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Theme: Forging partnerships between libraries and extension services for improved access to agricultural information

Digital Library for Indian Farmers (DLIF) using open source software: A strategic planning

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Abstract:
This paper highlights the role of Indian Council of Agricultural Research as an apex body in coordinating agricultural research, education, and technology transfer in India. Stresses the importance of information communication technology in advancing agricultural production. Reviews the existing infrastructure, information dissemination activities of extension workers and various agencies in disseminating agricultural information using ICT. Discuses the model of Digital Library for Indian Farmers (DLIF) using open source software. Advocates the full text digitization of useful literature for farmers in multilingual, on-line publication of text, audio & video document for farmers. Says that the proposed DLIF will be a gateway to farmers for providing links to useful websites and extension literature.

1. INTRODUCTION: Agriculture and allied sector of India contribute nearly 25% of Gross Domestic Product (GDP) and about 70% populations of the country dependent on agriculture for their livelihood. India is an agriculture-based country with 329 million hectares of land area of which 143 million hectares is cultivated. India's population is 1027 million (531.3 million male and 495.7 million female) as in March 2001. There are about 103 million farm families spread over 127 agro-climatic zones of the country with a variety of crop and animal production system. India is a Union of 29 States or Province and 6 Union Territories. There are about 6, 00,000 villages in India. Officially 18 languages are used in the country. The literacy rate in the country is 65.38 %. Radio, television and telephone are important Information Communication channels. Use of computers and Internet is increasing

day by day in rural India with the help of various ICT projects. Presently India has about 6.13 million Internet subscribers. Now BSNL (Bharat Sanchar Nigam Limited) is providing broad-band connection on cheaper rate for home use of Internet in India.

The ICT projects run by Public organizations, Private organizations and NGOs in India are focus on agriculture and rural development. There is lack of digital content in agriculture for providing information services to the rural users through ICT. The paper discusses the Indian agriculture research system and methods used for providing agriculture information to the farmers through agriculture extension system. The paper discusses the ICT initiatives for rural development, Information need of Indian farmers, and plan for development of digital library using open source software.

2. AGRICULTURE RESEARCH & DEVELOPMENT IN INDIA: Constitutionally agriculture is a State subject in India. Ministry of Agriculture, Government of India, through its Department of Agriculture and Cooperation (DAC), Department of Agricultural Research & Education (DARE) coordinates agricultural research and development. The DARE looks after agricultural research and education whereas DAC looks after extension. Indian National Agricultural Research System (NARS) is one of three largest R&D networks in the world. Established in 1929, Indian Council of Agricultural Research (ICAR) is the apex body of NARS, which plans, conducts and promotes research, education, training and transfer of technology for advancement of agriculture and allied science. India's first agriculture university (now "G.B. Pant University of Agriculture & Technology") was established at Pantnagar in the year 1960. Presently in the NARS about 30,000 Scientists/teachers are working in 47 Central Institutes (CIs), 5 National Bureaux (NBs), 12 Project Directorates (PDs), 31 National Research Centers (NRCs), 91 All India Coordinated Research Projects (AlCRPs), 440 Krishi Vigyan Kendras (KVKs, i.e. Farm Science Centers), 120 Zonal Agricultural Research Stations (ZRs), 10 Trainers Training Centers (TTCs), 44 Agriculture Technology Information Centres (ATIC), numerous regional research centers, 38 State Agricultural Universities (SAUs), 5 Deemed to be Universities (DUs) and 1 Central Agricultural University.

The Ministry of Rural Development is the apex body at the national level with the mandate to formulate policies and design & implement a number of programs that are aimed at bringing about a sustainable development in rural areas. The Ministry of Rural Development works through its three Departments i.e. Department of Rural Development, Department of Land Resources and Department of Drinking Water Supply.

3 TRENDS IN AGRICULTURAL EXTENSION IN INDIA

The use of information technology and electronic mass media is high priority channel for agriculture extension and dissemination of information to the farming community. Under World Bank funded project i.e. National Agriculture Technology Project (NATP), Innovations in Technology Dissemination (ITD) was started in 1998. The project is currently operational in 28 districts of seven states (four districts in each) namely – Andhra Pradesh, Bihar, Himachal Pradesh, Jharkhand, Maharashtra, Orissa and Punjab. The project focuses on restructuring public extension services and testing new institutional arrangements for technology transfer. Under the project Agriculture Technology Management Agency (ATMA) has been set-up in each of the 28 project districts of seven States. ATMA is a registered society of key stakeholders involved in agricultural activities for sustainable development in the district by integrating research-extension activities and decentralizing day to day of Public Agricultural Technology Dissemination System. All the research, training,

development and extension activities run by public, private and other organizations in the district are integrated under ATMA. A State Agriculture Management and Extension Training Institute (SAMETI) is also supported to meet training and capacity building requirement under the Project. The National Institute of Agriculture Extension Management (MANAGE) provides training and capacity building to the Project. The model of ATMA is now being implemented in 252 district of the country. There is intensive use of information technology and media back up. All the research, training, development and extension activities run by public, private and other organizations in the district are integrated under ATMA. Presently agricultural extension activity in India is being carried out through:

