Workshop on ICT/ICM for National Agricultural Research Information Systems in the Asia-Pacific Region

(14-16 September, 2010)

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AgriDrupal Technical Workshop

(16-17 September, 2010)

Asian Institute of Technology, Bangkok, Thailand

PROCEEDINGS

Organized by

Asia-Pacific Association of Agricultural Research Institutions (APAARI)
Food and Agriculture Organization (FAO)
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December 2010

CONTENTS

FOREWORD

Information and Communication Technologies (ICTs) offer immense opportunities for the National Agricultural Research Systems (NARS) in the Asia-Pacific region to achieve their mandate as apex organizations addressing the challenges of national food security, climate change, poverty alleviation, rural development and environmental sustainability. The potential of ICTs is significant in making Agricultural Research for Development (AR4D) more inclusive through highly targeted and location specific information services. Advances like cloud computing, availability of new generation mobile technology in many developing countries and Geographic Information Systems (GIS), ease of web 2.0 technologies and social networking at all levels have increased opportunities for new ways to share and exchange both information and knowledge with wide range of stakeholders. It also led to improve the agricultural advisory services and encourage innovative partnerships in Information Communication Management for Agricultural Research for Development (ICM4ARD) for greater impact and better income generation by the farmers.

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 into Information and Communication Management (ICM) issues related to digital content development, socio-economic impact, institutional and process interventions to manage all these continuous changes. 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.

Asia-Pacific Association of Agricultural Research Institutions (APAARI), as a neutral platform, has been promoting the use and application of ICT/ICM in AR4D in the region through its program called "Asia-Pacific Agricultural Research Information System (APARIS)". Advocacy and capacity development in new ICT/ICM is necessary to enable all stakeholders to adopt new advances in technologies and knowledge management systems to create content in the digital realm and to make it truly available, accessible, applicable and appropriable in a sustainable manner. In order to accelerate its application in the Asia-Pacific region and to integrate regional and national efforts with global initiatives, capacity development of NARS is critical to improve information and communication management for generation, storage, processing and usage of content in most economic and effective manner and with equity of access and use by the stakeholders, especially the end users.

Considering above, APAARI, the Global Forum on Agricultural Research (GFAR), the Food and Agriculture Organisation (FAO) and the Asian Institute of Technology (AIT) jointly organised a thee-day workshop on ICT/ICM for Information Managers from 14-16 September, 2010 at AIT, Bangkok. The objectives of the workshop included orientation of participants to the potential opportunities of new ICT/ICM for AR4D; Coherence in Information for Agricultural Research for Development (CIARD) initiative and equip them to contribute effectively towards CIARD Roadmap to Information Nodes and Gateways (CIARD RING); and identification of mechanisms to strengthen APARIS for efficient exchange of data, knowledge and technologies in the region. Twenty one Senior Information and Communication Managers of the NARS from 17 countries attended the workshop. More than 12 resource persons representing APAARI, FAO Headquarters, FAO RAP, Bangkok, GFAR, ACIAR, AIT and Kasetsart University provided valuable inputs in the workshop. The members of the APARIS Steering Committee also actively participated.

The workshop provided an opportunity to Information and Communication Managers of various NARS to present the country status reports. An important outcome of the workshop had been the endorsement of APAARI Communication Strategy which was thoroughly discussed and endorsed by the Information and Communication Managers of NAIS in principle for its implementation. Demonstration of APAARI website and information platforms for sharing information, demonstration of CIARD RING platform and its functions, application of AGRIS DSpace and a Technical Workshop on AgriDrupal on 16-17 September, 2010 with hands-on training helped participants to orient themselves to latest concepts and ICT tools for better sharing of agricultural information and knowledge resources.

These proceedings do synthesize country reports, presentations by resource persons, discussions and workshop recommendations. It is our exception that these proceedings would be useful to all APAARI stakeholders engaged in agricultural research for development.

(Dr. Raj Paroda)
Executive Secretary
APAARI

ACRONYMS AND ABBREVIATIONS

ACIAR	Australia Council for International Agricultural Research
ADB	Asian Development Bank
ADG	Australian Development Gateway
AFITA	Asian Federation for Information Technology in Agriculture
AIC	Agricultural Information Centre
AICC	Agricultural Information Communication Centres
AIT	Asian Institute of Technology
APAARI	Asia-Pacific Association of Agricultural Research Institutions
APARIS	Asia-Pacific Agricultural Research Information System
AR4D	Agricultural Research for Development
ASEAN	Association of South East Asian Nations
BARC	Bangladesh Agricultural Research Council
BIID	Bangladesh Institute of ICT in Development
CARDI	Cambodian Agricultural Research and Development Institute
CARDiG	Cambodian Agricultural and Rural Development information Gateway
CeRA	Consortium for e-Resources in Agriculture
CIARD	Coherence in Information for Agricultural Research for Development
CIARD RING	CIARD Roadmap to Information Nodes and Gateways
CIC	Community Information Centres
CoA	Council of Agriculture
CoP	Community of Practice
CRKB	Cambodian Rice Knowledge Bank
DIPA	Directorate of Information and Publications of Agriculture
EFITA	European Federation for Information Technology in Agriculture
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
GCARD	Global Conference on Agricultural Research for Development
GFAR	Global Forum on Agricultural Research
GIS	Geographic Information System
GPS	Global Positioning System
IAARD	Indonesian Agency for Agricultural Research and Development

IARI	Indian Agricultural Research Institute
ICAR	Indian Council of Agricultural Research
ICM4ARD	Information and Communication Management for Agricultural Research for Development
ICT/ICM	Information and Communication Technology/Information and Communication Management
IRRI	International Rice Research Institute
JIRCAS	Japan International Research Center for Agricultural Sciences
LEARN-IT	Linking Extension and Research Needs through Information Technology
MAAFLF	Myanmar Academy of Agriculture, Forestry, Livestock and Fishery Sciences
MARDI	Malaysian Agricultural Research and Development Institute
MPI	Ministry of Primary Industries
NAFRI	National Agriculture and Forestry Research Institute
NARC	Nepal Agricultural Research Council
NARI	National Agricultural Research Institute
NARIS	National Agricultural Research Information Systems
NATP	National Agricultural Technology Project
NiDA	National Information Communications Technology Development Authority
NINPs	National Information Nodal Points
OCLC	Online Computer Library Centre
OPAC	Online Public Access Catalogue
SAARC	South Asian Association for Regional Cooperation
SAC	SAARC Agriculture Centre
SAU	State Agricultural Universities
SLCARP	Sri Lanka Council for Agricultural Research Policy
TH e-GIF	Thailand e-Government Interoperability Framework
VAAS	Vietnam Academy of Agricultural Sciences
VERCON	Virtual Extension and Research Communication Network
VSAT	Very Small Aperture Terminal

Introduction

Information has become an important input in ever-increasing knowledge-intensive agriculture. Information is more critical for the small-holder resource poor farmers and producers who have been facing challenges posed by income generation with the limited resources in the struggle for their livelihoods and sustenance. It is true that they are not only resource poor but also information poor. The information needs of the resource poor small farmers and producers is fast changing due to increasing need for market participation; need for rural non-farm employment and income generation; integrated farming; agri-entrepreneurial opportunities; access to modern markets, food safety for consumers, climate change and its impact on agricultural practices and depleting natural resources. Now they need very crucial information for running their farm business management activities efficiently than ever before. New dimensions in agricultural research-extension-farmer-marketing continuum and increasing relevance to value chain-wise learning by multiple players in agricultural industry which demand knowledge-driven agricultural advisory services to all stakeholders.

The extension mechanism, which is conventional, mandated to provide necessary information support to farming community often fail due to a variety of inherent problems in addition to ever-increasing learning needs of stakeholders that are continuously changing due to globalization. This is where applications of Information and Communication Technology (ICT) in Agricultural Research for Development (AR4D) are offering immense opportunities to strengthen agricultural extension system all over the world.

The potential of ICTs is significant in making AR4D more inclusive through highly targeted and location specific information services; delivery of ICT-enabled services such as market access, access to export markets, traceability systems, mobile extension services etc. To add to this, the advances like cloud computing, availability of new generation mobile technology in many developing countries and Geographic Information Systems (GIS), ease of web 2.0 technologies and social networking at all levels have increased opportunities for new ways to share and exchange information and knowledge with wide range of stakeholders. It also led to improve agricultural advisory services and encourage innovative partnerships in Information Communication Management for Agricultural Research for Development (ICM4ARD) for greater impact and income generation by farmers. 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 into Information and Communication Management (ICM) issues related to digital content development, end-user needs, policy support, digital intellectual property rights, open access issues, standards for greater coherence, information and knowledge management, security of information systems, research in ICT/ICM, socio-economic impact, institutional and process interventions to manage all these continuous changes. 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.

