Web-based Information Literacy Campaign for Transforming Agricultural Research and Technology to Indian Farmers: A Model

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Abstract:

Indian economy is based on agriculture and country's 68% population is dependent on agriculture. There are more than 170 agricultural universities and ICAR institutes involved in education, research and extension of agricultural sciences in India. Agricultural extension information is vital for the development of farmers in India. Information literacy campaign can play a significant role for transforming agricultural research and technology to Indian farmers. ICT applications in Indian agricultural extension activities and agricultural libraries are discussed in this paper. A model is also proposed by the authors for a "web-based Information Literacy Campaign for transforming agricultural research and technology to the Indian farmers" using Moodle. Moodle is an open source software and well known for e-learning platforms.

1. Introduction

Agriculture is backbone of Indian economy where about 68% (830 million approximately) Indian population is dependent on agriculture directly or indirectly for their livelihood. There are 29States & 7 Union Territories, 664 district and 640867 villages in India. There are 22 officially recognized languages. According to 2011 Census of India, literacy rate in the country is 74.04 per cent out of which 82.14 males and 65.46 females are literate (Census of India, 2014). Indian Council of Agricultural Research (ICAR) plans, conducts and promotes

research, education & training and transfer of technology for advancement of agricultural sciences in India. Consisting 100 ICAR institutes and 70 Agricultural Universities/State Agricultural Universities (SAU), Indian National Agricultural Education and Research System (NAERS) is one of the largest national agricultural research systems in the world (Indian Council of Agricultural Research, 2015).

There are 641 Krishi Vigyan Kendras (KVKs, i.e. Farm Science Centers) for agricultural extension (i.e. transfer of agricultural research and technology to the farmers) in NAERS. There are 44 Agricultural Technology Information Centres (ATIC) established under ICAR institutes and SAU. India currently employs approximately about 110,000 Agricultural Extension Workers (AEW). Agricultural subject experts (ASE) have been working in KVKs for agriculture extension and training to the AEWs as well as Indian farmers. There are more than 250 Agricultural Technology Management Agencies (ATMA) set up at district level by Government of India to operate the extension reforms with active participation of farmers, NGOs (Non-Government Organizations), KVK and other Stakeholders operating at district/ town or village level. In each state, a State Agricultural Management and Extension Training Institute (SAMETI) has been established (Indian Council of Agricultural Research, 2015). The SAMETI provides training and undertakes human resource development on the concepts and processes of ATMA to the extension functionaries. SAU plays a key role in Indian agriculture extension system through Directorate of Extension, Subject experts, KVK, SAMETI, ATMA, etc.

2. ICT application in agriculture extension services in India

In India, a number of reform initiatives have been taken in agricultural extension during last decade. Agricultural extension literature has been published by SAUs and ICAR institutions in the form of pamphlets, technical bulletins, Kisan diaries, popular articles etc. Kisan Mela (Farmers fair), training programs, subject expert lectures/talks, radio & TV talks etc. have also been organized for agricultural extension in India. In 2010, Indian Agricultural Extension activities were reviewed with special reference to the farmers' information need (Glendenning, Babu, &Asenso-Okyere, 2010). The study found that in the conventional approach of agriculture extension system, research is performed by researchers and the results are turned over to extension staff for dissemination to farmers, has produced numerous success stories, but it has serious limitations for sustained agricultural growth and poverty reduction. It has failed to reach many of the farmers/actors who need information to improve their productivity and production, achieve food security, and create wealth. The study also mentioned that "the success of an extension approach will depend on how it enhances the "Information Flow" along the agriculture value chain" (Glendenning, Babu, &Asenso-Okyere, 2010).

In the present age of ICT, information has become a vital source for world economy/science/ technology/education/research and development. ICT in India is penetrated to

village level; most of the villages are now connected through telecom/mobile phones and millions of them are connected through Internet as well. Community Radio has also been started in agricultural extension by the SAUs for Indian farmers. In India, various initiatives have been taken in the area of ICT applications in agriculture extension by Government of India and various State Governments. A comprehensive study (Indian Council of Agricultural Research, 2014) on development and analysis of ICT initiatives in agriculture to meet the information need of the Indian farmers covered 26 ICT initiatives in agriculture. The study found wide information gaps between agricultural research and farmers in India. The study also found that Mobile is the most popular ICT gadget followed by TV and Radio. Further, the study suggested a need to provide farmer queries in multimedia mode i.e. audio mode (in local language) along with text, image and video. Agropedia has been developed in Indian Institute of Technology, Kanpur under an ICAR Project as a semantic web portal for agricultural extension content and interaction. It includes very limited and selected contents.

