229 have started their broadcasting and 145 are expected to start their service in near future. When all the licensed FM stations come under operation, it is expected that more than 90 percent of the population can listen the broadcasting of at least one community radio. Government has planned to establish additional FM relay towers for Radio Nepal so as to expand its broadcasting coverage nationwide by 2011. To address various constraints faced by community radios, Government of Nepal is in the process to present a bill in the parliament to amend acts and regulation regarding broadcasting sector. The proposed bill and regulations have been drafted to address the various issues raised by community radios pertaining to definition, government support, import and income tax exemption etc. Government's plans and policies give clear indication that the liberal policy for licensing FM radios will be continued in future as well.

Agriculture Information and Communication Centre (AICC) has started financing community radios for agricultural programs and planning to expand such programs at regional level. Prior to this, only Radio Nepal (Government radio) was broadcasting agricultural programs with the financial support of AICC. Lack of suitable contents of agricultural technologies in local languages for uneducated farmers is one of the constraints for FM stations especially for those located in rural areas. To address this problem, NARC has taken initiatives to incorporate technology communication components (in Nepali language) in its research projects. NARC is giving due attention to improve capacity of CPDD for prompt dissemination of technologies through community radios. In this regard, steps have been taken to establish collaborative linkages with community radio representatives and program production houses.

Among community media, the remarkable growth of community radio in Nepal is significant, both in the national context and the Asia-Pacific region, where no country has witnessed comparable growth of community radio (UNESCO IPDC, 2008). In this context, the experiences of Nepal on community radio movement can be helpful to other countries of Asia and the Pacific region where conditions are somewhat similar.

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Inter-Farmers Information and Technology Services (FITS) Trading through Information and Communication Technology in the Philippines

Joseph Edward O. Idemne¹ with Gelly R. Maypa,
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Introduction

Information and Communication Technology (ICT) in the Philippines is envisioned to bridge the digital and generational divide. Conceptualized as ePhilippines, this digital interaction is expected to lower the barriers between rich and poor, the gap between the urban dwellers and the rural folks. Conceived to reach the last mile connection in the country, ICT in the Philippines is planned to go beyond the constraints of affordability, access and acceptability (Richard Fuchs, 2008). The Commission on Information and Communication Technology (CICT) is the primary body of the executive branch of the Philippine Government that promotes, develops, and regulates integrated strategic information and communications technology (ICT) systems and promotes reliable and cost-efficient communication facilities and services.

CICT visions an ePhilippines. Its mission is to develop the country as a world-class ICT services provider, providing government services to stakeholders online, provide affordable Internet access to all segments of the population, develop an ICT-enabled workforce, and create an enabling legal and regulatory environment. This vision is anchored on the Philippine Strategic Roadmap for the Community eCentre Program which, among others, includes the following strategies: developing the human capital for sustainable human development and using ICT to promote efficiency and transparency in government. The Philippine Government, through CICT, partners with concerned government and private sector stakeholders, as well as internationally recognized bodies to develop and formulate ICT competency standards. These competency guidelines and standards are used and applied in education and training, and help to professionalize ICT human resource in government and private sector through the design, formulation and administration of competency-based certification exams.

ICT initiatives at the Community Level

To provide affordable access to ICT-enabled services and relevant content, the CICT made a multi-sectoral partnership with the Philippine Community eCentre Network (PhilCeCNet) to place the Philippine CeC Program in service. The PhilCeCNet, which was formed in 2006, is a learning and collaborative community of CeC stakeholders, ensuring responsive, efficient, valuable and sustainable CeCs. A Community eCentre (CeC) acts as a self sustaining shared facility providing

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affordable access to ICT-enabled services and relevant content. It serves as a conduit for efficient delivery of government and other services and a potent tool for empowerment and participation of developing communities which are not served and are considered undeserving. In essence, however, the ultimate goal is to bridge the digital divide and provide universal access to information and communication services. As of 2010, there are 115 CeCs in the country.

CeCs have evolved to be a catch-all for e-services in their communities. Some of the services offered by the various CeCs in the country include basic internet services (e-mail services, research and information resource generation) and business services (scanning, printing, copying, calling centre, ID services, video editing, lay-outing). Other centres also offer ICT services (trouble-shooting, technical services, web development), eBusiness (eBanking, eTrade), public eLibrary, eProcurement services, and databank/information centre. The more aggressive centres offer capability building services including online advertisement, and even telehealth/telemedicine services.

PCARRD

One of the dynamic partners of the PhilCeCNet is the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), a sectoral council of the Department of Science and Technology (DOST) that serves as the main arm of DOST in planning, evaluating, monitoring, and coordinating the national research and development (R&D) programs in the agriculture, forestry, environment, and natural resources sectors. PCARRD is the first DOST council to earn an ISO 9001:2000 certification for its quality management system, and is engaged in active partnership with international, regional, and national organizations and funding institutions for joint R&D, human resource development and training, technical assistance, and exchange of scientists, information, and technologies. The major strategic concerns of PCARRD in using ICT is to improve management of R&D in the agriculture and natural resources sectors to support planning, monitoring and decision making at all levels in the organizations, and to advance agri-industrialization in research, technology transfer and extension. In 1997, the Management Information Systems Division (MISD) established the Internet connectivity for PCARRD which gave encouragement to member organizations to pursue their goals.

