AGROPEDIA INDICA -The journey till November, 2008

A White Paper by the Social Science Research Team at IIT Kanpur

1. Introduction

There is no debate about the need for the development of the agriculture sector in a country like India, where more than 60% of the total workforce engaged in this sector. The total agriculture budget outlay in five year planning has been going up as has the plethora of government policies in favor of the farmers. Despite these efforts, the condition of the farmers (specially marginal and poor) and productivity of land has remained at very low levels, even when compared to other South East Asian countries with similar land holdings. Side by side, more challenges have emerged such as climate variability, soil quality reduction, and water scarcity. The farmers have also been exposed to price variability arising from privatization of the agriculture sector and liberalization policies.

It has been recognized that one of the most serious back-logs in agriculture is in the process of information flows. To address this, special attention has to be paid to empower the agricultural extension system which serves as the research to farmer link. In the 60's and 70's this agricultural extension system played a crucial role in the advancement of food security through the Green Revolution. In addition to focussing on the broader issues of resource constraints and market opportunities, there is a need for re-orienting and reviving the extension process, and bringing the extension scientist up-to-date with the latest happenings in the field of agriculture through the use of ICT.

'Redesigning the farmer extension agricultural research/ education continuum in India with ICT mediated Knowledge Management' (ReFEARI-ICTKM) is a project under the umbrella of the National Agriculture Innovation Project (NAIP) to facilitate the Knowledge Management (KM) process in the agricultural domain. The NAIP has been initiated by Indian Council of Agricultural Research (ICAR) with the assistance of World Bank to accelerate sustained transformation of Indian agriculture. ReFEARI –ICTKM aims to bring together a community of practice through an ICT mediated Knowledge creating and organising platform with an effort to leverage the existing agricultural extension system. This would promote technology-led pro-poor growth and diffusion of new technologies for improving agricultural yield and rural livelihood in India. The NAIP-KM system allows the development of highly integrated approaches between agricultural research and education sector with established extension processes such as the Krishi Vigyan Kendras (KVKs), emerging actors in private sector extension, NGOs and with organizations promoting rural information access centers. Thus the main objective of this project is to create a back-end process mainly through introducing digital services with suitable access and delivery systems for different stakeholders in both online and offline modes to provide information support. The proposed access and delivery system can be through different channels including desktops, laptops, mobile phones, broadcast media or print.

Under ReFEARI-ICTKM, a consortium of institutions of excellence in ICT research, state agriculture universities and agricultural research organizations have come together to build a comprehensive and integrated set of

processes and platforms to support and promote knowledge flows and exchanges between different stakeholders in the agriculture domain. Overall, one could categorise these institutions into three groups according to their roles and responsibilities. The first group consisting of IITK, IITB, IIITM-Kerala and NAARM-Hyderabad, is playing the role of ICT resource institutions. Private sector partners including NGOs in IT development provide short term consultant/contractual services to the partners when required. The second group comprises ICRISAT, Patancheru, GB Pant University of Agriculture and Technology (GBPUAT), Pantnagar and University of Agricultural Sciences (UAS), Dharwad. This group works as an information and learning resource provider. These two institutions are linked with two KVKs/agricultural research stations (ARS) each. Two KVKs in Maharashtra and Uttar Pradesh are also linked to the project through the IIT Bombay and IIT Kanpur network. The link with the extension centres ensures that suitable use cases can be generated for developing an appropriate knowledge management platform. ICRISAT-Patancheru and NAARM-Hyderabad, the third group, provide facilitation support for the agricultural research scientists and educators and the ICT4D actors.

IIT Kanpur, one of the IT resource organizations is responsible for creating the basic ICT platform for knowledge management, which hosts the ICT enabled services of other IT resource providers. This platform has been named Agropedia Indica. With the vision of Agropedia as a comprehensive, seamlessly integrated model of digital content organization in agricultural domain, the ReFEARI-ICTKM project aims to alleviate the knowledge gap in Indian agriculture. The Agropedia is just like an Encyclopedia in the agricultural domain. With the rapid development of creation, use and reuse of digital content, it is not very difficult to involve a large community of knowledge partners to create the knowledge contents. Taking into account the need of the different type of users, the knowledge nuggets could be represented in various textual, audio, video and hybrid formats and could be delivered through multiple interfaces. Agropedia Indica, on the other hand is a limited instantiation of the Agropedia vision, where the emphasis is on Indian agriculture (while scalability and standardization issues to make it globally applicable are kept in mind), with only the web as the delivery mode, and initially developed in English and Hindi.

2. Theoretical Background

This section highlights some of the theoretical issues that underpin the present development of the *Agropedia Indica*.

Creation of Knowledge: Knowledge management (KM) literature identifies tacit knowledge as a vital source of knowledge that needs to be identified, captured, stored and processed via IT tools so that such knowledge can be applied further in a new context. Tacit knowledge is derived through experience, ideals and values. When this knowledge is categorized, specified and codified it is transformed into explicit knowledge. Other KM models suggest that knowledge is shared and developed through active networking within and between groups. Thus, effective conceptual integration among the heterogeneous actors is essential for the development of knowledge, and the use of ICT can facilitate and strengthen this process of networking. The creation of new knowledge is based on the existing "knowledge spaces", that is, static, explicit content, as available in books or tacit knowledge in the mind of people which needs to be accessed, retrieved, and processed. In transformation of knowledge from explicit to tacit or from tacit to explicit it may change from its original form either intentionally or unintentionally for the purpose of application. Such changes may

occur at the sending or receiving end or any level of the link. *Agropedia Indica* aims to facilitate this knowledge creation and transformation process in the agricultural domain.

Knowledge Transfer Approach: 'Good Understanding needs Effective Communication': The effectiveness of knowledge transfer is gauged by the extent of understanding and application, which in turn depends on the nature of communication among the nodes. The *Agropedia Indica* approach is to build a dynamic interplay between sender and receiver i.e. to develop a feedback based network loop. The approach consists of a cyclical approach of top down push knowledge and bottom up pull information, because it is important to match the quantity and quality of the pushed knowledge with the knowledge requirement and the emissive and absorptive capacity of the knowledge nodes (users and contributors). In such a network based knowledge system, the use of ICT can significantly improve the process/power of accessibility by widening the flow capacity, facilitating e-collaboration, strengthening the network, and broadening the network area. Improved accessibility would have a positive effect on strengthening the capacity of the user nodes with repeated usage.