Under NATP (National Agricultural Technology Project) and NAIP (National Agricultural Innovative Project), ICT infrastructure in all ICAR Institutions/Agricultural Universities of NAERS (including KVK) has been developed. Though Government agencies/NAERS transfer agriculture information and technology in Rural India through KVK, AEW and ICT but latest agricultural research information and technology is not transferred timely among Indian farmers. Presently ASE, AEW and farmers access agricultural extension literature (mostly outdated literature) through print media (except few). Information Literacy campaign can play significant role in agriculture extension. Most of the ASEs and AEWs need Information Literacy training.

3. ICT Application in Agricultural Libraries in India (ALI)

In NAERS, every Agricultural University, SAU and ICAR institute has individual library to support teaching, research and extension activities of agricultural science. Hence, there are more than 150 ALI in NAERS. Web based technologies have been developing very fast and it is facilitating the access of digital resources. Digital resources have also been increased tremendously in Agricultural Libraries in India.

3.1 Consortium for e-Resources in Agriculture (CeRA): Under NAIP "CeRA" has been established at Indian Agricultural Research Institute (IARI) for providing access of online journals to 126 Agricultural Libraries in the first phase. The CeRA project was planned for 5 years from 2007-08 to 2011-12 but it is still continued for the year 2015. The main objectives of CeRA are as under(Consortium for e-Resources in Agriculture, 2015):
- To develop the existing Research & Development information resource base of ICAR institutes/SAUs, etc., comparable to that existing in leading institutions/organizations of the world.

- To create an e-access culture among scientists/teachers in ICAR institutes/agricultural universities.
- To develop a Science Citation Index (SCI) facility at IARI for evaluation of scientific publications.
- To assess the impact of CeRA on the quality of research publications measured through SCI.

Under CeRA more than 3000 online journals have been accessible for all Agricultural Universities and ICAR Institutions of NAERS. Under CeRA, DDR (Document Delivery Request) service has also been provided. Under this service, provision of online request has been made through CeRA portal. Users of CeRA can request through DDR for articles of journals available in Agricultural Libraries in India.

3.2   KrishiPrabha - Indian Agricultural Dissertations Repository: The project has been completed under the leadership of University Library, CCS Haryana Agricultural University Library; Hisar (http://202.141.47.8:8080/HAU/projects-krishi.html) with the aim to digitize all Dissertations and Ph.D. theses submitted during the year 2000 to 2007 in all Agricultural Universities including SAUs and deemed Universities. The main objectives of KrishiPrabha are (Goria, 2011):
- To develop, organize and sustain knowledge base of Indian Agricultural Dissertations in digital form and make it accessible on-line.
- To develop a standard format for submission of e-theses to the SAUs/DUs.
- To upgrade skills of human resources of SAUs/DUs.
- To publish a journal in electronic form/ hard copy from the Database.

The full text database includes about 7500 digitized theses. The digitized theses material after editing, organizing, value addition etc. are available online through IP based system. It is assumed that after the completion of the project in 2007 all dissertations and theses will be digitally available in at SAUs/DUs of India.

3.3   KrishiKosh http://krishikosh.egranth.ac.in/**:** It is an institutional repository of NAERS which is developed with the purpose to provide the access of intellectual outputs of the Indian NARES system. It includes digitized institutional publications, technical reports, annual reports, lectures, etc. in the form of preprints, reprints, old books etc as per copyright law. These contents which any one can easily have open access, essentially captures all the intellectual work being done under NARES. Thus institutional repository provides alternative source of scientific information to support quality research and teaching in line with objectives of open learning and OER.

KrishiKosh has been created under the National Agricultural Innovation Project (NAIP) and digitization of the valuable content was taken up by four major institutions of NARES. Using Open Source software, the material in the repository was organized into Institution-wise collection of documents such as books, journals, theses, reports, articles etc. The metadata tagging and uploading the fully searchable digital items in the repository has been done for about 9 million pages comprising about 20,000 documents.

3.4   e-GRANTH- Digital Library and Information Management under NAERS:

It is a subproject under component-1 of NAIP is launched under the leadership of IARI. Initially, the project was planned to strengthen digital libraries and information management of 12 different research institutes and agricultural universities of NAERS through WorldCat of Online Computer Library Center (OCLC) partnership. e-Granth provides digital access to resources of 12 libraries which include OPAC (Online Public Access Catalogue), important institutional repositories, rare documents and makes them publicly accessible over internet under NAERS. The major objectives of the project were (Indian Council of Agricultural Research, 2015):

- To create OPAC under "Indian Agricultural Research Group Catalogue" of all 12 library resources with (OCLC partnership).
- To digitize important institutional repositories (limited to IARI, New Delhi; IVRI, Izatnagar; ANGRAU, Hyderabad and UAS, Bangalore) including rare books and old journals and make them open access under NAERS.
- To strengthen capacity building for library and information management system (open to all libraries of NAERS).