K-Agrinet Program

PCARRD is part of the Knowledge Networking Towards Enterprising Agricultural Communities (K-Agrinet) program, which utilizes ICT to access information, modern technologies and indigenous knowledge to modernize the agriculture, forestry, and natural resources sectors of the country. K-Agrinet deals with eConsortia and eFarms, eLearning, and eAgrikultura, in terms of interconnectivity, hardware and software provision, system and content development, social mobilization, and program/project management. The program is a convergence of PCARRD, Philippine Rice Research Institute (PhilRice), the Department of Agrarian Reform (DAR), and the Development Academy of the Philippines (DAP). The partners conduct ICT trainings, provide ICT equipment, promote video-conferencing, multimedia, information systems, and mobile technology, and provide last mile connections to the different systems of the groups that are part of the project. This is illustrated in Figure 1.

Part of PCARRD's many ICT services offered to the people in need of information at a moment's notice is PCARRD's Short Message Service (SMS) that enables clients to send queries as text messages over a mobile phone or computer and get a quick response to their questions. PCARRD also has its online systems (www.pcarrd.dost.gov.ph) containing R&D projects evaluated and

Subcomponents	Components		
	eConsortia and e-Farm	eLearning	eAgrikultura
Interconnectivity	DOST-PREGINET, DA-NIN, AGRINET and AFRDIS clusters interconnected		
	Last mile connection of 80 FITS centres	Last mile connection of 5 PhilRice Branch Offices, 7 ATI centres, RIARCs	Last mile connection of eAgrikultura centres
Hardware and software Provision	State-of-the art ICT equipment bundled with licensed software (open source also an option)		
System and Content Development	Information portal (common website), Video-conferencing, Existing and new need-based, information systems, Mobile technology, Multimedia (radio, print, etc.)		
Social Mobilization	Orientation, Workshops, Skills upgrading, Value formation	Awareness campaign, ICT-Training	Advocacy; Community preparation; Agribusiness training
Program/Project Mgt	Planning, Monitoring and Evaluation		

Figure 1. Components and Subcomponents of K-Agrinet Program
(pcarrd.dost.gov.ph/k-agrinet)

approved by PCARRD and submitted R&D proposals. PCARRD's ICT components are also a big part in maintaining its services to clients online. PCARRD eConsortia are expected to sustain R&D information through ICT-enabled R&D Information Service. PCARRD eFarms provide electronic access to information and technology, and other services to FITS Centres and MS Partners of the K-Agrinet program. The 0917PCARRD8 program gives up-to-date information about commodities, technologies, and MS via text messaging, and the online expert help responds in 24-48 hours for urgent FAQs needed to be responded. Its website, pcarrd.dost.gov.ph, gives access to information about PCARRD and about specific commodities.

The FITS Centre

PCARRD made a concrete step in utilizing ICT to achieve its service-oriented goals with the establishment of the Farmers' Information and Technology Services (FITS) Centre all over the country. Its web-enabled system, the FITS Information System (FITS-IS), allows simultaneous updating of data by various FITS Centres nationwide, and makes the collection of important data and information in the agriculture, forestry and natural resources (AFNR) sectors fast and easy. The FITS-IS contains profiles of the 14 Regional Consortia, member agencies, FITS Centres and Magsasaka Siyentistas (MSs). Specifically, it hopes to organize data available on technologies whether from local, regional and other sources, to provide an up-to-date inventory of agriculture-related publications and video materials that are available in the FITS/Techno Pinoy Centre, and to make ICT-based services available to FITS clients. The FITS is a key role player to K-Agrinet's eFarm, which focuses on the knowledge-based eCommerce in the area.

FITS Centres, also called as Techno Pinoy Centres, are one-stop service facilities closest to most farmers, entrepreneurs and other clients. FITS Centres provide farmers and researchers fast access to information and technologies. To achieve this, each centre operates with four modalities as given in Figure 2. Technology services include technology trainings, technology clinics, linkage of clients

with experts and financial institutions, technical assistance and consultancy and support for enterprise development. This includes linkage with agencies that provide planting materials, animal stocks and other agricultural inputs. Information services include technology information in various multimedia formats, exhibits of new products and technologies, Internet, SMS, and FITS databases. As of January 2010, there are 630 FITS Centres around the country.