Knowledge Actors: Knowledge actors refer to various nodes that participate in the knowledge creation and transformation process. For Agropedia Indica, the knowledge actors can be broadly divided into three groups – Content Community (CC), Target Community (TC), and Actual Target Community (ATC). All the institutions who are working as the explicit knowledge providers (providing top down push knowledge), directly or indirectly, can be called as "Content community". The "Actual Target Community" on the other hand, is at the receiving (and bottom up push knowledge contributing) end such as farmers, agricultural workers, traders, retailers, self-help-group and intermediaries such as KVKs and scientists of state agricultural universities and the other deployment partners. The people of this community are the tacit knowledge holders by virtue of their practical experiences. Their knowledge is also dynamic as they are directly related to the practical field of work where the environment and the situation can change every moment. Their tacit and dynamic knowledge is also very helpful to the agricultural experts and researchers. So it is necessary to transform this knowledge to the explicit form through providing a means of communication.

Within the limited scope of the project, with current ICT infrastructure, literacy and language barriers, the actual target community of farmers, agricultural workers, traders, retailers, self-help-group etc. are represented through the extension workers, which are then classified as the target community. The target community thus has the responsibility to disseminate the knowledge among the farmers, and others who apply that knowledge in their daily practices, and collate knowledge from the ATC and channelize it into the KM system created in Agropedia Indica. Thus there is a cyclical knowledge creation, exchange and transformation path between experts and farmers through the target community. This "target community" is thus the "Social Integrator" from sociological point of view.

Another way to understand the knowledge actors is by understanding their transactional roles. The purpose of the CC is to develop relationships within the community itself and between communities. If we think each community as a collective node, there are direct links between the CC and TC and between the TC and ATC; and indirect links between the CC and the ATC through the TC. Knowledge develops operationally through these interactions. The CC can be seen as the managing community of the knowledge network as this node manages, directs, and facilitates the efficient and smooth flows of knowledge objects. This knowledge community has a common interest to create, share and use knowledge for the development of the

agriculture. All the participants have a common understanding of collective practices and goals and in this sense it can be seen as a community of practice (CoP). In this process of forming a knowledge CoP with geographically and culturally disparate researchers, experts, farmers, academic institutions, organizations and the others using ICT, each node is enriched by giving and receiving information and increasing the number of links. New and revived linkages between researchers and education sectors with agricultural extension are expected to develop through the Agropedia Indica platform.

Network structure: The structure of network communication is the combination of both the formal and informal according to the situation and need. While the CC and the TC are formally constructed within themselves; the ATC comprises locally based informal networks, predominantly based on trust and commitment. It is obvious that in a network with nodes from geographically distinct regions it is very difficult to ensure stability and sustenance of the developed knowledge community (may termed as knowledge ecosystem) with out some formal preconditioned contractual obligations from the nodes. The task of CC is to develop such a knowledge ecosystem which is trustable and at the same time user-friendly and informative.

But there is a problem in the context of 'open access' and 'content security implication' which needs to be balanced by the CC Open access is necessary to promote the diffusion and sharing of knowledge whereas security is necessary to ensure correctness and appropriateness of content and foster trust. In this project, the CC mainly acts as a constructor and controller of the knowledge flows and the TC are mainly the users of the formally created content, and contributors to the dynamic knowledge flow. All members of each group act as both senders and receivers, and create content and communicate with each other as and when required. Using ICT as the medium of knowledge transfer and sharing provides a platform for content organisation, acts as the knowledge repository, and also as a virtual administrative body. Every node has to posses certain conditions to enter into that network and for using it. The conditions are determined by the CC. In this sense, we can say, there are lateral links within the communities and vertical hierarchy across the communities in the knowledge network.

3. Agropedia Indica:

With the limited time frame of the project and others practical problems, it is not possible for the project team to consider the ATC in the project directly, and establish direct links between research-education-farmers as there is a large gap between these two communities from all aspects. While the CC deal mainly in established and verified information, represented in textbooks and theory, the ATC has practitioner knowledge from the ground up, which has to be abstracted for wider applicability. So the CC needs a bridge to link to the ATC. As the views and problems of ATC can be easily captured using the TC as intermediaries, they can best serve the purpose of the CC. So in the AI project the user group has been taken to be the TC (hence the name). Now let us look at the features of the AI portal at first, and then the roles and responsibilities taken by the different institutions of the CC i.e. the different consortium partners from the point of view of Agropedia Indica.

*3.*1 *Main Features of AI*

The AI web site is the common platform for creating and sharing knowledge for agricultural experts and researchers as well as the agricultural workers. When designing the portal, it is critical to take into account the requirements of these users and the different types of difficulties they could face in handling the web

process. This has resulted in a highly dynamic web portal, which has changed quite a bit since it was launched. As the ultimate aim is to build up an agricultural knowledge community and involve more and more users, the main attention is to develop this portal in such a way that it becomes as informative and user friendly as possible.