The entire 12 participant libraries standardized their OPAC in MARC21format through online WorldCat with the help of Connexion software of OCLC. OPAC data of all the participant libraries will be searchable through WorldCat or Agricat online union catalogue. Agricat union catalog of Library Resources of NARES is accessible through http://www.egranth.ac.in/AgriCat.html (figure-1). It intends to provide open access to all the catalogue of the holdings of NARES libraries so that the sharing of library resources becomes possible. Koha open source has been used in most of the Agricat libraries of NARES. In the second phase of the project, Agricate 2.0 has been developed using Koha. At present 38 libraries are parts of Agricate 2.0 (i.e. http://agricat.egranth.ac.in/) union catalogue of NARES.
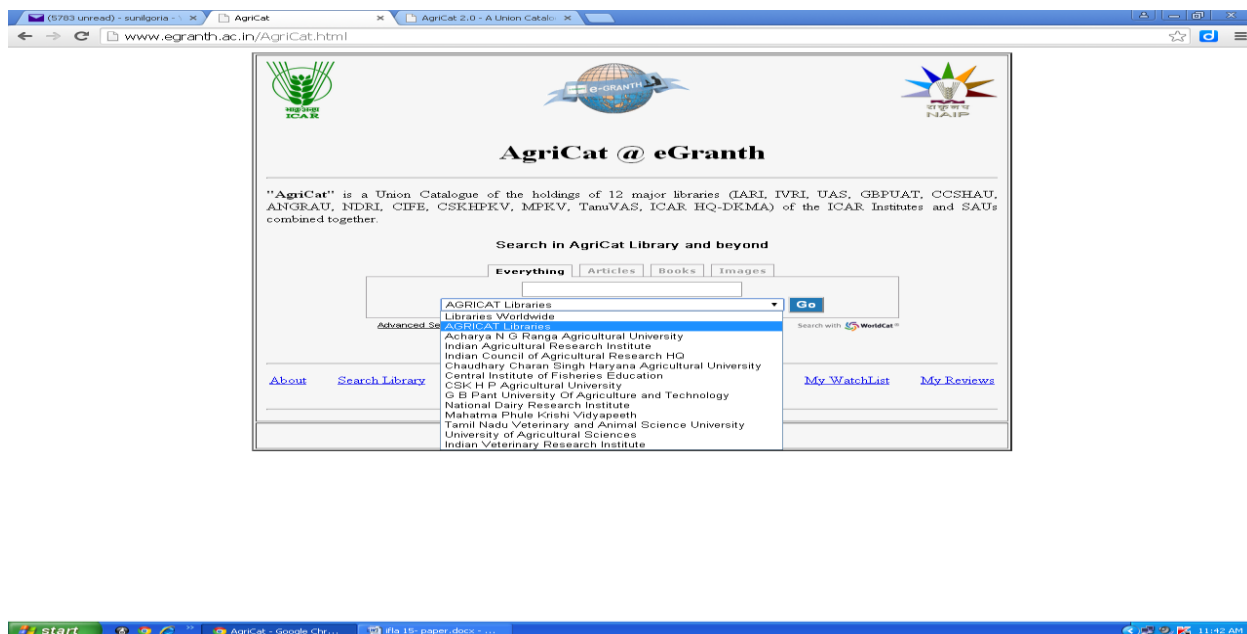
Figure-1

4. Information need of Indian Farmers:

In India, information need of the farmers is differ from one area to another. The Indian farmers need information in their local language. Farmers need information at the time of pre-cultivation, cultivation and post cultivation stages of agriculture farming. According to a study on 26 ICT initiatives in agriculture, it is found that (Indian Council of Agricultural Research, 2014):

- In North zone first priority of farmers information need is pest and disease (78%) followed by market information (60%) and weather information (47%);
- In South zone first priority is field preparation (58%) followed by is pest and disease (49%) and market information (44 %);
- In East zone first priority is government schemes (100%) followed by field preparation & input availability (92.5%) and
- In West zone first priority is credit and finance (55%) followed by nutrient management and Input availability (54%).

The Indian farmer generally needs the following types of information (Jain and Goria, 2006).