3.1 Public (Government) Extension:

- Department of Agriculture and Cooperation of the Union Ministry of Agriculture and their counter parts in State Departments of Agriculture, Horticulture, Animal Husbandry, Fishery, Forestry, Livestock Development and other line departments for the development of agriculture and allied activities for the welfare of rural people (States currently employ more than 110,000 extension staff of whom around 20 percent are graduates).
- 38 SAU based Directorates of Extension, 440 KVK (i.e. Farm Science Centers) and 44 ATIC of ICAR and SAU (Soon KVK will be established in every district of the country).
- Extension division of ICAR Institutes, 120 Zonal Research Stations and Institute Village Linkage Programs (IVLP).
- ATMA (restructured extension system) and ATIC
- Strengthening of Research-Extension-Farmer Linkage
- Encouraging Public-Private-Partnership
- Women Specific Interventions - Training of Women in Agriculture in various States

3.2 Private Extension:

- Establishment of Agri-clinics and agribusinesses by agriculture graduates.
- The Kisan (farmer) Call Centers have been started with a view to provide information on demand to the farming community in the country. A countrywide common toll-free telephone number 1551 has been allocated to these centers. Agriculture graduates manage Kisan Call Centres.
- Non-Governmental Organizations (NGOs) and Farmer's Organizations (FOs)
- Input suppliers/dealers (pesticides, seeds, nutrients, farm implements, etc.)
- Corporate sector, farm implements etc.
- Link farmers etc

3.3 Mass media for Information Support:

- Programs on Radio, television, private cable channels etc.
- Development/publication of extension literature (bulletins, magazines, journals etc) on current agriculture practices by NARS staff (scientist/teaches/extension experts) in regional languages or English and its distribution among farmers and extension workers.
- Use of Print Media in Technology Transfer - regular columns on current agriculture practices in regional languages in the local print media
- Production and Procurement of Audio-Video Films / Spots - on various themes of agriculture and allied subjects.

- A Scheme was launched on 21st January 2004 to utilize existing infrastructure of Doordarshan (National Channel of television), All India Radio and Indira Gandhi National Open University to provide information to the farming community.
- State/Regional/National/International Fairs/ Exhibitions and Awards

3.4 Information Communication Technology (Public + Private):

- Electronic connectivity through computers, NICNET, internet, V-SAT, etc
- Websites of NARS Institutes
- ICT initiatives by State Government programs (i.e. Gyandoot, Bhoomi, etc)
- ICT initiatives by Private sector in rural areas (i.e. E-Choupal, n-Logue, etc)

4. ICT INITIATIVES FOR AGRICULTURE AND RURAL DEVELOPMENT

Under NATP, ICT infrastructure is created in NARS by ARIS in order to bring information management culture. More than 400 ARIS cells have been created in NARS. These cells and their campuses house PC (Personal Computer) workstations, servers, UPS (Uninterrupted Power Supply) and all major network equipment such as switches, hubs, routers, network management, LAN cabling, Internet etc. The basis infrastructure required for linking all ICAR Institutes and SAUs has already been created. These cells are expected to promote the use of information technology in agricultural research, education and extension all over the India. Libraries of NARS are improved with ICT (Hardware, Software, LAN, Internet, Digitization, On-line/Off-line resources etc), under the Library Improvement and Networking of NATP. ICT has been implemented for agriculture extension activity under ATMA.

Under NATP, e-Extension by connecting 200 selected KVKs and 8 Zonal Coordinating Units (ZCUs) through an Intranet and Internet has been taken-up by ICAR to strengthen these selected KVKs to enable them to deliver extension services through Internet. These KVKs will be developed as Information hubs. Village information kiosk is supposed to be an Internet connecting node with minimum facilities to link to Internet and provide access to information sources. These kiosks may run on paid basis like STD/ISD telephone booths. Some of the states viz., Andhra Pradesh, Maharashtra, Karnataka, Madhya Pradesh, Kerala, Tamil Nadu etc. have already established such kiosks which are growing at fast pace. Use of ICT for rural development and transfer of agriculture technology has been done by Government and private organizations (including NGOs). The Ministry of Communication and Information Technology of the Government of India and the Telecom Regulatory Authority of India (TRAI), as well several state governments, have already developed strategies for accelerating the growth of the Internet and broadband connectivity in rural India. Bharat Sanchar Nigam Limited (BSNL) has laid fiber cables capable of reaching nearly 70 per cent of villages.