In order to enhance the stake of ARD in ICT4D, a series of global initiatives have been started by the Global Forum on Agricultural Research (GFAR), the Food and Agriculture Organization (FAO), the Consultative Group on International Agricultural Research (CGIAR) Centers and certain Associations (IAALD, AFITA, EFITA etc.). Initiatives such as Information and Communication Management for Agricultural Research for Development (ICM4ARD) Global Partnership Programme (GPP) by GFAR; Agricultural Information Management Standards (AIMS) of the FAO and the Coherence in Information for Agricultural Research for Development (CIARD) initiative are significant and helped organizations

at global, regional and national levels to leverage ICT/ICM for AR4D. The recent international workshop organized by GFAR in association with ICRISAT/CGIAR, FAO and APAARI in December 2009 reasserts that capacity development in ICT/ICM on a significant scale is one of the important action areas to enable ARD researchers and innovators at all levels to make better use of host of new developments, and to foster content generation in the digital realm in a substantial manner.

Asia-Pacific Association of Agricultural Research Institutions (APAARI), as a neutral regional forum, has been promoting the use and application of ICT/ICM in AR4D in the region through its program Asia-Pacific Agricultural Research Information System (APARIS). APARIS is closely associated with GFAR, FAO and CG Centers to strengthen the ICT/ICM initiatives in the Asia-Pacific region through compilation of success stories on ICT in AR4D, advocacy and capacity building programs targeted to different groups of stakeholders viz., decision-makers, researchers and information managers from the member National Agricultural Research Systems (NARS). The current capacity of ARD stakeholders in the region is not adequate to harness the potentials of ICT/ICM opportunities in AR4D. This may be one of the important reasons for less participation of developing NARS in the present global and regional ICM4ARD initiatives. In the recent regional consultations for the Global Conference on Agricultural Research for Development (GCARD 2010), ICT in AR4D has been identified as an important priority area in the South Asia, Southeast Asia and the Pacific sub-regions for sharing knowledge and information to bridge extension system to markets and highlighted need for strengthening capacities in ICT to meet new and emerging needs. Advocacy and capacity development in new ICT/ICM for AR4D is necessary to enable all stakeholders at all levels to adopt new advances in technologies and knowledge management systems to create content in the digital realm and to make it truly available, accessible, applicable and appropriable in a sustainable manner.

In order to accelerate application of ICT/ICM in AR4D in the Asia-Pacific region and to integrate regional and national efforts with global initiatives, capacity development of National Agricultural Information Systems (NAIS) is critical to improve information and communication management for generation, storage, processing and usage of content in most economic and effective manner and with equity of access and use by the global community. Building NAIS capacity would also enable appropriate changes in the approaches of NARS institutions, facilitate processes and contribute to the global, regional and national level initiatives for equitable flow of information.

With this background, APAARI-FAO-GFAR-AIT jointly organized a thee-day Workshop on ICT/ICM for National Agricultural Research Information Systems in the Asia-Pacific region during 14-16 September, 2010 at the Asian Institute of Technology (AIT), Bangkok, Thailand. The workshop was aimed to assist the member NARS with new capacities for better agricultural information management through revitalizing APARIS activities and through which strengthening global ICM4ARD initiatives to improve effective use of information by all ARD stakeholders in the region and the world over.

The objectives of the workshop included orientation of participants to the potential opportunities of new ICT/ICM for AR4D; orientation on Coherence in Information for Agricultural Research for Development (CIARD) initiative and equip participants to contribute to the CIARD Roadmap to Information Nodes and Gateways (CIARD RING); and identification of mechanisms to strengthen Asia-Pacific Agricultural Research Information System (APARIS) for efficient exchange of data, knowledge and technologies in the region.

Twenty one Senior Information and Communication Managers of the National Agricultural Information Systems (NAIS) representing the National Agricultural Research Systems of 17 countries from the Asia-Pacific region attended the workshop. More than 12 resource persons representing APAARI, FAO Headquarters, FAO RAP, GFAR, ACIAR, AIT and Kasetsart University participated and provided valuable inputs in the technical sessions of the workshop.

Inaugural Session

Dr. Simon Hearn, Principal Adviser, ACIAR & Chairman, APARIS Steering Committee chaired the Inaugural Session. Dr. Ajit Maru, Senior Knowledge Officer, GFAR Secretariat co-chaired the inaugural session. Dr. Raj Paroda, Executive Secretary, APAARI welcomed all the participants, briefed about the increasing role of Information and Communication Management in AR4D and highlighted the contribution of APAARI in improving use of ICTs in agriculture in the region. Dr. Malcolm Hazelman, FAO RAP also welcomed the participants and emphasized the need for improving use and application of ICT/ICM in AR4D for better agricultural research and extension services. Dr. Ajit Maru highlighted the need for accessibility, applicability and appropriability of agricultural information at all levels. The Guest of Honour Prof. Sudip K. Rakshit, vice-President for Research, AIT delivered special address and reiterated the need for sharing information and knowledge for sustainable agricultural development in the developing countries in the Asia-Pacific region.

The Chief Guest Mr. Hiroyuki Konuma, Assistant Director General and Regional Representative for Asia and the Pacific, FAO RAP inaugurated the workshop and delivered inaugural address. He stressed the need for using ICTs for food security and addressing the challenges of climate change. He flagged that farmers lack access to market information and suggested that ICTs could help improve access to market information to farmers. Dr. Simon Hearn pointed that ICT/ICM comes with challenges as well as enormous opportunities to harness for AR4D. He mentioned that regional organizations and national agricultural research systems should take up this challenge. The inaugural secession ended with the vote of thanks by Dr. Attaluri S., APARIS Coordinator.

Technical Sessions

Session I: Regional and Global Initiatives in ICT/ICM in AR4D

Chair: *Dr. Raj Paroda, Executive Secretary, APAARI*
Co-Chair: *Dr. Bhartendu Mishra, Executive Director, Nepal Agricultural Research Council (NARC)*

1. Status Report on APARIS

Dr. Attaluri S., APARIS Coordinator

The mandate, role, contributions and current activities of APARIS were presented. It shared different information services/platforms that APAARI created for sharing information and knowledge. It was highlighted that the involvement of National Agricultural Research Information Systems (NARIS) is essential in order to share and exchange agricultural innovations and information resources in the region. It was sought that the Information Managers of National Information Nodal Points (NINPs) should actively collaborate and contribute to APARIS in order to create value addition services, initiate need-based capacity building and partnership programs.

2. Global ICM4ARD Agenda

Dr. Ajit Maru, Senior Knowledge Officer, GFAR Secretariat

Presentation on the Global ICM4ARD Agenda highlighted the need for Change in Existing ARD Information Management Models in the context of new agricultural innovation systems and possible new information flows. It presented the perspectives of the GCARD Roadmap and its emphasis on sharing and exchange of information and knowledge for AR4D. It focused on the concept of CIARD: A New Way Forward to make information truly available to all. It also explained the CIARD RING and clarified on how to register the information services and information systems to the registry.

3. Experiences of ACIAR's Information and Communication Systems

Dr. Simon Hearn, Principal Adviser, ACIAR

The use of ICT in agricultural extension and rural development in Australia was explained. It shared lessons learnt from information gateways such as Australian Development Gateway (ADG) and the FARMSCAPE (CSIRO) initiative aimed to bridge the gap between farmers and sources of information. It indicate that it is difficult to separate social issues from ICTs; participatory methods are needed in order to implement ICTs; ICTs should be used across value chains and should involve government, community and commercial sector participation. It shared case studies on ACIAR ICT projects, use of web 2.0 in the Philippines horticulture program, and SMS-based services to farmers in Cambodia. It suggested that for enhanced impact, more effective engagement with local economic, institutional and cultural system need to be considered while introducing the ICTs.

Session II: Status of ICT/ICM in AR4D in the Asia-Pacific Region – Country Reports

Chair: *Dr. Malcolm Hazelman, Senior Extension, Education and Communications Officer, FAO RAP*

Co-Chair: *Dr. Fazle Karim, Head, Information Technology & Engineering Unit, AIT Extension, Asian Institute of Technology*

The SAARC Agriculture Centre (SAC) and 17 NARS representatives presented country reports. All the country reports shared current status of the ICT/ICM in the NARS, challenges for ICT/ICM, future plans and suggestions for improving agricultural information systems in the region. Country papers from Bangladesh, Bhutan, Cambodia, Chinese Taipei, Fiji, India, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Nepal, Papua New Guinea, Samoa, Sri Lanka, Thailand and Vietnam were presented. Brief abstracts of country reports are given below:

1. SAARC Agriculture Centre (SAC), Bangladesh

Ms. Nasrin Akter, Senior Program Officer, SAC

SAARC Agriculture Centre (SAC) (renamed from SAARC Agricultural Information Centre, SAIC) is the first regional Centre under the South Asian Association for Regional Cooperation (SAARC). The Centre has been given an enhanced mandate for agricultural research and development, policy planning, and knowledge management. The paper indicated the program building and implementation process followed in SAC and shared details of on-going and future programs. Presentation shared information on important information resources and services that include database of agricultural institutions,

experts in SAARC countries and CD-ROM based information services rendered by SAC. It emphasized the efforts of SAC in ICTs for agricultural development in the SAARC region and highlighted its future initiatives in the areas of exchange of best practices in rural entrepreneurship, marketing information systems and knowledge-based technology forecasting etc. SAC's presentation also briefed about its willingness to collaborate with APAARI and other regional organizations for partnership programs.