- 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 NAERS 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 and lack of water;
- 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. seed availability, crop insurance etc.;
- Weather information on local, regional and national basis etc.

5. Information Resources for Indian farmers:

Agriculture extension literature is produced by Indian agricultural universities, SAU and ICAR Institutes for farmers and extension workers in different forms (i.e. bulletins, popular articles, talks, training material), different formats (i.e. print/digital/audio/video) and in different languages (i.e. English, Hindi and various regional languages). Some important agriculture extension magazines/ periodicals/ bulletins published in India by various organizations are:

- ICAR extension periodicals: 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-Quarterly);
- SAU extension periodicals: Indian Farmers Digest (English-Monthly), Purvanchal Kheti (Hindi-Monthly) etc.
- Extension periodicals of Directorate of Extension, Ministry of Agriculture, India: Unnat Krishi (Hindi bimonthly), Krhshi Vistar Samiksha (Hindi-Bimonthly)

- Extension periodicals Ministry of Rural Development, India: Kurukshetra (English and Hindi-Monthly).
- The Fertilizer Association of India extension periodicals: Khad Patrika (Hindi-Monthly) etc.
- ICAR Institute Publications: Extension bulletins, Technical bulletins, Monographs, etc. publish in local/regional/national languages.

Apart from these publications, important information related to Agricultural Research and Technology for agriculture extension/Indian Farmers have been published on website of most of the NAERS institutions as well as other institutions. Audio-video literature has also been produced by many extension departments in NAERS. KVK, ATIC, Extension Department of NAERS institutions are important source of information for Indian farmers. Following are some useful websites for Indian farmers.

- Farmer portal http://farmer.gov.in/
- Agropediahttp://agropedia.iitk.ac.in/
- Department of Agriculture & Cooperation Network - DACNET http://dacnet.nic.in
- Extension Reform Monitoring System http://extensionreforms.dacnet.nic.in/
- National Institute of Agricultural Extension Management http://www.manage.gov.in/
- ICAR http://www.icar.org.in/
- State Institute of Agriculture Extension and Training http://siaet.nic.in/
- Soochana Se Samadhan - ICT in Agriculture http://203.129.234.81/index.php/media?func=viewcategory&catid=38
- e-Krishi.org: http://ww2.e-krishi.org/?folio=7POJ4E717
- Gyandoot Project (Cyber café cum Cyber Offices) http://www.dhar.nic.in/gyandoot.htm
- e-Sagu (i.e. e-cultivation) http://www.esagu.in/
- e-Choupal https://www.echoupal.com/
- Rice Knowledge Management Portal http://rkmp.co.in/
- Agmarketnethttp://agmarknet.nic.in/
- Agricultural Meteorological Division http://imdagrimet.gov.in/
- mKisan Portal http://mkisan.gov.in/
- Department of Agriculture and Cooperation http://agricoop.nic.in/
- National Portal of India http://india.gov.in/
- 'DD Kisan' Channel for farmers growth http://www.ddindia.gov.in/DDKisan/Pages/Default.aspx
- mKisan:A Portal of Government of India for Farmer http://mkisan.gov.in/
- Department of Agriculture & Cooperation http://agricoop.nic.in/

6. Information Literacy

Information Literacy has been known by various terms like users' education, library orientation, library literacy etc. in the field of library and information science. Information Literacy forms the basis for lifelong learning. It is common to all disciplines and to all levels of learning. The family of 21st Century "survival literacies" includes six categories: (Horton, 2007) (1) Basic or Core functional literacy fluencies (competencies) of reading, writing, orally and numeracy; (2) Computer Literacy; (3) Media Literacy; (4) Distance Education and E-Learning; (5) Cultural Literacy; and (6) Information Literacy. The boundaries between the various members of this family overlap, but they should be seen as a closely-knit family. As derived from the Alexandria Proclamation of 2005, adopted by UNESCO's Information for All Programme (IFAP), Information Literacy is the capacity of people to: (UNESCO, 2008)

- Recognize their information needs;
- Locate and evaluate the quality of information;
- Store and retrieve information;
- Make effective and ethical use of information, and
- Apply information to create and communicate knowledge.