Government of India and State Governments have been working in various e-Governance projects in India. Some of the important efforts by public sector, NGOs and private sector in ICT for rural India are include:

Cyber extension program of MANAGE (http://www.manage.gov.in/)
National Informatics Centre (NIC) (http://home.nic.in**)**
DACNET (http://dacnet.nic.in**):**
Community Information Centre (CIC) (http://www.cic.nic.in/)
Warna Wired Village Project (http://www.mah.nic.in/warana**)**
Bhoomi (http://www.bhoomi.kar.nic.in/**)**
e-Seva (http://www.esevaonline.com)
e-Sagu (i.e. e-cultivation) (http://agriculture.iiit.net/esagu/**)**
Gyandoot Project (Cyber café cum Cyber Offices) (http://www.gyandoot.nic.in/**)**

Information Village Research Project (IVRP) (http://www.mssrf.org/)
N-Logue (http://www.n-logue.com**)**
e-Choupal (http://www.echoupal.com**)**.

5. INFORMATION NEED OF INDIAN FARMERS: When a teacher/scientist/trainer even any subject expert goes for lecture/talk/practical/etc, he/she prepare/update him self through consulting literature/ document/etc but when a farmer goes to farming, generally he doesn't have any literature to consult. He proceeds for farming on the basis of experience. Generally farmers follow the advice of local shopkeepers/agents who sells him seeds, fertilizers, insecticides, pesticides etc. The information need of Indian farmers across the country is varied. The Indian farmer generally needs the following types of information.

i. Agricultural Information need:

- High yielding varieties of crops and availability of their seeds
- Location specific improved/high yielding varieties
- Improved techniques and methods of farming
- Pest control and weed control measures
- Knowledge of using pesticides, insecticides, fertilizers and their reliability
- Farm machinery, Pre-harvest & Post-harvest technology and agro-processing Technologies
- Advice on soil testing, maintaining soil quality and crop rotation
- Irrigation related information
- Sustainable agriculture farming methods
- Veterinary, dairying and milk related information
- Fisheries related information
- Horticulture/vegetable related information
- Information about agricultural institutions/organizations in the country and their services to the farmers
- Advice on export potential and quality of Indian crop in world market.
- Information about subject expert (agricultural and veterinary science) i.e. name, address, telephone number for contact as or when the need arise
- Information and availability of all the literature (Gray and popular journals etc) published by the NARS institutes, other organization and NGOs for farmers
- Latest technology, up-to-date information and current development in their filed of farming
- Guidance and information for solution of practical problems which arise due to diseases, insects, lack of water, etc
- Marketing information which includes prices of inputs and outputs e.g.; seeds, fertilizers, bio-fertilizers, pesticides, current marker (Mandi) rates of crops etc
- Various schemes launch by State and Central Government for framers and rural development i.e. crop insurance etc
- Weather information on local, regional and national basis

ii. Other Information need:

- Land records information
- Advice on employment opportunities for women and youth in rural areas
- Banking loan procedures
- Legal issues - land rights
- Health related information
- Education related information etc.

5.1 Reasons of Agricultural Information delay in rural India: The main purpose of extension is to transfer the agricultural advanced technology and research to the farmer, and feedback of field problems to the research system. Latest information and knowledge on the subject play a major role to full fill this purpose. There is an information delay between farmers and agriculture researcher in India because:

- Media, Information Management and ICT are not properly used
- Lack of sufficient extension workers
- Lack of Agricultural information literacy in India
- Lack of updated agriculture information with the farmers and most of the extension workers
- Poor technological knowledge of farmers and village level extension personnel
- Economic problems of rural people
- The top-down approach is adapted for extension activity. So the linkages between research-extension and farmer remained weak etc.

6. DIGITAL LIBRARY FOR INDIAN FARMERS (DLIF): Various ICT initiatives in Rural India shows that the infrastructure for information communication technology is developing at fast pace. The ICT efforts and many other efforts in Rural India by various organizations are alarming for high demand of authentic digital contents to fulfill the information need of Indian farmers. Generally private organization's projects are market oriented for making profit. Agriculture Research & Development and its extension activities in India are carried out by public sector (Government). Therefore the authentic digital content generation for proper use of ICT in rural India is the responsibility of public sector. Looking at ICT initiatives in rural India we propose that NARS should develop a DLIF which will collect, digitize (printed document), organize and disseminate content of all the agriculture extension literature (extension/technical bulletins, extension monograms, extension journals, pamphlets, audio-video documents etc) to full fill the agricultural information need of Indian farmers economically.