2. Bangladesh Agricultural Research Council (BARC), Bangladesh

Mr. Rafique Mostafa Kamal, Agricultural Information Centre, BARC

The paper presented the status of ICT/ICM in Agricultural Research for Development in Bangladesh. It briefed in detail about the present National Agricultural Research and Extension Systems under the Bangladesh Agricultural Research Council (BARC) and its constituencies. It explained that almost all the NARS institutions have established Local Area Networks, websites, e-mail systems and provides information services on crop management, agricultural technologies, information on animal diseases, poultry and fisheries besides several databases on agricultural organizations, technologies etc. The paper highlighted the role of Agricultural Information Centre (AIC) of BARC and ICT/ICM initiatives implemented by the Agricultural Information Service of the Department of Agriculture through ICT enabled web-based/SMS services on crop protection and production technologies at the community level through Agricultural Information Communication Centres (AICC) at the Union level. It also shared some of the important ICT initiatives by Department of Agricultural Marketing (DAM) on agricultural marketing information to farmers and other stakeholders; initiatives by oganizations such as Grameen, Katalyst, Bangladesh Institute of ICT in Development (BIID), WIN Computers, D-Net etc.

The paper emphasized that there is a need for improving capacities of information mangers on modern ICTs and suggested to have coordination between IT professionals and information managers. It finally suggested that APAARI should undertake capacity building and training programs on new technologies for information management and studies to analyse the impact of existing services for further improvement of information services.

3. Ministry of Agriculture & Forests, Bhutan

Mr. Motiraj Gurung, Deputy Chief ICT Officer and Webmaster, Information and Communication Services, Ministry of Agriculture & Forests

It highlighted that the role of ICTs is indeed significant in reaching the farmers in the villages which are scattered across very difficult terrains in Bhutan. The paper describes different ICT initiatives of the Ministry of Agriculture and Forests, The Royal Government of Bhutan which included web-based information services, interactive forums, biosecurity systems, bird flue information system and establishment of Community Information Centres (CICs) etc. It highlighted the efforts such as Virtual Extension and Research Communication Network (VERCON) that attempts to integrate agricultural research and extension with farming communities in Bhutan and ICT-enabled agricultural market information services that provides information on sales at the six auction yards in Bhutan. The presentation opined that real challenge is in reaching the farmers in remote and difficult terrains in Bhutan for which more investment, human resources and coordination between organizations are needed in order to harness ICTs for agricultural development besides other infrastructure development such as roads, electricity etc.

4. Cambodian Agricultural Research and Development Institute (CARDI), Cambodia

Mr. Mom Sovanna, Deputy Head of Training and Information Center, CARDI

The paper indicated the role of National Information Communications Technology Development Authority (NiDA) and Council for Agricultural and Rural Development (CARD) in promoting use of ICTs for rural and agricultural development in Cambodia. It presented the Cambodian Agricultural and Rural Development Information Gateway (CARDiG) established by CARD to provide a portal for information sharing on agriculture and rural development and boost information and knowledge management on agricultural and rural development among stakeholders through better access to web-based information. Initiatives such as the LEARN-IT Project (Linking Extension and Research Needs through Information Technology) funded by Asian Development Bank (ADB) and in collaboration with Thai and Vietnamese partner institutions that aimed to improve the food security and incomes, and enhance the livelihoods of poor farmers in Cambodia. The LEARN-IT is instrumental in transferring new technologies to farmers by empowering farmer intermediaries to effectively use information and communication technologies. It highlighted the Cambodian Rice Knowledge Bank (CRKB) initiative which provides information through different forms such as CD, website and printed documents in 15 provinces and Cambodian Agricultural Market Information Service that provide price information of 21 markets through website, FM radio and SMS services. It pointed that important challenges for implementation of ICTs in agriculture include lack of Internet connectivity, language barrier and inadequate human resources.

5. Council of Agriculture (CoA), Chinese Taipei

Mr. Jian-Chih Chiu, Technical Specialist, CoA

The paper presented important advances in ICT in agricultural development in Chinese Taipei with regard to use of ICTs in improving contents of agricultural information, food safety and agricultural knowledge management, increasing food production and efficiency of government services. It shared that in line with the rapid development of information and communication technology and the Internet, the department is exploiting ICTs to speed up the exchange of agricultural information and create a technology-based information system and hoped that ICTs would link the entire agricultural chain and will improve production and processing, and inspire the development of new products, new services and new outlets. The presentation highlighted functioning of Agriculture and Food Traceability System that helps consumers to easily track the traceability records and information when they buy the products; Agriculture Knowledge Managements Web (KMweb) that serves consumers, producers and researchers through a rich information resource base containing 40 thousands of agriculture knowledge documents and more than 70 thousands of video clips and photos; Agriculture Mobile Service Platform using mobile technologies, GPS and GIS to integrate information, such as agriculture product trading prices, plant pest alerts and professional trainings. Farmers and the publics can receive information in multiple ways via mobile phones, FAX machine and PC/Laptops in the form of SMS, FAX, phone call and email. Micro Precise Production Control System (MPPCS) for Lychee combines the cultivation information and webcam technology for real-time counseling mechanism by experts; Agricultural Real Time Webcam Counseling Service provides two-way multiple webcam counseling between 11 Centers in Agricultural Research Institute and Agricultural Research and Extension Stations and 110 Farmers' Associations and Agriculture Production and Marketing Groups.

It was pointed that most of the farmers in Taiwan are smallholder farmers and not familiar with modern technologies such as Internet that causes major challenge to develop and implement ICTs in agriculture. It opined that these farmers need highly professional information in agricultural production and business management.

6. Ministry of Primary Industries (MPI), Fiji

Ms. Riteshni L. Singh, Acting Senior Information Officer, Information & Communication Section, MPI

The paper indicated the status of ICT/ICM in agriculture in Fiji with reference to on-going efforts of the Ministry of Agriculture through different channels that include websites, print, radio, television and other electronic media to disseminate agricultural information. It highlighted the radio programs in Fijian and Hindi languages, television magazine programs, Government's Information & Referral Centre and Agriculture Ministry's Agri-Help Desk. It noted that extension officers are using laptops to access latest information to help farmers. The paper pointed out that the Fiji is facing several challenges such as lack of connectivity, lack of ICT infrastructure, lack of systems for sharing databases and information, low capacities in ICTs and computer illiteracy. It envisaged that use of mobile phones for agricultural marketing information services initiated by Secretariat for the Pacific Community funded by the EU and promotion of Public-Private Partnerships in sharing agricultural information and knowledge will be undertaken in the near future. It concluded that the Government is supporting the use of ICT for AR4D through its policies, capacity building programs and strengthening ICT initiatives to generate, manage and disseminate information and suggested that APAARI may assist in sharing information and knowledge resources through networking arrangements.

7. Indian Council of Agricultural Research (ICAR), India

Dr. T.P. Trivedi, Project Director, Directorate of Information and Publications of Agriculture (DIPA), ICAR

It illustrates the functioning of the Indian Council of Agricultural Research (ICAR) with its wide network of 98 Research Institutes and 578 Farm Research Centers (Krishi Vigyan Kendra) in addition to 45 State Agricultural Universities (SAUs) involved in region specific research and academic pursuits. It noted that ICT is playing a key role in agricultural growth and development in the country by providing timely and useful information in a demand-driven mode. The paper shared many successful initiatives by the ICAR that include web-based information services, open access to the Indian Journal of Agricultural Sciences, experiences of AGRISNET, AGMARKNET and several other ICT initiatives implemented by organizations such as M S Swaminathan Research Foundation (MSSRF), Gyandoot, iKisan, Warna Wired Village, Bhoomi projects in India. It mentioned several new initiatives such as Agropeadia which developed 11 knowledge models and uses them for tagging and searching the repository objects; e-Granth project aimed at creating Online Public Access Catalogue (OPAC) under Indian Agricultural Research Group Catalogue of all 12 library resources with Online Computer Library Centre (OCLC) partnership; Consortium for e-Resources in Agriculture (CeRA) which is providing free online access to 2600 journals from 8 publishers to 126 NARS libraries. It also indicated connectivity of Farm Science Centres through VSAT technology, information through Community Radio and Farmer Mobile Advisory Service that provide information services to farmers through mobile technology besides details of several printed, mass and electronic media products and services of the ICAR.

8. Indonesian Agency for Agricultural Research and Development (IAARD), Indonesia

Dr. Marhendro, Head, General Affairs Division & Mr. Rino Hermawanto, Head of Information and Reporting Subdivision, IAARD

The paper elaborated on different ICT initiatives started by the Indonesian Agency for Agricultural Research and Development (IAARD). Noted among them are its collaboration with ASEAN Agricultural

Research and Development Information System (ASEAN ARDIS) and initiatives under the Poor Farmer's Income Improvement through Innovation Project (PFI3P) with the support of Asian Development Bank. Under this project, agricultural market information system of Ministry of Agriculture (MoA) upgraded; a national farming website that would become a source of information and eventually a platform for agricultural trade was initiated; and information centers at the district agriculture offices were established that would be linking the information network of MoA and disseminate information through traditional media at the local level. The presentation highlighted the application of ICT within the IAARD and in its experimental farms. It reported that frequent change of ICT staff, poor telephone/internet connectivity, electricity problem at the local level and remoteness of project sites are some constraints. It concluded that issues like sustainability, suitability and applicability should be considered while implementing ICTs for agricultural development.