The two concepts i.e. Information Literacy and Lifelong Learning concepts are inter-related. According to Horton (2007) information literacy and lifelong learning are:

- Largely self-motivated and self-directed, which is to say, they do not require the mediation of an outside individual, organization or other kind of helper, beyond the learner him/herself, although advice and assistance can be helpful;
- Self-empowering, which means that they are aimed at helping people of all age groups, genders, races, religions, ethnic groups, and national origins, and no matter what their social or economic status may be, or role and place in their communities or society in general; and
- Self-actuating, which is to say the more information literate an individual becomes, and the longer the person sustains good information literacy learning and practicing habits and attitudes, the greater the self-enlightenment that occurs, especially if practiced over an entire lifetime. Ideally, one should become information literate, and practice those habits and skills over one's entire lifetime.

6.1   Information Literacy in Agricultural Libraries in India:

Indian Agriculture universities started teaching library skills way back in 1970s with Indira Gandhi Krishi Vishvidhalaya, Raipur (MP) being the first university followed by GB Pant University of Agriculture and Technology (GBPUAT) in 1976, and Marthwada Agriculture University, Maharastra (Singh and Klingenberg 2012). Indian Council of Agricultural Research formulated Common Academic Regulations and introduced a mandatory information literacy course entitled Library and Information Services coded PGS-501 for Post Graduate Studies

(PGS) in NAERS. Therefore, most of the library professionals of Agricultural Libraries have been teaching information literacy course to the PG students in NAERS (Goria, 2014).

6.2 Need of Information Literacy Campaign: Agriculture extension activities have been done by NAERS institutions through different media. Farmers are not aware with the various information resources related to agriculture. AEWs and ASEs are mediator between farmers and agricultural research, technology & information sources developed by NARES for farmers. Information literacy can play a vital role to transfer agriculture research & technology among Indian farmers through AEWs, ASEs and also directly to farmers. There are standards developed for information literacy of higher education, health, nursing etc. Following five standards of information literacy are according to the Association of College and Research Libraries (ACRL, 2000)

  i.   The information literate student determines the nature and extent of the information needed.
 ii.   The information literate student accesses needed information effectively and efficiently.
iii.   The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.
 iv.   The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.
  v.   The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

On the basis of ACRL and other information literacy standards, there is an urgent need to develop standards for information literacy in agricultural extension. Agriculture extension services for Indian farmers are also need based. To satisfy the needs of the Indian farmers a Web-based Information Literacy Campaign may be developed for transforming latest agricultural research and technology among Indian farmers.

7. Web-based Information Literacy Campaign Model:
Moodle (Modular Object-Oriented Dynamic Learning Environment), an open source software is used to develop the model of information literacy for agriculture extension in India. Moodle works on Virtual Learning Environment (VLE) which makes it easy to provide online support for any learning course / material. Therefore, It will play the key role for transferring agricultural research and technology in rural India. Trained ASE/AEW through information literacy campaign can transfer latest agriculture information and technology among Indian farmers in better ways. The proposed information literacy campaign model will also be useful and beneficial for other developing and underdeveloped countries because agriculture plays an important role in all these countries. Moreover, the information literacy campaign program will

develop relationships with agriculture extension system as new partners of libraries and information centers. Agriculture extension literature is produced by agricultural universities and ICAR Institutions for farmers/extension workers/ASEs in different forms (i.e. bulletins, popular articles, talks, training material), different formats (i.e. print/digital/audio/video) and in different languages (i.e. English, Hindi and various regional languages).

The present information literacy model purpose is to target directly to the ASE, AEW and other agricultural extension staff directly through online information literacy of various information sources and services available online and offline in NAERS. The Information literacy campaign will empower ASE and AEW to seek, evaluate, use and create information effectively to achieve their goals of agricultural extension for farmers. This campaign will be beneficiated to the Indian farmers indirectly. ASE and AEW will use latest information sources to transfer agricultural information among Indian farmers. Most of the information sources are not utilized by ASE and AEW in the lack of information literacy.

7.1 Practical steps for web-based Information Literacy campaign using Moodle: Moodle is designed to help instructors create an online course with opportunities for rich interaction and collaboration. It contains various design aspects that allow instructors and learner to interact, collaborate, and experience online learning in multiple ways. Moodle also needs various supporting software for installation. Moodle can be installed easily through the following steps

Followings steps:

- Moodle 2.8.5 XAMPP (Apachi + MySQL + PHP) is downloaded from https://download.moodle.org/windows/ for Windows-XP.
- In the Windows installation folder start Moodle.
- Go to Brower and run install.phpsript in localhost.
- Setup the localhost & Moodle database and install Moodle 2.8.5.
- Setup admin user and password.
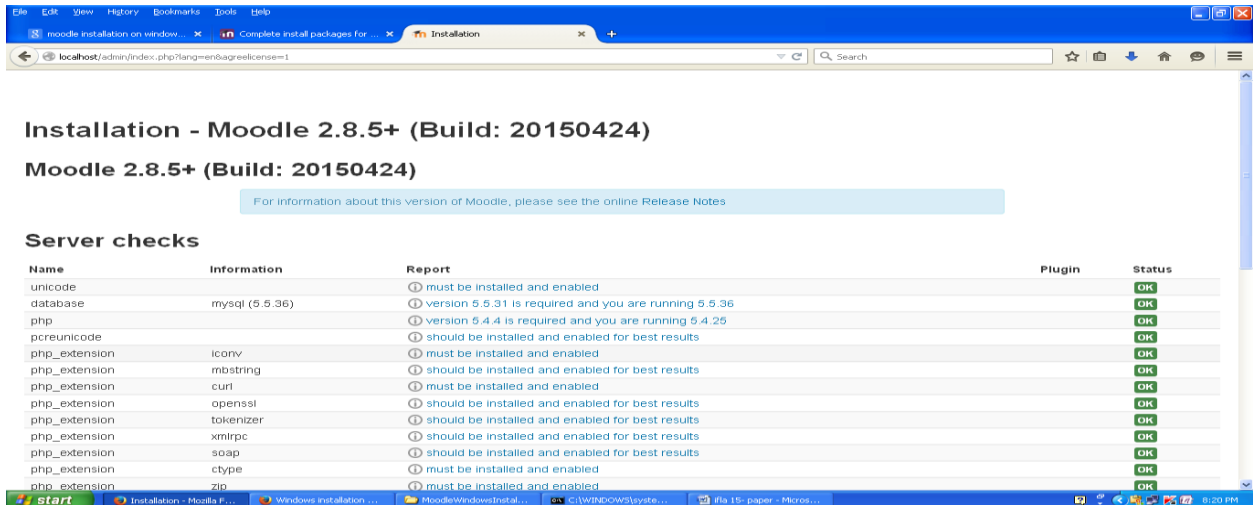- It will install complete Moodle system as shown in figure 2 and 3.

Figure-2

Access the Moodle through localhost and login as administrator for creating users, course categories and courses (figure-3). Moodle support site management, user management and course management activities. Feedback activity, database activity, tracking, resources linking backup etc are important features of Moodle.
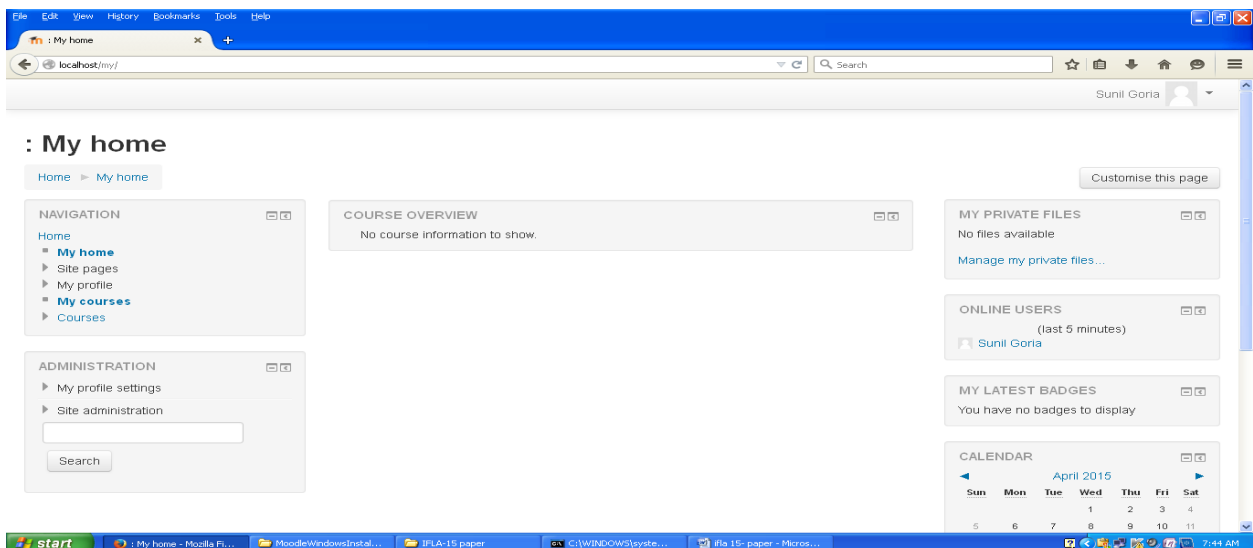