6.1 Purpose and Role of DLIF: The main purpose of the DLIF is to full fill the agricultural information need of Indian farmers. It will be a major source of authentic and updated information of extension literature for agriculture extension workers of public/private/NGO/etc. It will provide authentic information to the farmers and will avoid duplicate efforts of agriculture extension workers for producing literature. It will also act as a useful source for agriculture information literacy program in India. A database of all the Indian agriculture extension literature and the bibliographical control of this literature will be developed at DLIF for its use.

6.2 Development & Management of DLIF: ICT infrastructure in the libraries of NARS is already developed under NATP project of World Bank. Now these libraries are procuring, developing, and managing digital resources. So the DLIF will be developed by coordinating the efforts of these libraries and extension departments of NARS by one central agency, which will look after the development & management of DLIF. The work of central agency can be given to University Library of G.B. Pant University of Agriculture & Technology, Pantnagar after seeing the experience, infrastructure and availability of trained manpower. All the Extension departments of NARS will select farmers' useful extension literature for digitization, which is already published by their respective organization and individuals in print form. In future extension experts and subject specialist will be instructed by the NARS for the development of literature in digital format. The printed or digital format selected extension literature will be sent to the central agency by extension department, and the central

agency will publish this literature for DLIF. All digitize literature including audio-video will be available at DLIF. The collection at DLIF of digital born documents will be built through on-line submission by the participating agency to the DLIF. This digital literature at DLIF will be broadly classified and entered in Dublin core Meta data standard to make the literature easily accessible for its use. In this project funds will be required for digitization work and management activities. Initially one project manager will handle this project at central agency and DLIF staff will be trained to run the project in digital environment. An e-mail server will be managed for proper communication and management of DLIF.

DLIF will encourage to the extension/subject experts for the development of extension literature (i.e. training manuals, popular articles, bulletins, multi-media literature, video films, etc) for literate and illiterate farmers in the regional languages in electronic format. Most of the valuable document should be translated in multilingual in order to avoid duplicate efforts for creating the same literature for each region. DLIF will also produce CDs/DVDs of its e-resources for its wide use where the proper Internet connectivity is not available. The financial support to run this project will be met out by the Government of India/ICAR. In this project maximum amount of money will be spent on digitization of content rather than purchasing the content. The project is useful to fulfill the agriculture information need of Indian farmers, and extension workers and hence the investment is highly beneficial.

6.3 Hardware and Software requirements for DLIF: The existing ICT infrastructure developed under NATP in NARS will be used for DLIF. Some of the specific hardware (i.e. storage device, server, scanner, digital camera, video camera etc) will be procured for digitization and management of the DLIF. The open access software will meet the requirement of DLIF. In the present international scenario D-space on Linux operating system is most appropriate software for management of digital library. Massachusetts Institute of Technology (MIT) Libraries and Hewlett-Packard Labs have been collaborating on the development of D-Space (open source). It enables institutions to publish digital document on web. It accepts all forms of digital materials including text, images, video, and audio files. The others software needed for scanning and digitization of printed material, optical character recognition (e.g. Fine Reader), word processing (e.g. MS-Word), image management (e.g. CompuPic), image editing software (e.g. Adobe PhotoShop) and PDF file viewer (e.g. Acrobat Reader) are some others software which are available at a nominal cost.

6.4 Contents of DLIF: The DLIF will include two types of information resources firstly the born digital resources and secondly the digital surrogates (i.e. created from traditional print format through scanning). Apart from these digital resources, important useful websites for Indian farmers and rural people developed by public/private/NGO/etc will be linked with home page of DLIF. The following types of documents will be included in DLIF.

i. Agriculture extension magazines/periodicals: NARS and other Indian organization bring out magazines/periodicals, which contains latest agricultural information in the popular articles. These are most useful sources for Indian farmers, extension workers. Some important agriculture extension magazines/ periodicals published in India by various organizations are:

- ICAR publications: Indian Farming (English-Monthly), Indian Horticulture (English-Quarterly), Kheti (i.e. Farming) (Hindi-Monthly), Phal-Phool (i.e. Fruit-Flower) (Hindi-Quarterly), Krishi Chayanika (Hindi-Quaterly);