Agropedia Indica as on August, 2008:

Features

1. It is an agricultural knowledge repository which can be accessed by everyone.
2. The content would be the broad Indian agricultural domain; focus on some particular crops within.
3. It provides a platform where knowledge can be stored, created, exchanged and shared through Knowledge Models[1], wiki, blogs etc.
4. The Agropedia Indica is developed using web 2.0 technology.
5. There are two ways of content creation in the platform. The partners can upload expert knowledge through the content management system (CMS) or use the 'wiki' for emergent knowledge. In Wiki anyone is allowed to write content on agriculture related issues. All the contents are uploaded and created for Agropedia Indica is stored in the CMS, powered by Alfresco.
6. The contents may be of various forms such as textual, audios, video images, and video clippings.
7. The knowledge is also stored in the form of knowledge representation schemes like ontology, concept maps, topic maps etc., so that semantic searching is possible.
8. At present AI is a web-based application.
9. Before entering and using the AI platform, registration is an essential condition.
10. In the **Agropedia Indica,** the home page is having the portlets as 'Home' (the Home page), 'Search' (search agricultural content), 'Upload' (upload agricultural content), 'Agrowiki' (wikipedia like concept for agriculture), 'Krishi Vigyan Kendra' (the local agricultural information by the KVKs and local farmers), 'Kisan blog' (The audio blog), 'About us' (provide phone numbers and address to contact with the IITK project team), and 'Team' (name and designation of the IITK project members with photo).
11. The home page consists of different components like 'Search Agri-Content', 'Upload Agri-Content', 'AgroWiki', 'Krishi Vigyan Kendra', 'Kissan Blog', and 'Concept Maps', as shown in figure 1.

Portlets

[1] Knowledge models are the structural representation of knowledge by using symbols to represent pieces of knowledge and relationships between them.

Search Agri-Content: In this component one can search anything related to agriculture in textual, images, audio, or in video format. When anyone searches a particular topic the CMS provides all the contents it has, related to that topic; and the actual source, the name of the creator, the time of creation are always shown with the content.

Upload Agri-Content: Here one can upload the agricultural contents through the CMS in textual, images, audio, and video form which ever he/she wants; but before uploading registration is an essential condition. The contents may be uploaded from some authentic books, magazines, journals, websites, and other sources. The details of the source and creator must be mentioned after uploading the content. The word templates in which the agricultural scientists provide the textual content are supposed to call as 'Agris'. Videos should be small in size so that it would not take much time to download.

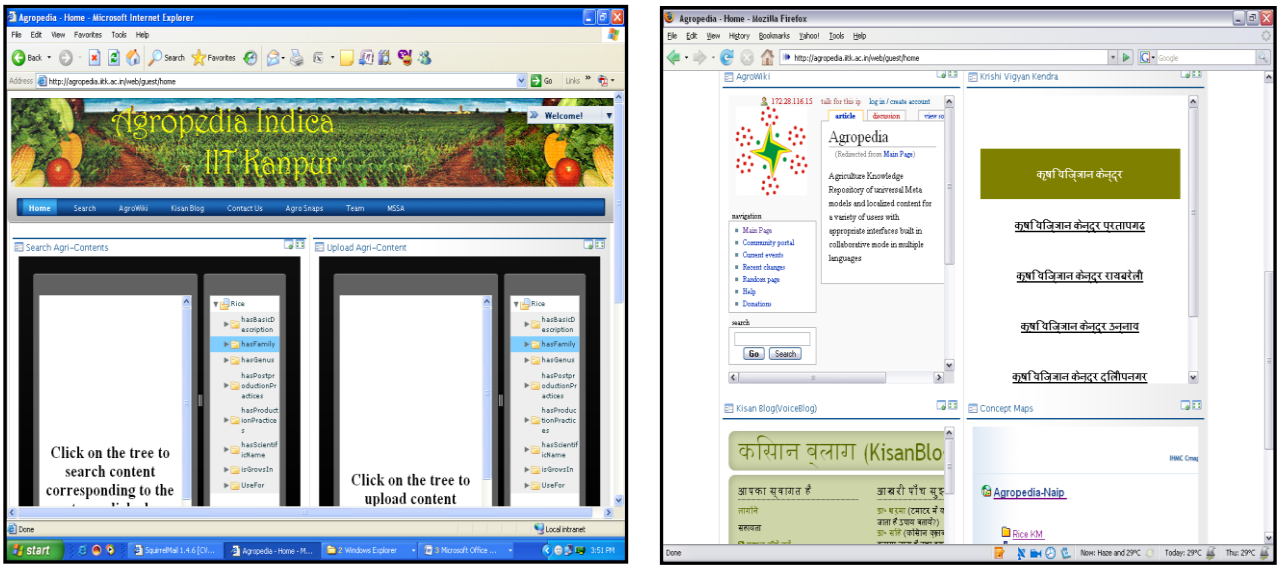


Figure 1. Grab-shot of Agropedia Indica Home Page, taken in August, 2008

AgroWiki: It is based on the concept of 'Wiki' where anyone can search and create content regarding agriculture. AgroWiki is using the 'media-wiki' technology, so one can visualize and upload images beside text. But as anyone can create the content, the problem of unauthencity may present here.

Krishi Vigyan Kendra: It is the place for the KVKs related to this project. It contains the local agricultural information which is provided by the KVK experts and local farmers. If they have validated password then they can create, upload, modify and update their contents. The contents are mostly created from the practical experiences. An illiterate farmer can also contribute in content creation with the help of the KVK experts. The system and the tool they are using to create content was developed by the IITK, in its previous project of Digital Ecosystem for Agricultural and rural Livelihood (DEAL). Recently there are five KVKs (Pratapgarh, Raibereli, Unnao, Kanpur Dehat, Kannauj) working with IITK by providing inputs from their practical experience, according to which the IITK team is trying to build the system. In future they are supposed to work as implementing partners from where the IITK can get some more feedback.

KissanBlog: The 'Kisan Blog' is developed by IITK itself in its previous DEAL project. It was also developed in web 2.0 technology. Here it is used as a very important tool for enhancing communication through audio format (both hearing and speaking), so it is also called as the 'Voice Blog'. One can use maximum 10MB (5/6 minutes) for both question and answer in audio. Content can also be created in textual format. The process of uploading is given in details in the allotted space. After uploading any voice or text, one has to put his/her name and choose the content category; and the uploading content will show in the site only after checking by the experts to avoid undesired noises.

Concept Maps(C-Maps): Concept map is a diagrammatically presentation of a concept with arrow and nodes; where nodes present the related terms of the presented concept and the arrow shows the relations of that concept with the other terms or nodes. These C-Map tools are generally used here to develop Knowledge Models. The specific place in the portal are allotted for concepts maps where concept maps of some general and some specific agricultural concept are installed as a sample. This is just because of the better understanding and learning for the content creator as it is also a better way to define any new concept.