Figure-3

Administrator of the Moodle system can create users which will perform the role of teachers. Four users including administrator have been shown in following screen (figure-4)
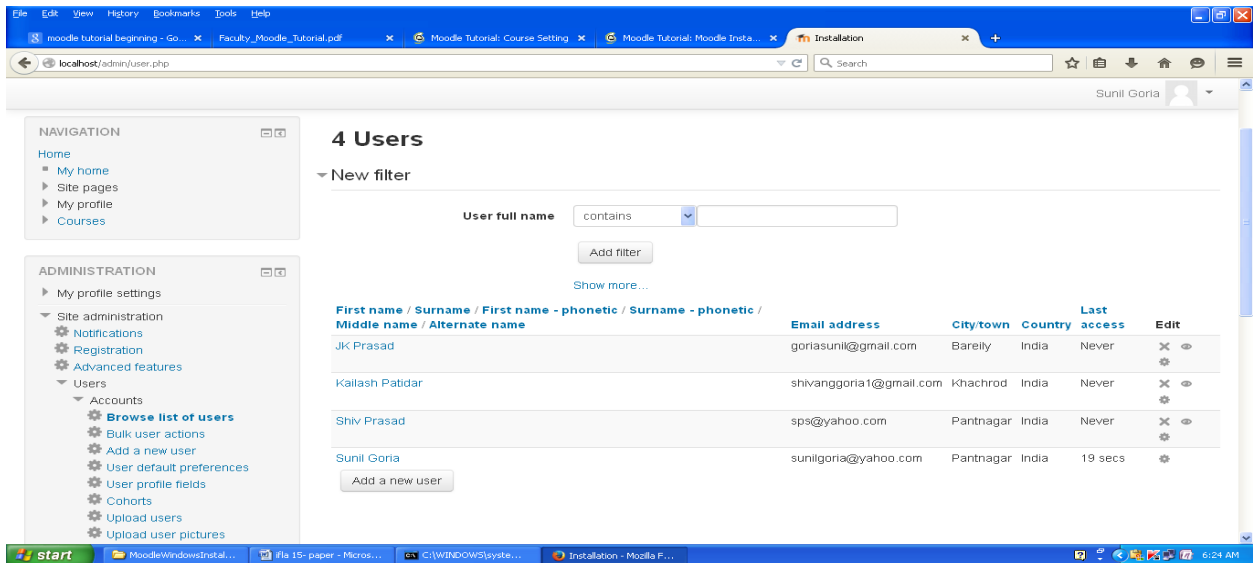
Figure-4