- SAU Publications: Indian Farmers Digest (English-Monthly) by G.B. Pant University of Agriculture & Technology, Purvanchal Kheti (Hindi-Monthly) by N.D. University of Agriculture & Technology, etc
- ICAR Institute Publications:
- Directorate of Extension, Ministry of Agriculture (India): Unnat Krishi (Hindi-bimonthly), Krhshi Vistar Samiksha (Hindi-Bimonthly)
- Ministry of Rural Development (India): Kurukshetra (English and Hindi-Monthly).
- The Fertilizer Association of India: Khad Patrika (Hindi-Monthly) etc.

ii. *Agriculture extension bulletins:* It will include popular bulletins, technical bulletins, extension monograms, pamphlets, etc developed by NARS Scientists/teachers time to time in local/regional/national languages. For example:
Soyabean Ki Unnat Kheti (Hindi) (Improved Technology for Soybean Production) by National Research Centre for Soybean (ICAR),
Farmers Almanac: Vyavasaya Panchangam (Telugu) (compendium of latest farm & home technologies useful for farmers), Various bulletins on Insect pests and diseases etc by Acharya N. G. Ranga Agricultural University.

iii. *Audio-Vedio literature:* Many ICAR institutions and SAUs are developing audio-visual tools for agriculture extension activity. These tools will be published on Internet under DLIF project.

iv. *Other useful publication for farmers*: Many useful publications for Indian farmers published by NGOs, sate agriculture departments and subject experts. These will be identified for publication at DLIF.

v. *Expert database:* DLIF will create a database of agricultural experts in various disciplines for farmers use.

6.4.1 Digitization of the Contents for DLIF: The extension literature in India is not organized at national level, and no database is crated for its use at national level. Therefore the digitization of existing extension literature and creation of database is the first task to use this literature. It is the need of hour to select the existing printed literature to digitize on priority basis. Coordination of digitization work at national level will be carried out by central agency. The libraries' of NARS will index and digitize the documents available at regional languages in their respective regions. The keywords for indexing will be provided by keeping in mind the farmers' popular language so that it can be useful to the farmer for retrieving the information.
Government is spending huge amount of money and efforts for transferring the agricultural technology, and latest information to the Indian farmers and also producing extension literature at a nominal cost (no profit no loss) or free of cost to the farmers. Therefore in the age of open access movement, all agricultural extension literature should be made available free of cost to the Indian farmers at DLIF.

6.5 Information Services: DLIF will be utilized as an authentic source of government agriculture extension literature. Extension workers of public and private sector, and NGOs will use the DLIF to provide information services to the Indian farmers. DLIF will be very useful under ATMA system to full fill agricultural information need of farmers by extension workers and various ICT projects running in Rural India. Village information kiosks will also utilize the DLIF for provide information services in their villages. Farmers which have

computer facility will use the DLIF. The Village Knowledge Centers of MSSRF will also be benefited by DLIF to full fill agricultural information need of Indian farmers.

7. RECOMMENDATIONS: It is well known that providing digital information service to rural India is not an easy task, but combined efforts of public, private and NGOs will make the project success. The success of the project will on funding to continue the efforts of proposed DLIF. The following recommendations are made for successfully operation of DLIF project.

- A national committee should be constituted by ICAR to work out the establishment of DLIF.
- The committee should ensure that the digital/print copies agricultural extension literature is deposited with the DLIF.
- In national interest, agricultural extension information generated at India should be made available free of cost by duly amending copyright rules.
- The committee should also instruct the extension department of NARS for creating multimedia and audio-video agriculture extension literature.
- State governments and various ministries of Government of India should encourage the use of DLIF in their e-governance and other ICT projects in rural India.
- The training kits, how to use DLIF should be prepared made available at Kisan Melas (farmer fair), farmers training programs and other places.

8. CONCLUSION: In the age of information technology, electronic documents are necessary for providing information services. DLIF will be a national digital resource center for Indian agricultural extension literature. This library will be accessible to all types of users (Indian farmers, extension workers, NARS scientist/ teacher, agriculture students etc). Presently the ICT infrastructures (LAN, Internet, and Computers etc) are available in NARS, so the use of this infrastructure, the information services can be provided to the farmers by the development of DLIF in economical manner. India is a second largest populated country in the world and its 70% people are living in rural area, which are directly are indirectly involved in agriculture. To educate these masses in agriculture it is difficult to provide a copy of any printed document to each citizen in rural India, but in the age Information Technology a single electronic version of a document can be made available to them for providing the information at their respective regions. Organized digital resources at DLIF can meet the information need of Indian farmers. The DLIF will be a milestone for providing agricultural information services and transfer of agriculture technology in rural India by extension workers with the help of Information Communication Technology.

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