Changed Features as on date (November, 2008):

The initial alpha version of AI portal was developed by downloading and modifying the open-source software, named 'liferay portal' while the present 0.2 version of AI portal is developed completely by the computer experts of the project team by using html and JavaScript. The main objective behind changing the techniques is to reduce the time to open the portal. The work process is also going on for changing the 'user interface' (UI) to make it more informative and attractive. The changes in the UI can be noted as follows.

1. In the **Agropedia Indica,** the home page has the portlets 'Search', 'Upload', 'Agrowiki', 'Knowledge Models', 'Kisan blog', 'contact us', and 'PhotoGallery. Figure 2 is a grabshot of the current portal.

2. However, there is no introductory page and the portal is open with the search portlet. Specific features and their changes are noted below

Search: There is no major change in this portlet, other than it becoming the opening page. Only the name has been changed from 'Search agri-content' to 'Search' and the entry in this portlet needs a user name and a password.

Upload: The 'Upload agri-content' is renamed as 'Upload'.

Agrowiki: Previously Agrowiki was available only in English. But now the Hindi version of Agrowiki has been created. So the users have an option to access Agrowiki in their preferred language.

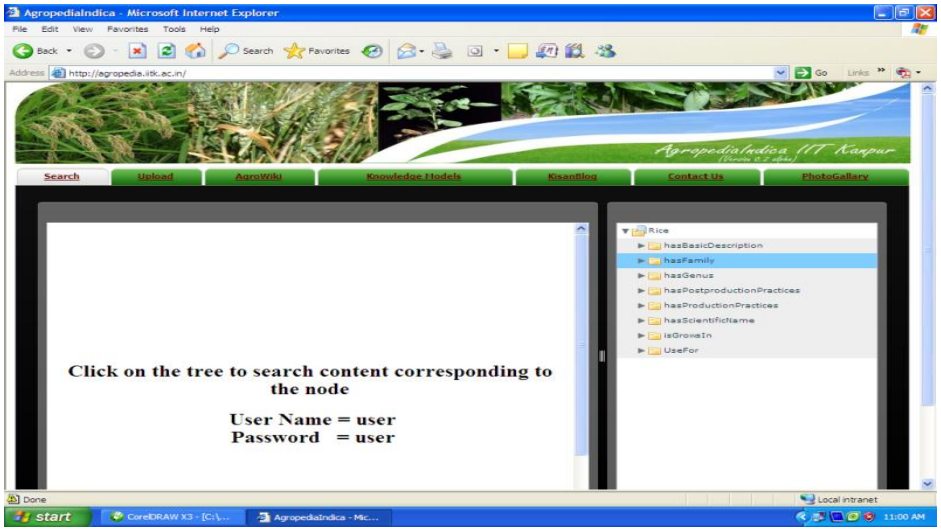


Figure 2. Grab-shot of AI portal taken on 10th Nov, 08

Knowledge Models: This name has been introduced in the place of concept map. This is the model in the form of maps presenting the knowledge through concept maps. No doubt the number of knowledge models, presented in the portal, increased more. Different partners and organisation as GBPUAT, ICRISAT, and TATA Chemicals, after the training sessions from IITK, have contributed a lot in developing knowledge models.

Contact Us: This comes in the place of 'about us'.

Photogallery: This is the place where the photographs related to the work process of the project team are presented. It includes the picture of different workshops, trainings, meetings etc. arranged and provided by this project.

However, we are still in the preliminary phases. The portal may continue to be modified according to users' requirements and suggestions for improvement. For example, a good introductory page explaining what AI is, and hand holding new users and interested browsers on how to use the different portals is the need of the day. We are currently working on this aspect. New emerging technologies, if effective for the project purpose, can also be embedded into it. Very soon we will introduce our next version of AI portal which is hoped to be more understandable and user-friendly. Therefore there is a long process ahead to give the user interface a standardized form. But it will never be final, as continuous modification would be required to keep the portal current, live and applicable.

3.2 Resource Partners

AI is a collaborative project. The main aim of this collaborative effort is to develop an ICT based platform for sharing of knowledge and culture. The same topic can be interpreted differently by the people from different culture and different area. That is why a common platform is essential for getting a complete idea and hence knowledge on a particular topic. In the present context of agriculture, the IITK group wants to fulfill this aim by developing Knowledge models, creating a content repository in agricultural domain and by building an Agri-knowledge community. In this project all the partners have their own roles and responsibilities to make

this project effective and successful. The roles and responsibility of the partners, in the context of AI are detailed below.

Indian Institute of Technology, Kanpur (IITK): The IITK is the main ICT developer and the host of the Agropedia Indica project. It takes the responsibility to build up the web-based portal for Agropedia Indica and the platform for knowledge exchange. It will develop the mechanism for online content organisation. Presently there are people from three broad areas –technical, agriculture, and social science, working together at IITK for developing the AI. The technical experts work on computer architecture and programming for developing the basic technological framework of AI. The agriculture experts focus on developing knowledge models using Concept-map tools, content organisation etc. Already they have prepared concept maps on basic description, production technology, protection technology, and post harvest management of selected crops (such as rice, wheat, Chickpea, green pea, Pigeon pea, sorghum, groundnut, litchi, and sugarcane) in conjunction with GBPUAT, ICRISAT and Tata Chemicals. Moreover, they have been active with the technical counter part in mapping their knowledge and tagging content so that the information is semantically enabled. Two experts of information systems/knowledge models from FAO have come to assist the standardization of the process. Besides this, the agriculture scientists work on providing content on rice through CMS; other contents on different crops from books; update weather reports in AI site with the help of Chandra Sekhar Azad University of Agriculture and Technology, Kanpur; translate and create new terms for '*Agrovoc'(the agricultural thesaurus*) in Hindi. They have also started populating the 'agrowiki' with seed content. The social scientists try to build the theoretical framework from socio-economic point of view and study the knowledge creation process.