9. Japan International Research Center for Agricultural Sciences (JIRCAS), Japan

Mr. Tomohide Sugino, Representative, Southeast Asia Office, JIRCAS

The presentation attempted to share application of ICT/ICM in agricultural research, extension, education and related institutes in Japan. Each organization provided internet access to its staff and established its own databases which contains technical information. Most of these recourses are open to public through websites. Through the Ministry of Agriculture, Forestry and Fisheries Research Network (MAFFIN), the Agriculture, Forestry and Fisheries Research Information Technology Center (AFFRIT) provides the Network Service System for facilitating the exchange of information on the research on a nation-wide scale; Scientific Computing System for high-speed and large-volume calculation; AGROPEDIA-a comprehensive database site widely available to agriculture, forestry, and fishery researchers (http://www.affrc.go.jp/en/agropedia/public) and Research Information Open Source System providing research information to a wide scope of domestic and foreign interests.

Various organizations provide farm advisory and extension services by using ICT/ICM. One of the pioneers among those service providers is Arida orange database (http://www.mikan.gr.jp/idea/top.htm). The database is supported by the research institutes and extension organizations in the local government of Wakayama prefecture. The database consists of information about orange production (the daily observation of orange growth, plant management manual, newly developed orange varieties, know-how about pest control etc.) marketing (the latest market prices etc.) and other technical information (weather data etc.). If farmers have any questions, they can send inquiries to the website and can get answers online from the relevant staffs in the extension organizations. Another notable case is a technical support system established in 2008 by the Japan Agricultural Cooperative (JAC) Tokyo Group in order to promote appropriate plant protection. It consists of two parts, namely 1) Recording system of crop management history and 2) Diagnosis system for appropriate use of pesticides. If farmers send information about their plant protection activities such as pesticide application to the system from their PC or mobile phone, the system immediately inform the farmers if their pesticide use is appropriate or not in reference to the guideline established by the Japan Plant Protection Association. Also farmers can search the possible plant protection options based on their crop management history.

With regard to ICT applications at JIRCAS, it mentioned the ICT/ICM collaboration in GIS studies in the Asia-Pacific; Database (opened to public) on local vegetables of Thailand, Soybean genetic resources in Northeast China and food production and consumption data in China; and several online publications for free use. SEICA (http://seica.info) is one of the notable ICT/ICM initiatives/projects implemented by the NARS in Japan. The consumers can trace the production history of the commodities

by inputting the ID number on the SEICA website. About 2,530 farmers and farms registered 10,614 products including rice, vegetables, fruits, legumes, root and tubers, spices, tea and other crops in SEICA.

The paper noted that though ICT/ICM became very popular, most information which is available online focused on the researchers and there are only few technical information packages which can be immediately used by extension workers and farmers. JIRCAS emphasizes that there is a need to formulate package of applicable information on new technologies, which can be accessed online. It was felt that future ICT/ICM applications should target on sensing technology on leafy vegetables, plant management system through automation, development of Robot suits for reducing the burden of farming practices, and development of the integrated information systems which provide consumers' information to producers and provide the information about environmental impacts of agricultural production to consumers and traders. It concluded that JIRCAS would promote ICT/ICM through open databases and online publications and promoting mobile internet services to small holder resource poor farmers in the region.

10. National Agriculture and Forestry Research Institute (NAFRI), Lao PDR

Mr. Manoluck Bounsihalath, Head of ICT Unit, Center for Agriculture and Forestry Research Information (CAFRI), NAFRI

The paper attempted to present the ICT initiatives led by the National Agriculture and Forestry Extension Service and the National Agriculture and Forestry Research Institute with support from the Laos Extension for Agriculture Project and the Upland Research Development Program (Swedish-funded) that uses various ICT tools for information and communication services. It highlighted two important case studies. The Lao44 – a Coalition for Lao Information, Communication and Knowledge (CLICK) that aims to allow citizens to publicly and freely share their information. It contain more than 1500 documents and 300 videos available on agriculture, forestry, health, education, training and extension materials, statistics, indigenous knowledge, environmental issues, laws, economics, gender and government policies. The Lao Agriculture Database (LAD) established by the National Agriculture and Forestry Research Institute (NAFRI) in collaboration with the Thai International Bibliographic Information System for the Agricultural Sciences and Technology (AGRIS) Center, Library of Kasetsart University (Thailand) to improve the collection and dissemination of agriculture and forestry related information in Lao and English languages. The database contains information on research results, surveys, training and extension materials, working papers, as well as policy and strategy reports. It was pointed that though there are ICT applications, very less information services are available in local Loa language which is very essential for target audience and emphasizes the need for improving capacities of staff to manage ICT/ICM in agriculture. It concluded that use of web 2.0 technologies seems promising in order to provide efficient information and communications in the near future and stressed the need for access to information for development through individual commitment; open source software and use of global commons.

11. Malaysian Agricultural Research and Development Institute (MARDI), Malaysia

Ms. Faizah Patahol Rahman, Information Resources Division, MARDI

The paper presented that the current status of ICT/ICM is promising in the rural areas with the launch of National Broadband Initiative which consists of two components namely Broadband for General Population (BBGP) and High Speed Broadband (HSBB). BBGP is now being expanded and innovated through new wireless technology such as 3G/HSPA and WiMAX. HSBB is being implemented

in selected areas for economic and business reasons. MyRen – Malaysia Research Network provides high-capacity broadband to universities, colleges, research organizations and scientific laboratories. It aims to provide accessible broadband to the Malaysian researchers to achieve the country's k-economy aspiration. This super highway enables researchers to run data-intensive applications, share computing equipments and run advanced applications within Malaysia as well as overseas. Use of remote sensing technology, GIS and ICT is gaining its popularity. It mentioned that a large number of organization currently involved in data collection and information initiatives related to agriculture that included: MePIS-a database of herbs and medicinal plant; I-Smart – a database of technologies generated by MARDI; Ag-Food-a directory of machines invented by MARDI; and Palm Oil Online Services – a comprehensive online database service on palm oil data, information and knowledge. Use of ICT tool by farmers, extension workers and researchers are very encouraging through portal for advisory services like Tanyalah Doktor (Ask the Doctor). It indicated that application of ICT/ICM is wide in the areas of research management, data management, agricultural libraries, financial management, agricultural extension and outreach activities. Though every organization implements ICT applications, there is still lack of smooth information exchange mechanism such as standard formats for data storage, retrieval and analysis.

The paper flags very important concerns such as low visibility on agriculture information, low synergy among agencies, lack of data governance and negative perception on farming which cause gaps in agricultural information systems. It suggested that APARIS should strengthen the agricultural information professionals through advocacy, capacity building and training. All participating countries should identify and make accessible their information systems or databases which are within the subject scope of APARIS.

12. Myanmar Academy of Agriculture, Forestry, Livestock and Fishery Sciences (MAAFLF), Myanmar

Ms. Daw L. Nang Kha, Research Officer, Data Management Section, Myanmar Seed Bank, Department of Agricultural Research

ICTs are being used to some extent in NARS for research data management, scientific and technical information, research management, agricultural extension and outreach services and agricultural education. The paper indicated that Myanmar Academy of Agriculture, Forestry, Livestock and Fishery Sciences (MAAFLF) organizes annual research conferences, and publishes proceedings and undertakes technology transfer. In collaboration with FAO, the National Information Sharing Mechanism on Global Plan of Action (NISM-GPA) has been initiated to share plant genetic resource information. Myanmar Agriculture Service (MAS) is also participating in knowledge dissemination through radio and TV networks, journals of agri-business news and market information. Department of Agriculture Planning (DAP) and Settlement of Land Record Department (SLRD) are implementing food security information system, regional data exchange project in ASEAN, e-governance, Electronic Document Management System (EDMS), Government Personnel Management System (GPMS), e-commerce and establishing MOAI website (http://www.moai.gov.mm). The Yezin Agricultural University (YAU) applies e-library and network learning for educational purpose. ICT infrastructure in Myanmar is in infant stage; there are several challenges for upscaling application of ICT/ICM in national agricultural research system for the improvement of food security and livelihoods. Myanmar needs appropriate national ICT/ICM policy; ICT infrastructure development for NARS; capacity building; private-public partnership; integration of current development in ICT/ICM into NARS; (two-way information exchange through radio, TV networks, phones, fax, e-mail); investment strategy to establish ICT/ICM in NARS; client oriented agricultural information system (agricultural knowledge banks/knowledge centers). In

order to fulfill the vision of emerging commercial & competitive agriculture through better informed farming system, the roadmap for ICT should consider: Formulating appropriate policy, organizing national seminar workshop for establishing ICT/ICM in NARS, immediate action plans for ICT/ICM development for NARS; developing a roadmap. It suggested that the action plan should include activities such as innovative use of existing radio, TV networks in NARS (Farmers' forum Agri-business talk-show), development study through the establishment of ICT/ICM model villages, providing farmers-centered agricultural consultation services through ICT/ICM and developing investment strategy for ICT/ICM in NARS. It expressed that Myanmar would look forward to have collaborations with APAARI for developing better informed farming community.