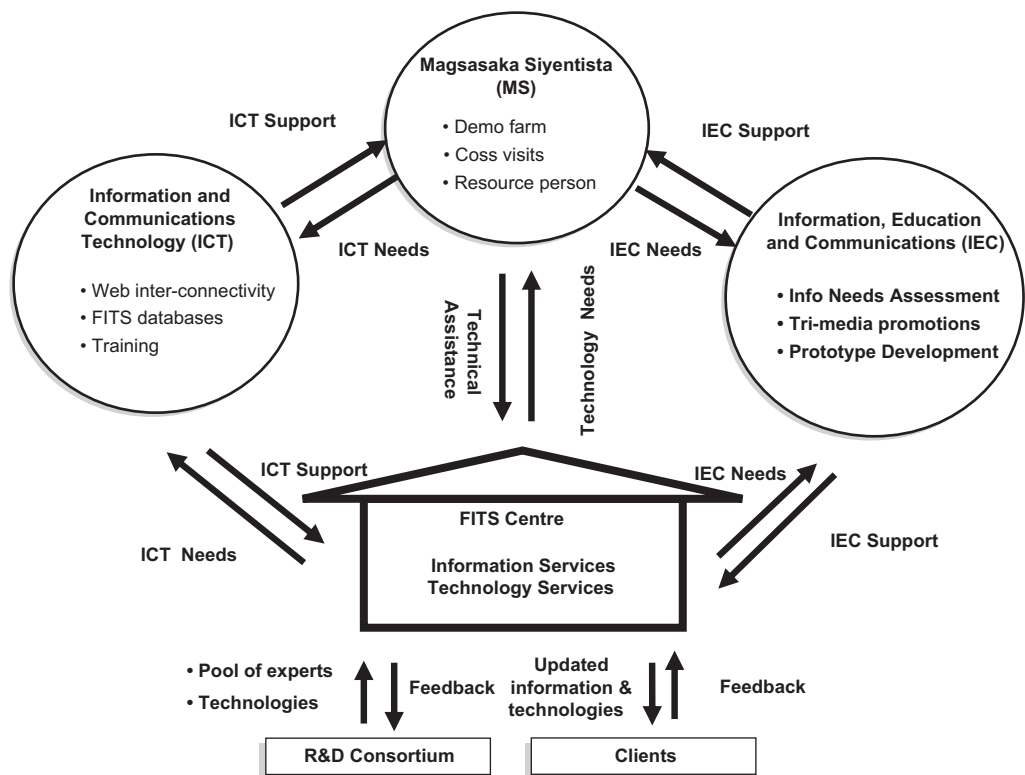


Figure 2. FITS Centre modalities

The FITS ICT program provides infrastructure (computer with internet connection, printers and fax machines, camera, cell phones) for FITS researchers, clients, and farmers. It is the modality which provides immediate response to current problems and frequently asked questions (FAQs). It provides opportunities for capability enhancement through trainings and enables quick inquiry available from the FITS-IS through the internet.

The FITS Information, Education and Communication (IEC) Program is a research-based and need-based communication process that aims to hasten the adoption of FITS' and MS clients' technologies. These include information and technology assessments, objective setting and communication setting, production and pretesting of prototypes and dissemination of IEC materials in appropriate formats and the promotion of value-added products in technomarts.

The FITS MSs, with their S&T-based farms, are outstanding farmers who are successful in indigenous S&T-based technologies. They initiate farmer-to-farmer advisories, serve as resource speakers in technology seminars, trainings and clinics and provide technical assistance and hands-on

trainings. They also promote their S&T-based farms which showcase the effectiveness of their S&T intervention in improving farm productivity and income.

FITS Centres per region are supervised by the Regional Consortia. There are a total of 14 consortia around the regions of the country. These include the Western Visayas Agriculture and Resources Research and Development Consortium (WESVARRDEC) and the Cotabato Agriculture and Resources Research and Development Consortium (CARRDEC).

Consortiums that run FITS

WESVARRDEC is an organization of 28 institutions and agencies in the region that seeks to pool technical expertise and other resources related to R&D activities, aims to establish a regional R&D group that plans and coordinates research programs, and sets to maximize the management of resources to advance R&D goals in Region 6. WESVARRDEC envisions a modern, vibrant and highly productive agricultural and natural resources sector in the region. It is based at the University of the Philippines Visayas (UPV) campus in Iloilo City. As of 2010, the consortium has 39 FITS Centres, one of which is the K-Agrinet FITS Banga in the province of Aklan, famous for its world-acknowledged Boracay Island.

WESVARRDEC seeks to harness the individual talents, assets and resources of its member agencies, provincial, city and municipal FITS Centres and network of research institutions in order to reap effective, efficient, relevant and significant contributions in agriculture and natural resources toward operative regional development.

CARRDEC is a consortium of 22 member agencies that are involved directly in achieving the R&D goals of Central Mindanao. It envisions itself to be a catalyst in developing agriculture and natural resources and it aims to improve the quality of life of the people in Region 12 and the Autonomous Region of Muslim Mindanao (ARMM). It is based at the University of Southern Mindanao (USM) in Kabacan, North Cotabato.