This paper is a first effort at documenting the process so far. In this process the social scientists access whether the techniques deployed for network formation and strengthening are inclusive and sustainable, and whether the process provides the right incentives for the partners to participants and new actors to join. Moreover it is important to ensure that the developing environment within the AI group in-house is fruitful and also suggest how best to tailor the web portal and services to real user needs. Thus for the creation of a knowledge community, which is complete in all respects the three group of people need to work together as a team.

IITK has arranged and will continue to arrange workshops and trainer training session for the two participating SAU's and KVK experts under them. The two KVKs that are linked with IITK are KVK-Pratapgarh and KVK-Raibareilly. The purpose is to make these institutions aware about the Agropedia portal management, empower them to use it and convert other extension workers into users, while collecting feedback and suggestions from them at the same time. It enables the partners to create and edit knowledge models as well as contribute content to populate the CMS within the domain of agreed crops. The IITK team develops and shares the guide lines for Knowledge Models with sample Knowledge models on some general and specific agricultural concepts. It helps to develop the Knowledge Models mainly with the help of Concept Map tools.

Thus, IITK has the responsibility to develop the technical platform to support Agropedia Indica from back end.

Indian Institute of Technology, Bombay (IITB): IITB is the ICT developer and the host of the aAQUA, a question answer forum on agriculture, which will be added as a portlet in the front page of the Agropedia Indica.

aAQUA would be available in English, Hindi and Telugu. IITB would help other consortium partners for capacity development in aAQUA management and gives 24x7 hours support to SAU partners. It has already successfully provided the aAQUA platforms to two SAU's for their KVK's and in NAARM and ICRISAT for training purposes.

Indian Institute of Information Technology and Management (IIITM) Kerala: IIITM-Kerala provides the ICT and hosts for the multi-modal engagement and delivery services. It has the responsibility to develop the proper user interface, give advice to web studio design and support for content management in SAU's. It also develops design of decision support systems (DSS) for farmers and provides capacity development and advisory support to NARES partners. It has already trained a number of faculty and ICAR experts in the management of portal-based multi-modal services in support of farmers and extension services. The semantic search capability of Agropedia will support IITM-K's efforts at designing and deploying a DSS.

Govind Ballabh Pant University of Agriculture and Technology (GBPUAT), Pantnagar: The state agricultural university is one of the main agents for development of knowledge models, content providers and an implementing partner. It provides content from books, magazines, articles, literatures, papers and other authentic sources mainly on the selected topics as sugarcane, wheat, Organic Basmati Rice, Litchi and Peas for AI. The scientists can gather knowledge from their experience and other sources and can digitize them after analyzing which are valid and which are not. It works as the intermediary for knowledge transfer to the agropedia repository and engages two KVKs for impact assessment. The university implements the tools, observe the impacts, find the difficulties and give the feedback and suggestions to the ICT developers for the required modifications. It also works for capacity building and strengthening selected KVK's/ARS.

University of Agricultural Science (UAS), Dharwad: This agricultural university, like GBPUAT, is a content provider and implementing partner. It provides content mainly on Rice, Sugarcane, Groundnut, Pigeon pea, Bengal gram, and Cotton. It also works for capacity building and attached with two KVKs for impact assessment. Thus the responsibilities of these two agricultural universities are similar, except that they are working on different crops. Due to time and distance issues, the IITK team has not been able to interface effectively with the Dharwad team yet.

National Academy of Agricultural Research Management, Hyderabad (NAARM): NAARM works as a facilitator to the other partners in their works. It facilitates content sourcing by giving the spatial data sets of land use, soil and other features. It advances in agricultural research and education through the incorporation of GIS tools. It provides capacity strengthening support to SAU's and capacity development of NARS in Knowledge Management.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru: ICRISAT is the Consortium Leader. It works as a channel for communication among the partners and with CGIAR & FAO. Thus it manages the whole project. Beside this ICRISAT works as content provider mainly on drought related issues and provide a full fledged training and test-bed for use by NARS partners and research students in IC tools in extension and education. It also works for impact assessment and identifies and develops new actors and opportunities for system integration.

In brief, for Agropedia Indica, IITK develops the software architecture and deploys it complete with user interface, which hosts the portlets of IITB and IIITM- Kerala, who benefit from the semantic search facilities of

AI for their servers as well. Content, which is the backbone of AI for it to be successfully deployed and used, will be provided by the implementing partners, GBPUAT, UAS, Dharwad and ICRISAT. The resources of NAARM could be used to introduce and popularize the AI. ICRISAT is also the Consortium coordinator which works as a channel for communication and over all facilitation.

4. Social Perspective:

4.1 Objective

The purpose of the NAIP-Agropedia Indica project is not only to develop an efficient well designed platform for agricultural knowledge management, but to ensure that it is effectively deployes by socializing the whole process. The top-down push system, with a path like, Research→ Technology →Implementation is not effective as it bypasses user needs completely. A 'Need Analysis' helps to understand the existing problems from the user perspective, the gap between "what is and what should be" and contextualize it in the right socio-economic circumstances. So before developing the AI portal, the first task of the IITK team was to know the urgency for and the awareness of people of the need of ICT based infrastructure. This is followed by empowering the implementing partners to use the AI platform so that they can influence more and more people to use it. Moreover, it is critical to involve these partners in the implementation of the platform itself. IITK's efforts toward these objectives are described next.

4.2 Tasks and Deliverables

The social science team supports the technical team by interfacing with the other project partners to develop use cases, providing feedback on the services designed, keeping the team together and devising mechanisms for evangelizing the use of agropedia. Thus, they represent the user (in addition the agricultural scientists) and give their views, suggestions and comments on the tools being developed, to make the systems as user friendly as possible. In addition, training and capacity building to evangelise the use of agropedia is an integral role of the social science group. In more abstract terms, the task of the social science team could be interpreted as one to develop mechanisms to populate 'Agropedia' and make its use sustainable by enabling a network to continue using it and dynamically improving it, though no specific deliverable is associated with this activity.