13. Nepal Agricultural Research Council (NARC), Nepal

Mr. Manoj Thakur, Senior Scientist, Communication Publication and Documentation Division (CPDD), NARC

The paper explains the role of Communication, Publication and Documentation Division (CPDD) under the Nepal Agricultural Research Council (NARC) in implementing different ICT initiatives in Nepal agricultural research, extension and other services to farmers. It described contributions of CPDD through electronic and mass media (Radio, Television, FM, Community Radio, Print and online media). It also mentioned the library and documentation services rendered by CPDD that include CD-ROM-based literature search service, web-based information services through NARC's website. The Nepal Wireless Networking Project which connects 42 villages in rural Nepal through wireless networking focuses on e-commerce (www.nepalwireless.com.np). The network has been used for Open Learning Exchange (www.olenepal.org), Tele-teaching, Tele-medicine and e-agriculture. The High Level Commission for Information Technology (HLCIT) established 100 Rural Info Centres, which provide agricultural information to farmers for improving crop productivity, information about nutritional status of rural people and environment protection (www.telecentres.org.np). It was underlined that infrastructure, human resources, investment and policy support are some of the challenges for implementing ICT/ICM in NARS in Nepal.

The paper reported that several ICT/ICM activities are planned for future that include production of video programs on successful technologies, establishment of in-country NARC knowledge centers, organization of media field visits at outreach sites, dissemination of project information through web platforms, production of print and electronic materials and strengthening networking system to share and exchange information with the support of regional/international agencies. It was pointed that poor access to ICT by farmers, low investment, lack of updated information and weak linkages cause gaps in agricultural information systems. In order to overcome these problems, training support to NARS, hardware and software support and proper network management are felt necessary. Sharing and exchanging of agricultural databases, success technologies and other information resources are emphasized. It was envisaged that establishment of rural tele-centres, use of Community Radio and production of video clips on success technologies (in local language) and sharing it by translating in regional as well as in international language would help improve information and knowledge services to small holder resource poor farmers in the Asia-Pacific region.

14. National Agricultural Research Institute (NARI), Papua New Guinea

Mr. Seniorl Anzu, Information and Communication Officer, NARI

It presented the background of Papua New Guinea and the importance of agriculture in the country. The national infrastructure in telecommunications by government owned Telikom PNG Ltd, Mobile

Phony (BeMobile, Digicel Ltd.), the PNG (.pg) internet gateway to the world, PNGARNet (PNG Academic and Research Network) Company, Local Televisions (EMTV, NTS) and Radio Broadcasting (public/NBC, commercial, church-owned) found encouraging though the country is characterized by poor infrastructure facilities with unreliable power supply, poor quality of Internet connectivity, poor access to telephone networks and lack of broadband technology. It was reported that few NARS have websites and most of the organizations use internet for communication purposes, involve in development of databases and use print and electronic mass media such as radio and television for extension and outreach activities. Notable initiatives included RAIS – Regional Agricultural Information System for 3 Western Pacific countries – PNG, Vanuatu & Solomon Islands; Research Management Information System (Major NARI projects); Prioritization of Information and Knowledge function under refocused institutional structure by all NARS; NARI Communication Strategy (draft); production of videos on promising agricultural technologies and SMS Mobile project on accessibility of market information for vegetables (FPDA, Digicel, AIGS/AusAID). The constraints for ICT implementation included lack of skilled manpower, poor ICT infrastructure, limited resources for ICTs in most of the NARS etc. It suggested that efforts are needed to improve ICT infrastructure facilities, human resource development, creation of Resource Centres at Provincial, District and Community levels and stressed for a need to organize capacity building program for the benefit of the Pacific countries.

15. Ministry of Agriculture and Fisheries, Samoa

Mr. Misa Konelio, Assistant CEO-Crops, Ministry of Agriculture and Fisheries

In Samoa, the Ministry of Agriculture and Fisheries ensures access to agricultural information by all users, utilizing appropriate approaches and technologies such as farmer trainings, on-farm advisory visits, hard copy publications and mass media, radio, television and newspaper. The internet access is now progressing at a rapid rate in Samoa, with infrastructure and support networks available in the main cities of Apia and Salelologa and their surrounding districts and readily accessible by NGOs, Government Ministries, tertiary institutions and internet cafes. Unfortunately, computer hardware and internet connectivity is not accessible for the vast majority of farmers in Samoa. This is largely due to low financial capability, insufficient personal computer skills or lack of infrastructure. The Ministry of Information, Communication and Technology is working on a project for the implementation of tele-centres in the rural villages. The majority of farmers do have access to mobile phones and television through which agricultural development can be communicated in Samoa. Policy and strategy on the use of ICT/ICM within the Ministry of Agriculture and Fisheries in Samoa is currently in draft form. Computer hardware and software is now accessible by many of the Research, Development and Advisory Officers within the Samoan Ministry of Agriculture and Fisheries although access to the internet and external databases is restricted for some officers only. Mass communication methods such as radio, television, newspaper, DVD documentaries, trainings and on-farm demonstrations are well adapted to agricultural extension in the Samoan culture. These are the main communication methods by MAF for undertaking agricultural development across all stakeholders, in addition to publishing of technical information in the form of pamphlets, manuals and posters. Mobile phones are widely used for general communication, however they are not currently used as a tool for agricultural extension. The Ministry of Agriculture and Fisheries received assistance in ICT/ICM from the ACIAR, SPC, FAO, UNDP etc.

Challenges for the adoption of ICT and ICM in Samoa include need for National Information and Communication System Policy for agricultural development, centralized information centre and partnerships with other organizations. It concluded that Agricultural Information Systems could be improved in Samoa through coordination and linkage with internal and external information sources

and development of personal skills in information systems. Support from APAARI in building capacity of the staff in information and communication management and creation of a Central Database for all NARS and improvement of networking of NARS through APARIS are felt necessary.

16. Sri Lanka Council for Agricultural Research Policy (SLCARP), Sri Lanka

Dr. (Mrs.) P.H.A.P. Chandrakanthi, Senior Scientist, SLCARP

It explained the status of ICT/ICM in the NARS in Sri Lanka and mentioned initiatives such as web-based services, INFORM, CD-ROM based information services and access to online journals, TEEL database and use of web 2.0 technologies in agricultural research. It highlighted the role of ICTs in agricultural extension and marketing through cyber extension. It noted that ICT infrastructure is at medium level in NARS and it needs to be improved along with other aspects such as increasing investment, capacity building and networking of institutions. It recognizes that Mahinda Chinthana Policy promotes ICT use in Agriculture Development and stressed need for favourable policies related to Internet/Cellular Telephone/Radio/TV that support rural and agricultural development in Sri Lanka. It was opined that lack of awareness on ICTs, language barriers, low capacities to manage ICT/ICM, lack of coordination and the issue of sustainability of ICT projects form major challenges. It was suggested that APAARI may assist in development of suitable databases for NARS, undertake training on new ICT tools and help introduce common policies/strategies and share good practices to foster ICT/ICM for AR4D in the region.

17. Department of Agriculture, Thailand

Dr. Isiwat Bandrapiwat, Head of Agricultural Information Group, Department of Agriculture

The rapid developments in broadband services and mobile phone usage are driving the development of technology infrastructure in Thailand. Advances such as Internet Protocol version 6 (IPv6), grid computing, broadband wireless, Web 2.0 and Web services, 3G mobile services, WiMAX and digital broadcasting are rapidly gaining importance. The Thai Government recognizes that ICT has an important role to play in the enhancement of economic productivity, as well as in the transformation of Thai society into a knowledge-based society. Thailand's second ICT Master Plan (for 2009-2013) is currently being drafted. There are various organizations in Thailand responsible for agricultural research and development such as Department of Agriculture (DOA), Department of Agricultural Extension (DOAE), Rice Department, The Queen Sirikit Department of Sericulture, Department of Livestock and Department of Fisheries. Farm advisory and extension services through use of ICT are implemented to improve the present Research-Extension-Farmer linkages. It noted that the Thailand e-Government Interoperability Framework (TH e-GIF) developed by MICT/Thailand defines the technical policies and specifications governing information flows across governments. As an apex agricultural research body, DOA uses ICT/ICM for development of DOA Refbase, Agriculture Technical Database, Agricultural Library, Information and Documentation Services through Libnet, marketing information services through www.thethaifruit.com and use of Web 2.0/social networking tools and technologies for dissemination of agricultural information. It was suggested that APARIS may assist in setting the standard of agricultural research information interchange at the regional level and motivate National Agricultural Information Systems (NAIS) to use the standard. APAARI should also undertake advocacy on ICT/ICM use in agricultural research and development, use of social media to enhance communication among NAIS and provide guidance on information security, ethics etc.