CARRDEC aims to enhance R&D collaboration and partnership between and among agencies/institutions on strategic agriculture and natural resources based products, ensure the production of globally-competitive goods and services anchored on sustainable management systems and to effectively and efficiently promote the adoption of appropriate and affordable technologies. It also assists member agencies in enhancing their capabilities in research development and extension (RDE) and entrepreneurship and strengthens resource generation capabilities for sustained implementation of programs. CARRDEC empowers LGUs, POs, and NGOs and other stakeholders by providing information and technologies in particular the benefits and risks of agricultural development policies and projects as basis for policy formulation and decision making. As of 2010, CARRDEC has a total of 45 FITS Centres. FITS Tampakan, a K-Agrinet FITS, is one of the showcase FITS of CARRDEC.

The Need for ICT Intervention

The Municipality of Banga was adjudged as the cleanest and greenest town in Region 6 for three consecutive years and declared as the National Champion for the Gawad Pangulo sa Kapitaligiran Program for the year 2003-2004. In line with this, then Mayor Atty. Jeremy Fuentes initiated the livelihood program that was conducted through the FITS Centre. In 2005-2007, the focus was on chicken and swine production, and backyard cattle upgrading with support from the Philippine Carabao Centre.

In 2007, under the new administration, Mayor-elect Antonio Maming changed the program to Upland Development through High-Value Fruit Tree production for fruit trees last longer and are more environment-friendly. He called this the “Re-greening of Banga the Beautiful” consistent with its previous accomplishments. He wanted to achieve this through good quality cultivars to improve the existing fruit species in the area. He then instructed FITS Manager Ms. Gelly R. Maypa to secure the fruit tree cultivars. The need was for Large Planting Materials (LPMs) of exotic fruit trees as follows: Grafted Durian (1,650 pieces), Grafted Mangosteen (1,000 pieces), Grafted Seedless Lanzones (1,780 pieces), Grafted Pummelo (2,405 pieces) and Grafted Sweet Mandarin (700 pieces).

After an intensive inquiry from the Department of Agriculture, the Department of Environment and Natural Resources, and other nurseries in the region, Ms. Gelly R. Maypa realized the limited supply of the desired cultivars at an exorbitant price. To sustainably “beautify” the town again, she has to source outside of the region-particularly from Mindanao.

ICTs put to use through FITS

The solution process is a testimony to the network and modalities of the TGP and the K-Agrinet programs. Instead of going the expensive way through a visit in Mindanao, the FITS manager utilized the Techno Gabay network and called Dr. Bessie Burgos of the Technology Outreach and Promotion Division (TOPD) of PCARRD on her K-Agrinet-provided cell phone to inquire about the possible suppliers from Mindanao. She informed Dr. Burgos that Banga has a budget of almost eight hundred thousand for the high value fruit tree project.

Accordingly, Dr. Burgos recommended SMARRDEC Regional Techno Gabay Coordinator (RTGC) Danny Pacoy and Dr. Cayetano Pomares, CARRDEC RTG Coordinator, and gave contact details. Danny Pacoy provided a quotation, but some commodities were unavailable, so Ms. Gelly R. Maypa coordinated directly with Dr. Cayetano Pomares. She texted her e-mail address and requested for a detailed price quotation.

A series of message transactions covering inquiries and negotiations followed through the months. The no-face-to-face dealings emphasize how ICT technology bridged the geographic divide in the countryside. Physically, North Cotabato is approximately 500 air kilometers from Banga, Aklan, crossing over several islands in the Sulu Sea. The digital divide was also crossed over with the use of cell phones, Short Message Services (SMS-Texts) and the e-mails.

The purchase of the Large Planting Materials (LPMs) were negotiated through arrangements with CARRDEC RTG via Internet. Ms. Gelly R. Maypa used her cell phone for the calls and SMS and used the ICT equipment to fax requirements to Dr. Pomares. To push the transaction, Dr. Pomares referred Ms. Gelly R. Maypa to their Magsasakang Siyentista, MS Alvin Claudio. They communicated through May Baldove, the Information Service Specialist (ISS) of FITS Tampakan. Utilizing the interconnectivity and laptops provided by the K-Agrinet program to FITS Tampakan, MS Alvin Claudio contacted other nursery growers in Tampakan using his leadership as an MS, but the problem is that the individual growers did not have a receipt at that time. Their initial solution was to arrange for an LGU-to-LGU (Local Government Unit) transaction. After several discussions, through the Internet, the no-face-to-face deal proceeded. The funds were then obligated to MS Claudio for payment, but MS Claudio did not proceed with the transaction because of the needed arrangements with LGU Tampakan.