4.3 Process

Any system is accepted by people of a society when they find it useable and helpful for them. The evangelization process indicates 'how to learn one's culture and how to belong in it'. The IITK team is thus building agropedia in consonance with the culture and the need of the users (extension workers) and wants to involve as many people as possible in the building process, which itself would propagate better use. Even after development of agropedia, it may be necessary to modify it according to changes in the tastes or needs of the users, developments in technology, or on a broader level, with changes in the situation such as infrastructure availability. Thus the purpose of the project is to develop the system by keeping in mind the culture, value of the society and the ability of the people. For this, agropedia works within the existing social

system and uses the strength of the prevalent social capital through building up proper networks. Some specific initiatives of the social science team include:

Ms. Margherita Sini of FAO with the IITK agricultural experts

Ms. Antonela Picarela of FAO (volunteer) and Mr. Jiteendra Singh of IITK (Project Engineer) with the KVK scientists of Pratapgarh

4.3.1 Need Analysis Studies

1) Need analysis of the farmers (completed)
A detailed study was undertaken, using questionnaires and interview techniques. The following is a summary of the findings, which does not throw up too many new issues.

Each and every farmer faces the problem of lack of information or more specifically the reliable source of information. Not getting any reliable and conveniently available source nearby, the farmer depends on seed sellers for information; even knowing that the sellers cannot be relied upon because they push products that give them higher margins. Though different initiatives have been taken by the government to provide information, small and marginal farmers are not able to get it, mainly due to the barriers of language of communication, cost and time involved in accessing information and social barriers of caste and community. Moreover, many times the information is not in line with the queries of the farmers and while answering, the experts use many technical terms. These make farmers less interested to search for information from the experts. Sometimes they are hesitant to ask questions just thinking that they would be made fun of.
Farmers need information in simple form that they can easily understand and obtain. Their queries are related to seed variety, pesticide and weedicide selection, weather and cultivation technology, government schemes and policies. Most queries are local related to cultivation. The information is best absorbed if it is in local language, with pictures, voice and movies; demonstrated or given in an interactive session in a friendly environment. To reduce farmer hesitation, experts need to respect farmers as sources of indigenous knowledge and encourage sharing of knowledge rather than dissemination.
Beside this, most farmers are not well versed with KVKs and their activities. Many of the KVK scientists are frustrated as they do not have adequate administrative support, are not involved in the extension planning process (as all technologies are introduced in a centrally planned top down manner without taking into account local intricacies), and sometimes do not get access to information and support of experts immediately to answer farmer queries. To make the process effective, feedback from using any technology should be taken from the farmers and incorporated; this is absent in the present government structure.

2) Need Analysis of the KVK scientists (in progress)

The information is being collected in different ways, through questionnaires from and direct interaction with partner KVKs, direct interaction as well as implementing partners as GBPUAT and UAS Dharwad.

4.3.2 *Workshops, Evangelizing-Meetings and Training Sessions*

IITK has already successfully organized some interactive sessions to drive awareness of the agropedia initiative and develop knowledge models in an inclusive and democratic manner. A summary of these are presented below, in chronological order, with actual minutes of meetings attached as Annexures, where available.

1st Rice Workshop at IIT Kanpur

The first workshop was on rice was held at the Visitor's Hostel, IITK from 14th -16th February, 2008. The objective was to understand the knowledge modeling aspects of rice. A number of delegates came to attend this workshop from different parts of the world particularly from FAO, NECTEC (Thailand), London School of Economics, ICRISAT, Dharwad AU, GBPANT AU, ICAR, and HBTI of Kanpur. The experts of the five KVKs, working with IITK and the members of a NGO named WIZMIN, working for the rural people, also joined in this workshop. We discussed about the vision for Agropedia, its necessity, the work process, action plan, prospects and objective of the KM consortium, responsibilities of different actors, the need and importance of extension services, Agrovoc in flavor of technology 2.0, use of Semantic Tool to build a Repository of Reusable Information Objects in Agricultural Education and Extension, and synergies in collaboration. The focus of the workshop, however was on obtaining inputs for a rice knowledge model for AI including aspects of rice production technology, extension needs etc., and to set the tone for a collaborative effort to build AI. The outcome of the workshop was clarity among the different partners on their roles, some action points and a reiteration of commitment to create an agri-knowledge e-community and build the best and most useable agricultural portal in India, which could have international usability as well. Annexure I provides a detailed report on this workshop.

Dr. V. Balaji from ICRISAT speaking on Prospects and Objective of the Consortium

Dr. Johannes Keizer from FAO speaking on Knowledge Models for “Agropedia Indica” – Rice

Dr. T. V. Prabhakar of IITK sharing his view on Agropedia- The Vision and The Project

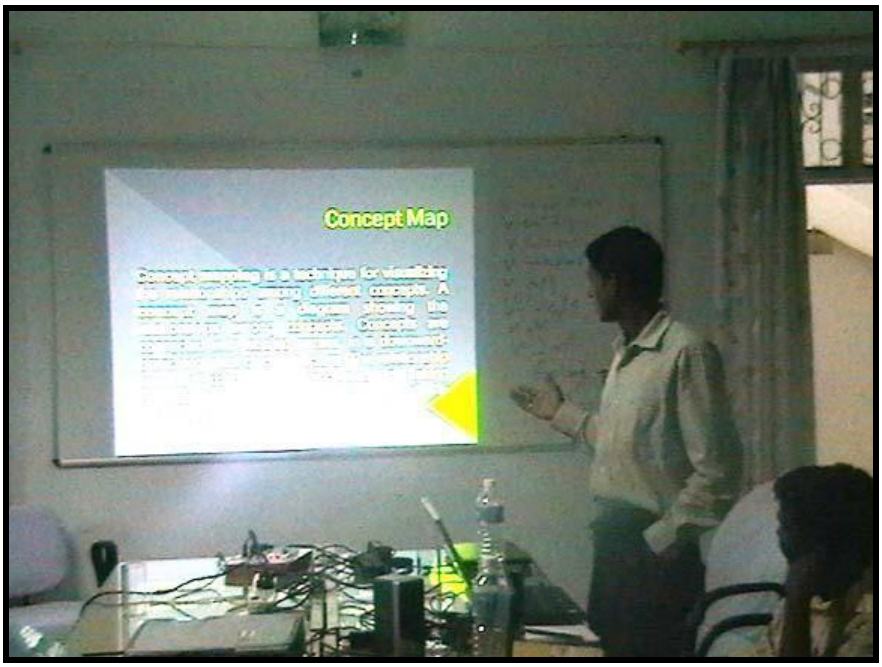
Dr. J Chatterjee of IITK, Dr. Johannes Keizer from FAO, Dr. Asanee Kawtrakul from NECTEC with the other participants attending the workshop