18. The Vietnam Academy of Agricultural Sciences (VAAS), Vietnam

Dr. Nguyen Van Van, Director, Department of Information and Communication

It explained the salient feature of agriculture in the 7 agro-ecological zones with details of agricultural situations in Vietnam. It gave a glimpse of agricultural research systems in the country under the Ministry of Agriculture and Rural Development. Information and Communication Technology Program promises good opportunity for the development of ICT application in agricultural research systems. There are many ICT projects funded by Ministry of Agriculture and Rural Development. These projects support computer for farmers in villages, training farmers on use of computers. ICTs such as radio, television, electronic & mass media and web-based technologies are widely used in order to transfer advanced technologies from research findings into agricultural production through ICT in Vietnam. Vietnam Television regularly broadcast guidelines and policies of the State for agricultural development through "Rural Today" and "Friends of Farmers" programs on VTV1 on weekly basis and dissemination of technological knowledge on VTV2 on daily basis. Radio the Voice of Vietnam (VoV) broadcast agricultural information daily to the remote areas where there is no electricity and no television.

Currently there are 63 websites for agriculture for 63 Provinces in Vietnam. Websites of Ministry of Agriculture and Rural Development (www.agroviet.gov.vn); Vietnam Academy of Agricultural Sciences-VAAS (www.vaas.org.vn); Department of Cultivation (www.cuctrongtrot.gov.vn); Plant Protection Department (www.ppd.gov.vn); Department of Cooperatives and Rural Development (www.dcrd.gov.vn); Vietnam Agriculture Newspaper (www.nongnghiep.vn); National Agriculture Extension Center - NAEC (www.khuyennongvn.gov.vn) are popular sources of information. The Linking Extension and Research Needs through Information Technology (LEARN-IT) supported by the Asia Development Bank through International Rice Research Institute (IRRI) aimed to enrich the knowledge for rice farmers in Vietnamese language. It provides rice farmers with overall-knowledge on rice cultivation techniques and production. VAAS also created Vietnam-Maize-Knowledge Bank aimed to improve production efficiency of corn, which is a second important food crop after rice in Vietnam. It recommends that there is a need to establish regional network to support and share experiences between countries; human resources development and training skills needed in ICT/ICM, setting up small projects to assist member countries to build community information club models with farmers' groups and training farmers on how to use computers and internet for agricultural production.

Session III: Opportunities and Innovations in ICT-enabled Knowledge Management in AR4D

Chair: *Ms. Faizah Patahol Rahman, Malaysian Agricultural Research and Development Institute (MARDI)*

Co-Chair: *Ms. Valeria Pesce, Information Management Specialist, Global Forum on Agricultural Research (GFAR)*

It provided opportunity to share important initiatives/experiences/case studies by Kasetsart University on Agricultural Institutional Knowledge Repositories: Experiences of AGRIS DSpace and AGROVOC Plug-in for AGRIS Dspace; Role of Agricultural Libraries in Agricultural Research for Development in India by IARI, Production Planning and Protecting Ecosystems using Remote Sensing and GIS by AIT; and *e*-Agriculture by the FAO RAP.

1. Development of Agricultural Institutional Knowledge Repositories: Experiences of AGRIS Dspace and AGROVOC Plug-in for AGRIS Dspace by the Kasetsart University

Dr. Aree Thunkijjanukij, Director & Ms. Thiranan Damrongsorn, Assistant Director,
Kasetsart University, Main Library and Thai AGRIS Centre, Bangkok, Thailand

The presentation dealt with development of Thai National Research Repository with the collaboration of 31 Research Organization with special mention to Thai Agricultural Information Network (Thai AgNet). The case study on Kasetsart University Agricultural Knowledge Repositories and AGRIS Dspace were shared through demonstration. Details of future works on Thai Agricultural Ontology with AGRIS Dspace were also explained. A presentation on AGROVOC Plug-in for AGRIS Dspace was also made. AGRIS Dspace is the customized Dspace for the agricultural community in order to use the AGRIS AP profiles for metadata and the AGROVOC thesaurus to control the subject keywords. The presentation included demonstration on how to manage keyword in data entry process and expand search in searching process by using Dspace AGROVOC Plug-in.

2. Role of Agricultural Libraries in Agricultural Research for Development in India: Experiences of IARI Library

Dr. Usha K. Khemchandani, Head, Library Services, Indian Agricultural Research Institute (IARI) Library, New Delhi, India

The presentation shared experiences of developments in the Indian Agricultural Research Institute (IARI) Library which is a *de facto* National Agricultural Library in India. It described infrastructure, information and documentation services of the IARI Library and explained its role in agricultural research in the country. The important services that included Access to ETD (Electronic Theses & Dissertation) in Agricultural Libraries, CD-ROM Databases, Online Journals (Full Text), bibliography of articles on Indian Agriculture, Bibliography of IARI theses etc. The presentation highlighted the involvement of IARI Library in several project initiatives such as AGRIS project, digitization of rare books/publications under C-DAC project, automation and networking of agricultural libraries, networking of 42 major libraries of ICAR Institutes and SAUs under the NATP, Consortium for e-Resources in Agriculture (CeRA) Project, Krishi Prabha Project, AgroWeb, E-Granth Project etc.

3. Sustainable Production Planning and Protecting Ecosystems using Remote Sensing and GIS

Dr. Md. Zakir Hossain, Head, Agriculture, Resources & Environment Unit, AIT Extension,
Asian Institute of Technology, Bangkok, Thailand

The presentation explained the scope of Remote Sensing and GIS through case studies and shared the application of advances in remote sensing and satellite imagery with special reference to cloud seeding and artificial rain making and spatial resolution technologies, real time GIS etc. As part of case studies, the failure in production planning, land use changes in upper gulf of Thailand, shrimp farming development in Pak Phanang, Thailand, results of the study of shrimp farming in Kandaleru Creek area, Andhra Pradesh, India etc., were shared. It discussed in details about the advancements in RS and GIS open source software applications in the areas of zoning, warning and monitoring and finally suggested to have an Asia-Pacific Agricultural Geographic Information Systems to foster use and application of RS and GIS for AR4D in the region.

4. *e*-Agriculture

Mr. Gerard Sylvester, Knowledge & Information Management Officer, FAO RAP

The *e*-Agriculture–international initiative that aims to reinforce the value of global dialogue and cooperation to address emerging issues around the role of ICT as an instrument of sustainable agricultural and rural development. The *e*-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use ICTs in the rural domain, with a primary focus on agriculture. The e-Agriculture Community of Practice (CoP) is active on three levels: Virtually using a web-based platform (www.e-agriculture.org), Face-to-face meetings and events and In-country interventions through partners. It has over 7,000 members, from more than 150 countries consisting of policy makers, rural service providers, development practitioners, farmers, NGO and CSO staff, researchers, information and communication specialists in agriculture and rural development. The CoP members interact with each other and contribute a range of resources in the form of case studies, good practices and lessons learned, documents, publications, links, learning resources, news and events. The topics of Online Discussion Forums included the role of public private partnerships in *e*-Agriculture in Asia, mobile telephony in rural areas, role of ICTs in agricultural value chains, gender and rural livelihoods.

5. Presentation on APAARI Communication Strategy and Proposed APARIS Work Plan

Dr. Attaluri S., APARIS Coordinator, APAARI

The APAARI Communication Strategy emphasises a strategic and systematic approach to communicate with all the stakeholders and audiences with an aim to increase the impact of APAARI's programs through greater involvement of all stakeholders in the whole research process, improved knowledge management, and more effective communication. It explained the vision, objectives, SWOT analysis, principles, stakeholder analysis, information needs, information channels, evaluation methods and the work plan. Participants were asked to review the Communication Strategy to make suggestions in the open discussion on day 3.

Session IV: Putting CIARD principles into practice in the Asia-Pacific Region

Chair: *Dr. Ajit Maru, Senior Knowledge Officer, GFAR Secretariat*
Co-Chair: *Dr. Johannes Keizer, Information Systems Officer, Knowledge and Capacity for Development, Office of Knowledge, Exchange, Research and Extension, FAO*

Under the theme, a detailed presentation was made on the CIARD Checklist and the Pathways and CIARD RING Platform. During the discussion, questions on the CIARD initiatives, its benefits and membership were clarified.

1. CIARD into practice: the Checklist and the Pathways. Illustration of some of the Pathways

Dr. Johannes Keizer, FAO and Ms. Valeria Pesce, GFAR

The presentation attempted to explain the vision and mandate of CIARD initiatives in detail with demonstration of checklist and sharing of some of the pathways. It clarified many questions from the participants on the CIARD initiative, benefits, mechanism and its relevance to agricultural information dissemination.