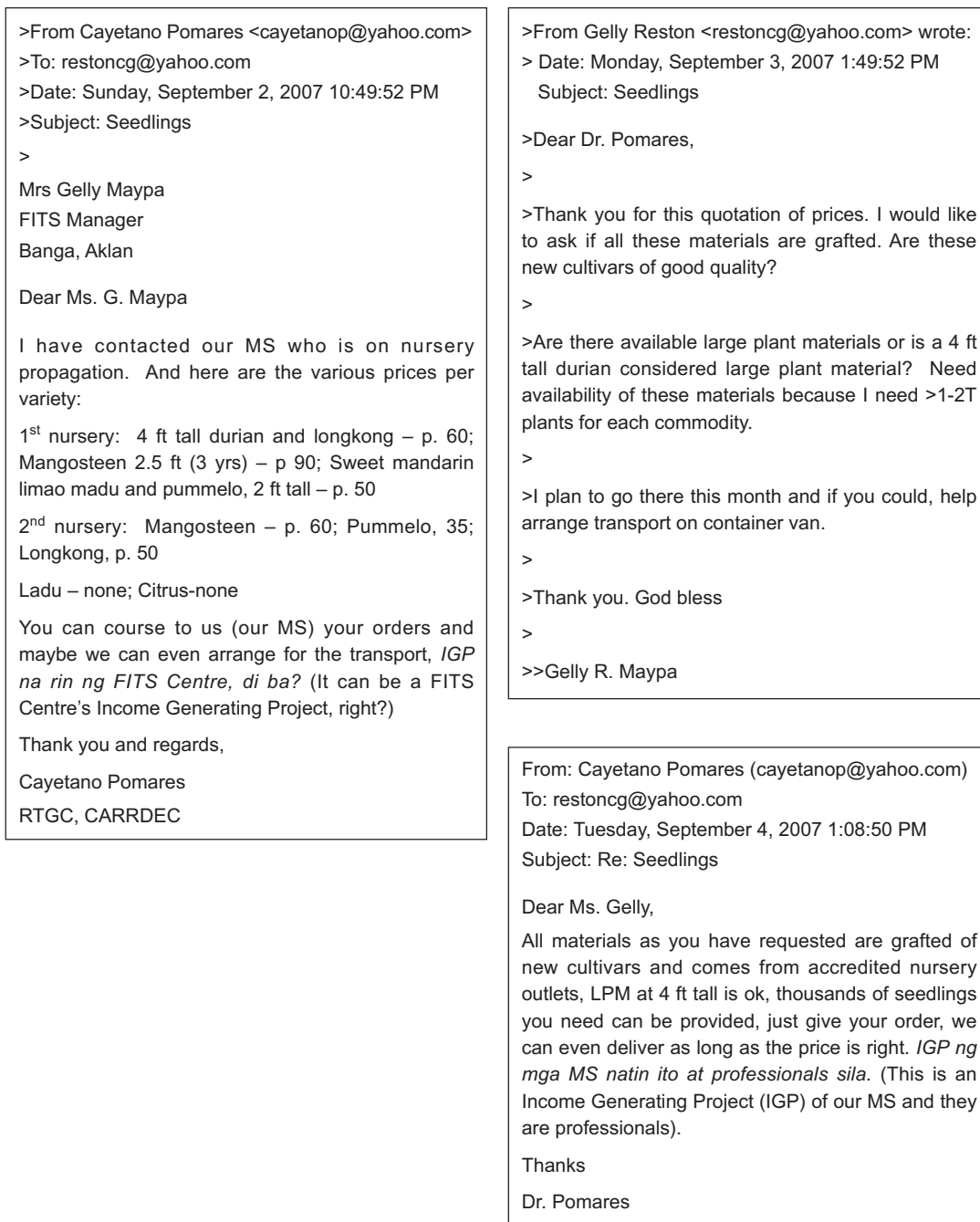


Figure 3. Communication through ICT components

This was the first difficulty. The LGU to LGU solution did not prove viable because of the intricacies of the paperwork involved. Dr. Ketch Pomares had to search for another supplier and, thanks to the TGP network, the answer came from another MS, Dr. Pablito Pamplona whose Grace Farm and Nursery is located in Kabacan, North Cotabato. Dr. Pomares got in touch with Dr. Pamplona to source out the cultivars. Dr. Pamplona immediately reached out to his network that included the USM Muslim Women Livelihood Plant Nursery Project.

The nursery project, composed of about 18 members, responded to the challenge and contributed 700 durian and 1,200 lanzones seedlings to meet the purchase requirement of FITS Banga. This proved to be a big boon to the group inasmuch as they use the proceeds to serve as livelihood income for their families and to distribute planting materials to depressed Muslim communities in Camp Abubakar and its vicinities. Dr. Pamplona also utilized his network of nursery growers to reach the desired number of plant cultivars.



Figure 4. USM Muslim Women Livelihood Plant Nursery Project in Cotabato

Banga LGU then provided to buy the plant materials with a very reasonable price of P 80.00 to P 120.00 per plant delivered directly from Cotabato, Mindanao to Banga, Aklan in Panay Island in the Visayas.

Then the second problem occurred: Dr. Pamplona did not have the complete set of papers for a private entity-to-government transaction. To solve the problem, Dr. Pamplona asked for the help of the Cotabato Producers and Multi-Purpose Cooperative to serve as seller because they have a legal personality and a complete set of papers to handle the government transaction.

With the willingness of the cooperative to serve as seller, the third situation occurred – the sale had to go through a bidding process involving face-to-face transactions. This is when the Banga Bids and Awards Committee (BAC) Chairman, Mr. Herminiano Andrade, used another ICT component. He accessed the Government Procurement Policy Board (GPPB) online using the Internet connection of FITS Banga (Figure 5).