Under ICT course category, 'Web-based Information Literacy Campaign for Transforming Agricultural Research and Technology' is created as a model of information literacy campaign. Resources (i.e. lessons, databases, external, assignments etc.) and activities (i.e. Chat, Wiki, Glossary, Forum, Quiz etc.) can be added to any course(figure-5).Information literacy course can be accessed through localhost as well as on global IP (internet protocol) address (figure-6). The Information literacy campaign can be for free public access or restricted access through user identification and password enrolling users in Moodle course.
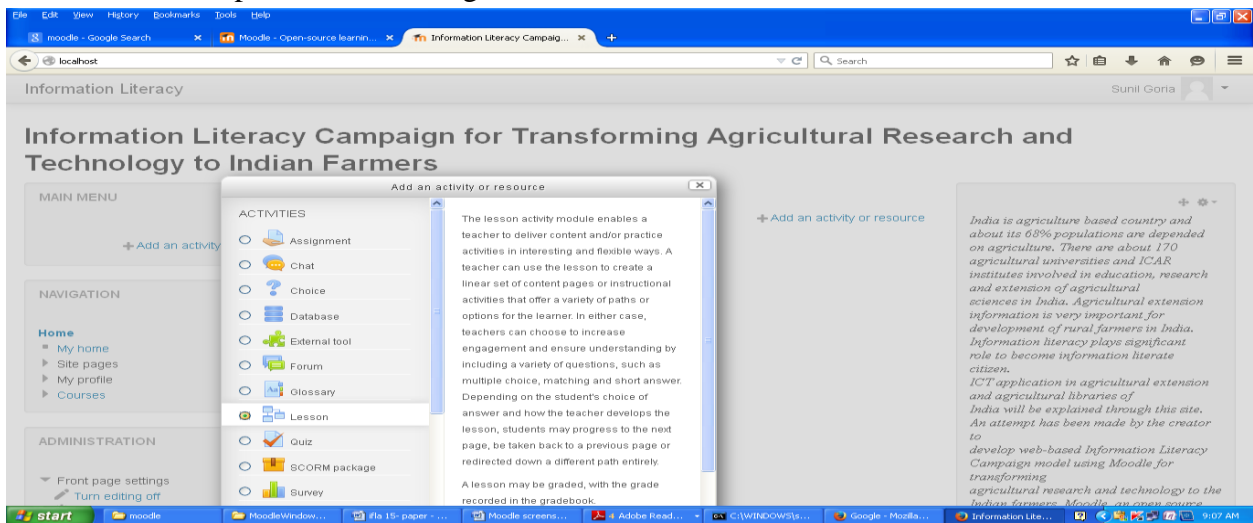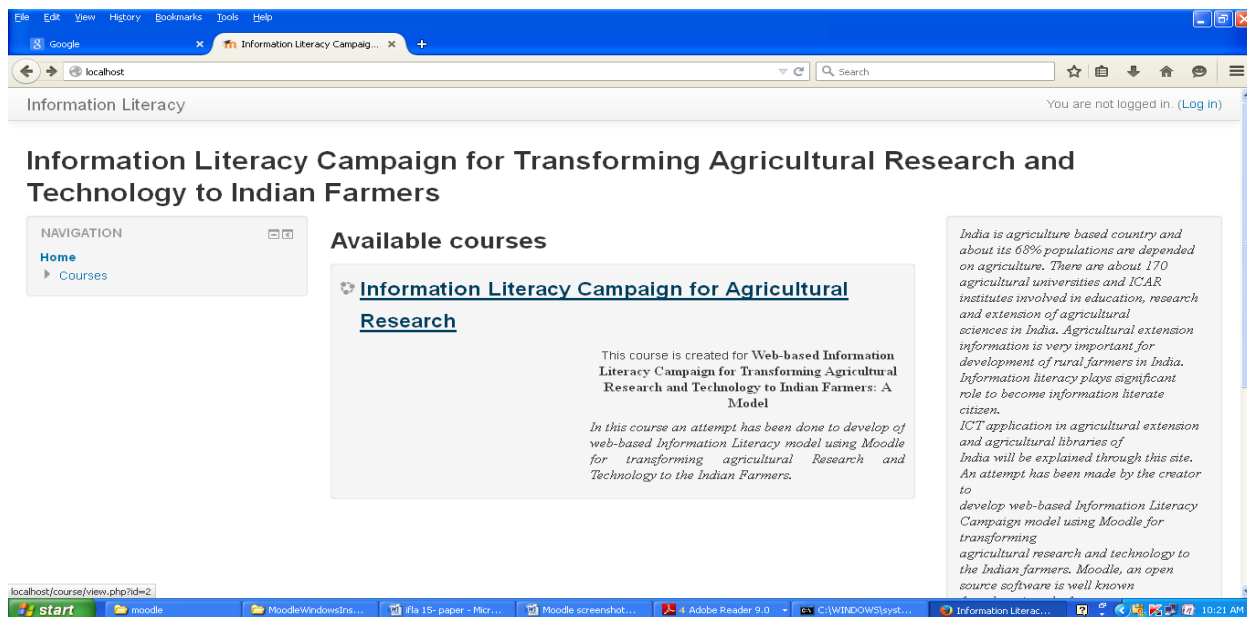

Figure-5

Figure-6

8. Conclusion

The Agricultural Libraries in India have been playing a key role in research, education and extension of agriculture in the country through acquiring, processing, organizing and disseminating agricultural literature and information for the users. The NAERS libraries have also been providing online resources to the users through CeRA (Consortium for e-Resources in Agriculture of India), KrishiKosh (i.e. Institutional Repository of NAERS, Union catalogue NAERS (i.e. Agricat), and Document delivery request services. In NAERS, some of the libraries have been involved to manage and distribute agricultural extension literature to the farmers in collaboration with extension departments. It has been observed that most of AEWs, ASEs and other experts of agricultural extension unit of NAERS have been using extension literature in print form. They need to be trained through web-based information literacy campaign for online resources. Therefore, there is an urgent need of Information Literacy Campaign for Transforming Agricultural Research and Technology to Indian Farmers through AEW, ASE etc.

The web-based information literacy campaign model discussed in this paper can be easily used through Internet by ASEs/AEWs and other users in NAERS as well as by Indian farmers. Information literacy training will develop trained ASEs/AEWs, which can be applied to create and communicate agricultural knowledge/agriculture extension among Indian farmers. This practical model can be elaborated in regional and other languages and can also be implemented in other developing and underdeveloped countries because agriculture plays an important role in many parts of the world.

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