2. The CIARD RING Platform

Ms. Valeria Pesce, Information Management Specialist, GFAR

A presentation was made on CIARD RING platform followed by a demonstration on the CIARD RING website. It demonstrated on how to register services by the National Agricultural Institutions. Issues regarding participation of NAIS, institutional preparedness, and the nature of information services to be submitted in the CIARD RING platform were discussed. Queries of participants on the functioning and mechanism of CIARD RING platform, information standards, interoperable services, management of information resources for greater coherence and sharing were clarified during the question and answer session.

Session V: Strengthening Agricultural Information Systems in the Asia-Pacific Region

Chair: *Dr. Raj Paroda, Executive Secretary, APAARI*
Co-Chair: *Dr. Ajit Maru, Senior Knowledge Officer, GFAR Secretariat*

Dr. Raj Paroda initiated open discussion and briefed that APAARI through its APARIS program has been instrumental in sharing and exchanging agricultural information and promoting use of ICT/ ICMs for AR4D in the region with the involvement of NARS and their representative NINPs. It was assured that APAARI would continue to assist the NARS in the region in strengthening agricultural information systems through providing need-based capacity building programs, exchange of expertise, technical assistance and networking of information and knowledge resources. He then invited all the participants to critically review and endorse the APAARI Communication Strategy and provide suggestions for its implementation. They were also asked to suggest mechanisms and strategies to strengthen APARIS activities and implement CIARD in the region for strengthening Agricultural Information Systems in the Asia-Pacific.

1. Discussion on APAARI Communication Strategy

This session opened up discussion on APAARI Communication Strategy. Opportunity was given to every participant to critically comment and suggest opinion on the APAARI Communication Strategy. While appreciating the draft strategy, participants and the resource persons made the following suggestions:

- A step-by-step approach may be followed to implement the APAARI Communication Strategy;
- Prioritization of activities depending on the relevance and availability of resources may be necessary;
- Categorization of stakeholders into primary, secondary and others is useful to target the information and communication services;
- Integration of communication activities with the initiatives like CIARD is felt necessary; and
- Involvement of National Agricultural Information Systems is essential for implementing the Communication Strategy.

Finally, with the above suggestions, participants have unanimously endorsed the APAARI Communication Strategy and expressed willingness to cooperate for its implementation.

2. Discussion on Strengthening Agricultural Information Systems in the Asia-Pacific Region

All the participants very actively participated in the open discussion and made constructive suggestions for improving Agricultural Information Systems in the Asia-Pacific through strengthening APARIS activities. The suggestions were shared in the plenary session as workshop recommendations.

Session VI: Plenary Session

Chair: *Dr. Simon Hearn, Principal Adviser, ACIAR*
Co-Chair: *Dr. Ajit Maru, Senior Knowledge Officer, GFAR Secretariat*

It provided opportunity to all the participants to air their opinions and suggest recommendations on the ICT/ICM in AR4D. The workshop recommendations are as follows:

I. Recommendations

1. Implementation of ICT/ICM for AR4D

- It was highlighted that the needs of small-holder resource poor farmers should be given high priority while implementing the ICT/ICM in AR4D.
- Famers' information needs vary depending on place and situation. They appear similar but different (same, same but different). Needs of farmers should be taken into consideration while implementing the ICT/ICM initiatives.
- Emphasis should be given on creation of value added information services that cater the information needs of the farmers, researchers, extension workers and other stakeholders.

2. Strengthening APARIS

- It was felt necessary that APAARI may explore possibilities to sign Memorandum of Understanding (MoUs) with other organizations at regional, sub-regional and national levels for greater collaboration to strengthen APARIS activities in the region. The SAARC Agriculture Centre showed interest to sign an MoU with APAARI.
- It was agreed that national agricultural research systems may share good practices and success stories on agricultural innovations.
- It was agreed that APAARI Newsletter is an important channel of communication for dissemination of latest information and all the national agricultural research systems should contribute to it on regular basis to share information about their activities.
- It was pointed that access to readily available agricultural information resources in the region is not adequate. APARIS may establish access/linkages to freely available information resources, open databases and online publications to improve access and use of agricultural information in the region.
- It was felt necessary to assess the agricultural information services at the national level to improve the effectiveness and plan for relevant information and communication services in agriculture. APAARI may provide its experiences and guide in assessment of information services at the national level.

- It was suggested that creation of information gateway is necessary to locate and access available agricultural information resources in the region. APAARI may involve in creation of such gateway and databases that improve access to agricultural research information services, websites, databases and documents related to agricultural research policy and projects.

3. Capacity Building

- It was emphasized that collaboration in advocacy and capacity building at the sub-regional and national levels is very crucial for improving use of ICT/ICM in agricultural research for development. APAARI should be involved in advocacy and capacity building of NARS leaders and ICT managers in the region. The participants from the Pacific countries strongly expressed the need for such capacity building and orientation programs to improve use of ICTs in the Pacific sub-region.
- It was felt important to strengthen the capacity of information managers at the national level on new ICT/ICM tools and techniques. It was also felt important to provide technical support to national level agricultural research information systems for better management of ICT/ICM for AR4D. It was suggested that APAARI may undertake programs that improve capacities of information managers, agricultural librarians and documentation specialists in the region.

4. CIARD Implementation in the Asia-Pacific region

- It was agreed that CIARD initiative would integrate all the existing information services and systems which in turn help improve access to and use of agricultural information in the region. It was suggested that APAARI through its APARIS program may facilitate the process of CIARD in the region led by FAO and GFAR.

II. Concluding Remarks and Valedictory Program

Dr. Simon Hearn, Dr. Raj Paroda, Dr. Ajit Maru, Dr. Malcolm Hazelman and Dr. Fazle Karim made concluding remarks. Dr. Raj Paroda thanked all the NARS leaders who showed keen interest in the workshop and nominated the participants. He appreciated the cooperation and support of partners FAO, GFAR and AIT in conducting the workshop. He kept on record the kind cooperation of Prof. Said Irandoust, President of Asian Institute of Technology and commended the efforts of all resource persons from FAO, GFAR, AIT and Kasetsart University and the excellent support provided by the Faculty and staff of AIT Extension and APAARI. At the end, during the valedictory program certificates were distributed to all the participants.

AgriDrupal Technical Workshop

(16-17 September, 2010)

A Technical Workshop on AgriDrupal was organized on 16 and 17 September, 2010 jointly by GFAR, FAO and APAARI under the CIARD umbrella for the interested participants who opted to attend the workshop. Participants were exposed to technical aspects on the website management by using AgriDrupal Content Management System (CMS), overview of AgriDrupal, its tools & features. Hands-on training sessions on AgriDrupal installation, content design and customization etc., were

conducted. Ms. Valeria Pesce, Information Management Specialist, Global Forum on Agricultural Research (GFAR) provided expert inputs and acted as resource person for the workshop.

Outcomes

1. Orientation on potential opportunities of new ICT/ICM for AR4D

Participants were oriented to immense opportunities of new ICT/ICM for AR4D through sharing of experiences at the national, sub-regional, regional and global levels by different resource persons. Presentations on use and application of ICT/ICM for AR4D in the areas of agricultural research, extension, marketing, farm mechanization, CIARD initiative, need for CIARD RING to integrate information services and systems, remote sensing and GIS, web-based information services, *e*-Agriculture, institutional knowledge repositories, AGROVOC, open source software tools such as DSpace and library and information services provided opportunity to participants to know the latest developments in the area of ICT/ICM for AR4D.

2. Orientation on CIARD initiative and CIARD RING membership

Participants were oriented to the Coherence in Information for Agricultural Research for Development (CIARD) initiative thoroughly through presentation on CIARD vision, checklist and pathways. A presentation on the CIARD Roadmap to Information Nodes and Gateways (CIARD RING) and its functions, membership registration and other issues made participants to understand and equip themselves to participate and submit their services in the CIARD RING. Several doubts of participants on CIARD and CIARD RING were clarified during open discussion, which helped them to understand the relevance and use of CIARD initiative towards making the public domain agricultural research information and knowledge truly accessible to all.

3. Strengthening APARIS

a. Endorsement of APAARI Communication Strategy

APAARI Communication Strategy, which is aimed to improve and strengthen the APARIS activities, was presented and the comments of participants and resource persons were sought. All participants provided valuable suggestions and endorsed the APAARI Communication Strategy in principle for its implementation.

b. Status of ICT/ICM in AR4D in the Asia-Pacific region

Besides country presentations on the status of ICT/ICM in AR4D in the region, data on important indicators of the ICT/ICM in AR4D were collected from the participants who represent the NAIS. With the help of this data and country papers, the status report on ICT/ICM in AR4D in the Asia-Pacific will be updated and the same will be published by APAARI.

4. Publicity and other outreach activities

APAARI, FAO, GFAR, some of the NARS and AIT have displayed and distributed their publications among participants. APAARI displayed its posters/banners indicating the activities of APARIS, its major achievement, information on capacity building programs and distributes more than 30 success

stories, ICT status reports, and APAARI on CD-2010. FAO distributed iMARC Modules on CDs and brochures on *e*-Agriculture, AGROVOC concept server etc. GFAR distributed informative brochures on CIARD and CIARD RING among all the participants. Participants from the NARS also displayed and distributed their publications and brochures on information projects/services.