Mr. Herminiano Andrade faithfully followed the provisions of Section 36 of the Government Procurement Reform Act (Republic Act 9184) through a real-time response from the GPPB, fulfilling the vision of the ICT Roadmap. On August 4, 2008, the municipality posted the announcement on its bulletin board. The same announcement was posted on its electronic board (Figure 6). The invitation also specified the requirements of the Prospective Bidders and the particulars relative to the eligibility statement, screening, bid security, performance security, pre-bidding conference, evaluation of bids, post-qualification and award of contract. The issuance of bid documents was set to August 4-12, 2008 ultimately leading to the notice of award on September 12, 2008.

Since there was no other bidder who signified, the prospective sole supplier was contacted by FITS Banga via cellular phone call to finally close the deal in September 2008.

On October 7, FITS Manager Gelly R. Maypa visited Cotabato and CARRDEC to visually examine the large planting materials (LPM) prior to shipment and finalize the transactions. The face-to-face

GPPB Inquiry:

meeboguest 229739: I am Herminiano Andrade the appointed BAC Chairman of Banga, Aklan

meeboguest 229739: I would like to inquire about the purchase of goods with no local suppliers available

gppbtso: Good afternoon Sir. What particular concern do you wish us to address?

meeboguest 229739: There are no local bidders available except a cooperative from Cotabato that passed the eligibility requirements.

meeboguest 229739: Can we consider him as a sole bidder?

gppbtso: Yes, Section 36 recognizes situations involving single calculated and responsive bid.

meeboguest 229739: Can we get a copy of Section 36 please?

Figure 5. GPPB online enquiry

Republic of the Philippines
Province of Aklan
Municipality of Banga

August 4, 2008

INVITATION TO APPLY FOR ELIGIBILITY
AND TO BID

Name of Project: Livelihood Project
Location: Poblacion, Banga, Aklan
Brief Description: Purchase of Assorted Quality Planting Materials of High Valued Fruit Trees

Approved Budget
For the Contract: P 780,000.00
Contract Duration: 60 days
Delivery Period: 30 days

Figure 6. Announcement of the municipality

field inspection concluded the non-face-to-face B2B transactions over several months. October 27, 2008 was arranged as the date of delivery of the plants. A total of ten thousand cultivars were loaded into three container vans and left Cotabato on the 22nd of October 2008. The vans had to journey to the port of General Santos first because this was the most accessible port for the Super Ferry boat. From General Santos, the ship will proceed to Iloilo City wharf and the container vans transferred to the delivery trucks for the road trip from wharf to the town of Banga, Aklan. The Super Ferry arrangement was the best in terms of savings in time and cost. Savings in time was important in this transaction. This is where the expertise of the Magsasaka Siyentista comes to fore.

Having transported cultivars from Mindanao to Palawan and Luzon before, Dr. Pamplona was well aware of the effect of distance and temperature on the cultivars. The plants had to be at least 4 feet tall already, leaf-bearing, fully saturated with water in potted containers and must be stacked in a particular manner and placed in vans that can be opened. A closed van will increase the temperature and humidity in the container vans and will cause the plants to have an increase in transpiration. This condition will cause the leaves to fall and stop the carbon cycle of the plants leaving the plants dead. Thus, the trip arrangements had to be scheduled properly.

The K-Agrinet mobile phone granted to FITS Manager enabled her to have continued contact with Dr. Pamplona to facilitate the release from the Iloilo port plant quarantine. The FITS manager contacted Dr. Hector Peñaranda, the former Techno Gabay Coordinator of WESVARRDEC who was then serving as Plant Quarantine Officer of the DA-RFU 6 through SMS. Having informed Dr. Peñaranda about the coming of 3 vans full of plant materials from Cotabato, the FITS manager personally requested Dr. Peñaranda to facilitate the release of the vans on her behalf. Also through SMS, she requested Dr. Peñaranda to pick up Dr. Pamplona from the Iloilo airport and help facilitate the lodging and papers needed for the release of the vans.

By using the available ICT mechanisms, Ms. Gelly R. Maypa smoothed the progress of the release, fully conscious of the effect of distance, time and temperature on the “goods.” On October 27, 2008 at 1:00 o’clock early in the morning, the container vans left Iloilo with Dr. Pamplona and his son Jayboy

on board and proceeded to Banga. Through mobile phone and SMS Dr. Pamplona received directions from the FITS Manager on the road during the journey. Ms. Gelly R. Maypa went to the Banga Rotonda to meet them and at around 9:00 in the morning, the three big container vans rumbled along the streets of Banga and proceeded to the FITS Centre located at the town's gymnasium. The mayor, Hon. Antonio T. Maming and some LGU officials welcomed the group with the people waiting to help in unloading the plants at the covered court of Teodosio Park. Dr. Pamplona and Mayor Maming – the supplier and the purchasing agency head respectively, met in person for the first time after the procurement was done through ICT.