Dr. R. Sarkar of IITK, Dr. D. Tiwari from GBPUAT, Ms. Margherita Sini from FAO, Dr. Asanee Kawtrakul from NECTEC, Dr. D. Pattanaik of IITK with the other participants attending the workshop

2nd Workshop /1st Training Session on Knowledge Models at Pantnagar

The second workshop on Knowledge Models was held in Pantnagar from 31st July to 2nd August, 2008, to train the scientists of GBPUAT and their KVK experts. The IITK group comprised three technical experts, a knowledge model expert of FAO and an agriculture expert. They discussed in detail about how to develop Knowledge Models with the help of C-Map tools and how it linked with content uploading onto the AI web site. In addition hands on training were provided on how to use different portals added in this web site for better understanding. The IITK group needed objective feedback on whether the scientists are comfortable with the AI web site and the techniques that were being used and the difficulties and problems faced, based on which the AI portal could be modified. A questionnaire developed by the social science team was used for this purpose. Annexure 2 provides the minutes of meeting from this training session.

Ms. Margherita Sini of FAO giving guidelines on Knowledge Models to GBPUAT team



Mr. Jiteendra Singh of IITK giving demonstration on Concept Map tool to GBPUAT team

Ms**.** Margherita Sini of FAO, Dr. K.P. Singh of GBPUAT and Dr. Vimlesh Yadav of IITK with other GBPUAT members in the training workshop

Workshop on understanding User needs and Follow up on KMs

Prof. T.V. Prabhakar, Mr. Jitendra Singh and Ms. Sugatha Chaturvediof the AI team visited the Kisan Mela on 5th October 2008 organized by GBPUAT in the university campus. On the second day they participated in discussions with NAIP team members of GBPUAT. The IITK team has also arranged for some training on how to upload knowledge models onto the IITK server, how to access knowledge models from agropedia.net, how to upload content in agropedia portal and how to write in Agrowiki. From their discussion several points emerged on the finer details of knowledge models, and a future action plan was developed, as can be seen in Annexure 3.

Dr. T.V. Prabhakar and Mr. Jiteendra Singh of IITK showing the Rice Knowledge Model (developed by IITK) to GBPUAT members

The GBPUAT team and The IITK team discussing on Rice Knowledge Model

Train the trainers Session at IITK for Consortium Members from GBPUAT

Kiran Yadav and Kamini Bisht of GBPUAT came to IITK for complete training on knowledge models (the CMAP tool and the relationship building) in a three days programme from 13th October to 15th October, 2008. This training programme helped reduce confusion and solved the problems that were being faced by the KM developers in GBPUAT on the five crops, organic basmati rice, wheat, vegetable pea, litchi and sugarcane.

Ms. Kiran Yadav and Ms. Kamini Bisht of GBPUAT for training session on relationship building and knowledge model at IITK

Workshop on Understanding User Needs and Determining Content Type

A team of five agricultural scientists and two computer experts from IITK were at GBPUAT on on 23rd October, 2008 for deciding the type and form of the agricultural content for the content management system of AI. The meeting was very useful, resulting in the revision of some of the terminology that were being used in the agropedia KMs. It also paved the way forward for work to commence on building the content management system.

Dr. M. K. Kulshrestha of GBPUAT giving suggestions on type of content of Agropedia Indica to the IITK team

Dr. K. P. Singh and Dr. M. K. Kulshrestha of GBPUAT sharing their view on type of content

Evangelising meets at Delhi

Dr Runa Sarkar of the AI team addressed the consortium on Agroweb – Digital Dissemination System for Indian Agricultural Research (ADDSIAR) at Delhi on 18th July, 2008. The objective was to kindle the curiosity of the ADDSIAR consortium partners on AI and make them aware of this initiative. The presentation on Agropedia stressed the need for different ICAR organizations to participate in the agropedia web 2.0 processes for it to be successful. It was well received with commitments from different partners to contribute to the platform when running and suggestions on methods to evangelise, including targeting KVK scientists who come for training at NAARM to enable and equip them to become part of the e-community.
Prof. T V Prabhakar of the AI team, along with Dr V Balaji of ICRISAT were part of deliberations at Delhi under the aegis of DR N T Yaduraju of NAIP for project formulation to develop a rice knowledge portal. This effort would complement the AI efforts significantly.

Interactions with Stakeholders outside the Consortium – Tata Chemicals

A scoping meeting of the IITK NAIP project team with the members of Tata Chemicals was on 7th and 8th of July, 2008 in IITK. Mr. Praveen Chandra, Mr. Shiromani Kant and Mr. Ramandeep Singh from Tata Chemicals came to IITK to give a clear picture of their work process and the purpose, and to know the work plan and the objective of the project. In this meeting both the team tried to understand how much they could help each other to fulfill their objectives.
This was followed by a visit of Prof. Jayanta Chetterjee, Prof. T.V. Prabhakar and Dr. Vimlesh Yadav of the AI team to the Tata Chemicals office at Noida on 24th July, 2008. A large number of Tata Chemicals employees actively participated in this meeting. After realizing the importance of the knowledge models, Tata Chemicals agreed to collaborate with IITK to develop knowledge models on crop-nutrition.

The third meeting between the two teams was essentially a training session on knowledge Models and COE (CMAP Tools Ontology Editors) tools, held at IITK on 26th and 27th of September, 2008. Mr. Prem Chand Jha and Dr. Vineeta Misra, attended to build an understanding of the techniques of Knowledge Models for developing crop-nutrition knowledge maps. As the visitors from Tata Chemicals were experts on plant nutrition, they also gave feedback on the knowledge models developed by the IITK team. Once again, questionnaires were administered to assess the usefulness of the training session.