Presentations by the resource persons, country papers presented by participants and the photographs were distributed to all on CD at the end of the workshop.

Annexure I

Program

Day 1: Tuesday, 14 September, 2010

08:30-09:30	Registration	
	Inaugural Session	
	Chairperson: Dr. Simon Hearn	
	Co-Chair: Dr. Ajit Maru	
09:30-09:37	Welcome Address	Dr. Raj Paroda, Executive Secretary, APAARI
09:37-09:45	General Remarks	Dr. Malcolm Hazelman, FAO RAP
09:45-09:55	General Remarks	Dr. Ajit Maru, GFAR
09:55-10:10	Special Address	Prof. Sudip K. Rakshit, Vice President for Research, AIT-Guest of Honour
10:10-10:25	Inaugural Address	Mr. Hiroyuki Konuma, ADG and RR for AP, FAO RAP-Chief Guest
10:25-10:40	Chairman's Concluding Remarks	Dr. Simon Hearn, Chair, APARIS Steering Committee
10:40-10:45	Vote of Thanks	Dr. Attaluri S.
10:45-11:15	Coffee break and group photograph	

	Session I: Regional and Global Initiatives in ICT/ICM in AR4D	
	Chair: Dr. Raj Paroda, APAARI	
	Co-Chair: Dr. Bhartendu Mishra, NARC	
	Rapporteur: Mr. Seniorl Anzu, NARI, PNG	
11:15-11:40	Status Report on APARIS	Dr. Attaluri S., APARIS Coordinator, APAARI
11:40-12:10	Global ICM4ARD Agenda	Dr. Ajit Maru, GFAR
12:10-12:30	Experiences of ACIAR's Information and Communication Systems	Dr. Simon Hearn, ACIAR

12:30-13:00	General Discussion	
13:00-14:00	Lunch	

	Session II: Status of ICT/ICM in AR4D in the Asia-Pacific Region – Country Reports	
	Chair: Dr. Malcolm Hazelman, FAO RAP	
	Co-Chair: Dr. Fazle Karim, AIT	
	Rapporteur: Dr. Attaluri S., APAARI	
14:00-16:15	Sub-regional report from SAARC Agriculture Centre & Country Reports of: Bangladesh, Bhutan, Cambodia, Chinese Taipei, Fiji, India, Indonesia and Japan Followed by discussion for each country presentation for 5 minutes	About 10 minutes presentation by each country representative (based on the guidelines circulated to participants)
16:15-16:35	Coffee break	
16:35-18:35	Country Reports of: Lao PDR, Malaysia, Myanmar, Nepal, PNG, Samoa, Sri Lanka, Thailand and Vietnam	
19.00-	Reception Dinner by APAARI	

Day 2: Wednesday, 15 September, 2010

	Session III: Opportunities and Innovations in ICT-enabled Knowledge Management in AR4D	
	Chair: Ms. Faizah Patahol Rahman, MARDI	
	Co-Chair: Ms. Valeria Pesce, GFAR	
	Rapporteur: Mr. Rafique Mustafa Kamal, BARC	
09:00-09:45	Development of Agricultural Institutional Knowledge Repositories: Experiences of AGRIS DSpace by the Kasetsart University and AGROVOC Plug-in for AGRIS DSpace	Dr. Aree Thunkijjanukij, Director Ms. Thiranan Damrongsorn, Assistant Director Main Library and Thai AGRIS Centre, Kasetsart University
09:45-10:15	Role of Agricultural Libraries in Agricultural Research for Development in India: Experiences of IARI Library	Dr. Usha K. Khemchandani, IARI Library, New Delhi, India

10:15-10:45	Coffee break	
10:45-11:15	Sustainable Production Planning and Protecting Ecosystems using Remote Sensing and GIS	Dr. Zakir, AIT-Extension
11:15-11:45	*e*-Agriculture	Mr. Gerard Sylvester, FAO RAP
11:45-12:30	Presentation on AP AARI Communication Strategy and Proposed AP ARIS Work Plan	Dr. Attaluri S., APAARI
12:30-13:30	Lunch	

	Session IV: Putting CIARD principles into practice in the Asia-Pacific region	
	Chair: Dr. Ajit Maru, GFAR	
	Co-Chair: Dr. Johannes Keizer, FAO	
	Rapporteur: Mr. Gerard Sylvester, FAO RAP	
13:30-14:00	CIARD into practice: the Checklist and the Pathways. Illustration of some of the Pathways	Dr. Johannes Keizer, FAO and Ms. Valeria Pesce, GFAR
14:00-14:30	The CIARD RING platform	Ms. Valeria Pesce, GFAR
14:30-16:00	Service interoperability and the RING: a) How services interoperate: standards and their integration in the RING b) How services interoperate: examples (Agris, AgriFeeds, AgLR harvester...) c) How to build interoperable services: the importance of tools	Dr. Johannes Keizer, FAO and Ms. Valeria Pesce, GFAR
16:00-16:20	Coffee break	
16:20-18:00	Practical and Institutional issues for NAIS participating in CIARD: a) Becoming a partner b) Registering a service and becoming a partner c) How to register services in the RING; Demonstration of the registration	Ms. Valeria Pesce, GFAR

Day 3: Thursday, 16 September, 2010

	Session V: Strengthening Agricultural Information Systems in the Asia-Pacific Region	
	Chair: Dr. Raj Paroda, APAARI	
	Co-Chair: Dr. Ajit Maru, GFAR	
	Rapporteur: Mr. Rafique Mustafa Kamal, BARC	
09:00-11:30	**Discussion on how to strengthen APARIS** a) Discussion on APAARI Communication Strategy: Suggestions and Endorsement b) Mechanisms and strategies to strengthen APARIS activities in the region c) Pathways and the RING for NAIS in the AP region: Benefits for NAIS: Good practices (Pathways and RING) that can be easily replicated, with focus on how to replicate them; what is missing for the NAIS and What else would the NAIS expect? d) The RING for NAIS in the AP region: Current status of AP services in the RING; next steps; special needs; Challenge for NAIS: How to build interoperable services. How new tools and technologies can be adopted at the national level in the Asia-Pacific region.	Dr. Attaluri S., APAARI and Ms. Valeria Pesce, GFAR
11.30-12:00	Coffee break	
12:00-13:00	**Session VI: Plenary Session**	
	Chairman: Dr. Simon Hearn, ACIAR	
	Workshop Recommendations	Dr. Attaluri S.
	Concluding Remarks and Valedictory Program	Dr. Malcolm Hazelman Dr. Ajit Maru Dr. Fazle Karim, AIT Dr. Raj Paroda
	Chairman's Concluding Remarks	Dr. Simon Hearn
	Vote of Thanks	
13:00-14:00	Lunch	
14:30-17:30	APARIS Steering Committee Meeting	For the APARIS Steering Committee Members only

AgriDrupal Technical Workshop

Organized by the Asia Pacific Association of Agricultural Research Institutions (APAARI)
with support from the Global Forum on Agricultural Research (GFAR)
and the Food and Agriculture Organization of the United Nations (FAO)
under the CIARD umbrella

Program

Day 1: Thursday, 16 September, 2010

14:30-16:00	**Introduction to Content Management Systems (CMS) and Drupal** Introduction to CMSs. Content management vs. website management. • Integrated content management: managing web pages, news, events, documents, multimedia, Institutions, experts... • Semantic organization and navigation: menus, categories, search/browse • Integration of standards in CMSs Extensible content management: introduction to Drupal • The Drupal model: content types, taxonomies and views • Extending content types: defining metadata models to manage whatever you like • Exposing metadata in different formats: Views and Content templates Drupal and RDF support
16:00-16:15	Coffee break
16:15-17:30	**AgriDrupal overview** 1. AgriDrupal as a community and as a suite of solution for agricultural information management 2. AgriDrupal pre-configured installations for agricultural information management and dissemination 3. Overview of the "reference" AgriDrupal installation: • Document repository functionalities: overview of pre-defined content types, taxonomies and views; Agrovoc integration; Agris AP export; OAI-PMH compliance • Management of Experts and Institutions: content types and views • Management of news and events • Community functionalities: overview of forum/blog/wiki management, email notifications, member profiles, newsletter management • Integration of feeds; Production of feeds

Day 2: Friday, 17 September, 2010

09:00-10:00	**AgriDrupal: hands-on training session** • Basics: Installation and configuration. • Overview of "content editor" functionalities: change logo, name, menu items; create/edit content, edit taxonomies • Users and permissions • System: modules and upgrades
10:00-10:15	Coffee break
10:15-12:00	**Content design and content display** 1. Analyze and customize existing pre-configured content types a. Special fields: node reference, content taxonomy, select box with allowed values and PHP code b. Create a new content type (e.g. Project) 2. Analyze and customize existing pre-configured views a. Special views: calendars, maps, RSS feeds
12:00-13:00	**Look and feel** • Drupal themes, AgriDrupal theme, theme customization • Regions and blocks

Annexure II

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