Role of Knowledge Worker

The solution process is a testimony of what the CICT through the ICT Roadmap describes as a Knowledge Worker and how this capacitated worker facilitated the solution process. Ms. Gelly R. Maypa is a certified Knowledge Worker. The Roadmap document emphasizes developing human capital for sustainable human development. A well-developed human capital base of a nation plays an important role in its progress. While education and training are the most important investments in human capital, the document also states that the government's human capital agenda vis-à-vis ICT is not simply to develop the ICT skills of its people but to harness the power of ICT for education and life-long learning (ICT Roadmap).

Ms. Gelly R. Maypa was employed by the Department of Agriculture and was assigned as an Agri-Research Specialist for Rainfed Resources Development Project-Panay Rainfed Agricultural Development in 1987-1990, a Special Project with USAID. Her first experience with ICT was when she was trained on micro-computer system at Michigan State University in 1987. Her second exposure to ICT was when she received a USDA study grant on Resource Management at Colorado State University in the United States of America in 1989-1990. The course involved the use of computers and the internet as a course methodology. Part of her study was working on GeoSensing for Indonesia and the Philippines. She was designated as FITS Banga Manager from 2004 to the present. Under her helm, FITS Banga was chosen as K-Agrinet Centre for e-Farm and e-Consortia during the first e-Convergence conference at ASU where CICT is hosted.



Figure 7. Gelly R. Maypa

She then volunteered and served as Rural Radio Broadcaster when she resumed office in 1991 at IBC-DYRG. For her dedicated service, she was nominated by former WESVARRDEC consortium director Mr. Ruben Gamala for the PCARRD Professional Media Award in the Broadcast Category as awarded in recognition of her efforts and dedication in creating awareness on the flagship programs of the WESVARRDEC in Region 6 through her radio program "Farm Watch." The small farmers and their families acquired a strong grasp of the technologies generated by PCARRD and other RDE centres thereby influencing technology adoption in Region 6. She was proclaimed as the national

PMA in broadcast champion in 2003 and was awarded by the Ambassador of Australia, DOST Secretary Estrella F. Alabastro and PCARRD Executive Director Patricio S. Faylon.

Moving beyond the borders of the centre, FITS Banga initiated the provision of ICT services to farmers who can invest in and demonstrate the utilization of technologies in their own farms. Ms. Gelly R. Maypa established a FITS Satellite Office in Barangay Daja Sur to provide lowland and upland farmers as well as freshwater fishermen, processors and entrepreneurs access to information and technology. By working on the *last mile connection*, she has enabled farmers and homemakers to have access to new farming technology and, as a public relations service, enabled them to reach their loved ones outside of the country through internet access.

Results

1. **Actualization of the K-Agrinet Program.** The Knowledge Networking Towards Enterprising Agricultural Communities (K-Agrinet) program was envisioned to utilize ICT to provide access to information, modern technologies and indigenous knowledge to modernize the agriculture, forestry, and natural resources sectors of the country. The study exemplifies that the utilization of the ICT equipment provided by K-Agrinet enabled the B2B and no-face-to-face transactions at substantial savings.

The following sub-components of K-Agrinet are highlighted by the study: interconnectivity, hardware and software provision, system and content development and social mobilization. With the use of modern technologies and equipment, the project need enabled the modalities of the Techno-Gabay Program – particularly the FITS centre and the manager, the Magsasaka Siyentista and the ICT equipment – to transform agricultural communities and their host local Government Units (LGUs) to become enterprising focal points through knowledge networking.

2. **Savings through direct purchase facilitated by the ICT network.** The primary beneficiaries of the study are the households and farmers of the Municipality of Banga who desired to pursue the “regreening of Banga the Beautiful.” Using ICT to bridge the digital, geographical and access divide,

Table 1. Distribution Scheme of High Value Fruit Planting Materials for Livelihood Project 2007, Banga, Aklan

No of Barangays	No of Plants per Barangay	No of Households	Avg. Plant Per HH
Cluster A – Grafted Durian Intercropped with Banana 5	250	1,172	1.07
Cluster B – Grafted Seedless Lanzones with Saba Banana 7	250	1,263	1.38
Cluster C – Grafted Mangosteen 4	250	1,465	0.68
Cluster D – Grafted Seedless Pummelo (Magallanes) 7	250	1,893	0.93
Cluster E – Grafted Sweet Mandarin 3	750	510	4.41

Source: Files of BAC Chairman

the municipality was able to obtain more cultivars for more households thus achieving a greater distribution ratio as given in Table 1.

Due to the appropriate sourcing, the municipality enabled more households to participate in the livelihood project, even to the extent of 1 plant each (on the average) to the 6,303 households among the 26 identified barangays.

Inasmuch as some of the households do not have the available land area, the participating farmers have more plantlets to ensure the growth and sustainability of the trees they will be planting. The re-greening becomes more sustainable and will provide more livelihood when the trees bear fruit. More significantly, the municipality was able to save the cost of Pesos One Million Four Hundred Twenty Thousand (Php 1,420,000.00) that it would have shelled out if the municipality sourced out in Iloilo City at market prices (Table 2). A few large planting materials were available although at prices that were 100%-300% more. A big contribution to the reduced prices is the tax-exempt status of the Cotabato Producers Multi-Purpose Cooperative. The sale was relieved of the 3% VAT and 1% expanded VAT charges.

3. ***Success as a Magsasaka Siyentista.*** A Magsasaka Siyentista showcases the effectiveness of S&T interventions in improving farm productivity and income. With the coordination through the ICT equipment, and with the application of his expertise in developing and transporting live cultivars to prospective buyers, Dr. Pablito Pamplona effectively sealed a deal worth Php 780,000.00 that covered the cost of goods sold of Php 680,000.00 and transportation and related costs of Php 100,000.00. For all practical purposes, he not only provided planting materials for FITS Banga, he also provided income for his farm and extended the gains to the other nursery growers in Cotabato.

4. ***Gender advocacy and social impact achievement for the Techno Gabay Program.*** The inter-FITS trading afforded the USM Muslim Women Livelihood Plant Nursery Project the opportunity to respond to the challenge and contributed 700 durian and 1,200 lanzones seedlings to meet the purchase requirement of FITS Banga. This totaled to earnings of Php 228,000.00 that proved to be a big boon to the group inasmuch as they use the proceeds as livelihood income for their families and to produce quality planting materials to be distributed to depressed Muslim communities in Camp Abubakar and its vicinities. The multiplier effect has reached beyond the agricultural and technological spheres and radiated to the social and development domain. ICT has not just traversed the digital, geographic and generational divide, it has crossed over religious and political rifts.

5. ***The Last Mile Connection happens only through Knowledge Workers.*** The development of ICT human capital goes beyond education and skills, networking and entrepreneurship. The capability and competency building among knowledge workers is designed to assist and empower urban and rural communities to use ICT for their access to basic social services and economic activities. Thus a knowledge worker (the FITS Manager) is a combination of leadership, business, management and computer ability and cleverness that bridges the digital and class divide.

6. ***ICT makes government transactions and processes more transparent and reduces losses from graft, corruption and unnecessary leakages.*** ICT enabled the provision of greater and more accurate information, resulting in a more informed bidding process that the Bids and Awards Committee of the Municipality of Banga was able to follow. It also allowed the private sector to track the progress of the transactions. The progression impressed a greater confidence among the trading actors and fostered a greater prospect of straightforward dealing promoting an enhanced expectation of integrity.

Table 2. Computation of Price Differential in Cost of Plant Cultivars from Cotabato City and Iloilo City (2007)

(in Philippine Pesos)

Buying Price	No of Plants per Barangay	Cost if Bought in Iloilo	Cost as Purchased from Coop
Cluster A – Grafted Durian Intercropped with Banana			
350	1,250	437,500	
120	1,250		150,000
Savings			287,500
Cluster B – Grafted Seedless Lanzones with Saba Banana			
350	1,750	612,500	
120	1,750		210,000
Savings			402,500
Cluster C – Grafted Mangosteen			
500	1,000	500,000	
120	1,000		120,000
Savings			380,000
Cluster D – Grafted Seedless Pummelo (Magallanes)			
250	1,750	437,500	
80	1,750		140,000
Savings			297,500
Cluster E – Grafted Sweet Mandarin			
150	750	112,500	
80	750		60,000
Savings			52,500
TOTAL SAVINGS			1,420,000

Source: Survey of Ms. Gelly R. Maypa

Lessons Learnt

In the Philippine context, ICT is an integral part of agriculture research for development. ICT has been touted as bridging the digital, geographic, economic and generational divide because of the interconnectivity, hardware and software provision and system and content development. It makes interactions and transactions happen in real time and achieve savings in time, travel and opportunity costs. More than these, however, the utilization of ICT equipment, as in this case, enables no-face-to-face and B2B transactions at a higher level: it affords transparency and integrity at less cost. Procedures can be executed and documents sent and tracked to ensure an efficient flow with less leakage.

ICT opens opportunities for agricultural workers to perform added roles. The transition from farmer to integrator to entrepreneur is fast-tracked by ICT through the immediate dispatch and receipt of appropriate information. Decision making is enhanced enabling a developing entrepreneur to take calculated risks and develop alternatives. ICT can achieve a multiplier effect and cross over gender, religious and political schisms over and above digital and geographic divides. The benefits of utilizing ICT in agricultural entrepreneurship for development can radiate to the social and development domain, affecting not just individuals but communities as well. It may well foster any peace process in the future as agricultural development, accomplished in real time, enables the exchange and dissemination of reliable information leading to the completion of any transaction.

ICT utilization in Philippine agriculture demands that the desire to serve must be matched by technical knowledge and personal traits. The last mile connection can happen only through knowledge workers equipped to be leaders, managers and computer experts. The knowledge worker knows not just hardware and software but also how to spot needs and socio-economic goals; she works not just for productivity but also for sustainability; and fosters growth to assist and empower urban and rural communities through ICT. ICT4D, indeed, is alive in the Philippines.

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