IITK will continue to organize and participate in workshops, trainings and publicity sessions to develop and evangelise Agropedia. The next workshop is planned for launching and releasing all the knowledge models developed. This is tentatively scheduled in Delhi around the middle of January. It is expected that several ICAR partners will be invited to the workshop so that awareness and use of agropedia is promoted.

4.3.3 Other 'Evangelising' Practices

In addition to the above initiatives, the social science team has been working towards

a) Preparing flyers and others dissemination materials to be distributed at Krishi Melas and at agricultural university campuses

b) Publishing Articles in popular domain literature

c) Developing Research Papers for conference and journals

d) Developing methodologies for Wikipedia analysis

e) Continuous evaluation of workshops and meetings through analysis of the questionnaire results

The social science team received a lot of feedback from the workshop participants. It also tried to assess and understand the farmers' and KVK experts' needs and expectations from such a knowledge management portal. The AI team continuously modifies the user interface and services provided by the AI platform to make it user-friendly and informative, based on inputs from the social science team. Through the process of expanding the distribution and dissemination of information about agropedia, the ultimate objective is to create a digital knowledge ecosystem in the Indian agriculture domain where the whole process of Knowledge creation, sharing, and transfer grows automatically and able to sustain with changing environment.

5. Conclusion

As knowledge creation and exchange is an open- ended process both with respect to time and area, there is a need to build a digital ecosystem based ICT platform for the agricultural domain in India. Agropedia Indica is an attempt in this direction. Through the agropedia, knowledge actors from divergent view points, disparate cultures and different geographies with a common interest in agriculture can come together to create novel and useful knowledge nuggets. The ICT based platform developed by AI connects localized knowledge clusters and overcomes the shortcomings in the networks of the existing extension system through channelising knowledge flows and knowledge. The structure of the network is neither too organic nor informal, nor too rigid or hierarchical so as to promote the process of knowledge co-creation. Moreover, local interaction coupled with interaction with other knowledge nodes in the e-community would create a dynamic process of knowledge creation. In building up and strengthening a structure of communication and collaboration among the actors in Indian agriculture, AI aims to exploit the existing social capital based network structure.

ANNEXURE -I

Rice K. M. Workshop 14-16th February 2008

Indian Institute of Technology Kanpur, Kanpur 208016

Day 1 **Title: Introduction to Workshop**

Speaker: J. Chatterjee

Theme: The Rice KM workshop is organised at IIT Kanpur as a part of the NAIP project, to understand the aim and objectives of the project and chalk out a plan of action for different partners of the consortium. In the present era ICT is a potential enabler both for agricultural and social development. The Challenges in-front of Indian agriculture are diverse To achieve a productivity of 4% growth rate in agriculture India needs a knowledge driven way of doing agriculture in an innovative way. This in itself is a challenge in terms of research, technology, and implementation. In this direction *Agropedia Indica* proposes a new way of knowledge management to Indian agriculture sector. Knowledge in the agriculture domain consists of both scientific knowledge (*Gyan Dhara*) and localized knowledge in the form of experiences from the field (*Jana Gyan*). However in the absence of proper mechanism to capture those knowledge most of the innovations taking place around different parts of the country did not diffuse from one region to another. The *Agropedia Indica* tries to create an encyclopedic knowledge both to meet the contemporary need of the farmers as well as scientist in an easy operable and convenient way by using different ICT tools.

Title: Research and Development IIT Kanpur

Speaker: K. Muralidhar

Theme: IIT Kanpur (IITK) beside formal teaching caries researches through its nine engineering departments and four basic science departments. The aim of the institute is to promote interdisciplinary work in various areas of engineering and basic sciences. The institute has developed several research centers within the institute toward this end. Media Lab, Design Lab, Digital innovation, Environmental Science and Engineering, Archeology and cultural resource management are some of the examples of this effort. Out come of the research are produced in the form of doctoral and master's dissertations, publications and patents. The institute has established a centre for incubation and enterprise both to promote entrepreneurial activity based on new technological idea and IITK supported technological interfaces. Funding agencies for research activity at IITK involves various national agencies and international agencies. The R and D of IITK support

interdisciplinary, interdepartmental and inter-institutional research activity. The collaboration of FAO and ICRISAT with IITK to promote agricultural productivity is a new dimension added to the ongoing research activity of the institute. The out come of this effort will go a long way and serve millions of farmers of this country.

Title: IME Department and this Project

Speaker: N. K. Sharma

Theme: Rice is a major consumable product across the globe. It has both religious value as well as economic value. For example a broken piece of rice is not used for any kind of religious ceremonies. Cultivation of rice in India has a long tradition and many forms of episodic knowledge are embedded in it. In the absence of a proper mechanism to capture it a large segment of it goes unnoticed. Long back Isigayi (a Japanese author) has predicted about the importance of information in the future era. Digital tools and technologies can potentially transform Indian agriculture through knowledge creation and value addition. The effort of the Department of IME to encode these knowledge's through ICT tools is praise worthy. Above all collaborative contributions expected from this workshop will not only create new knowledge structures in the domain but will also create new avenues of research in the management discipline.

Discussants:

Dr. Patil

Ouestions:

Should our understanding be limited only to the understanding of relationship between information and knowledge or should it be broadened to understand the process of wisdom as well?

Title: Prospects and Objective of the Consortium

Speaker: V. Balaji

Theme: At present Indian agriculture extension faces crisis in terms lack of coordination between research education and extension worker. Observation shows that the best collaboration that U S and India ever had was collaboration at agriculture frontier. The consortium assumes that giving collaboration between different unusual agencies we can build a global expanding knowledge system for betterment of human society. Much of the work in this direction has been come out through support of ICAR. Currently there are many expectations from the project. Dr. M. S. Swaminathan (Agricultural Scientist and Parliamentarian) has a keen interest in the project and is likely to make a statement on this at the parliament some time latter.

Title: Prospects and Objective of the Workshop

Speaker: T. V. Prabhakar

Theme: This workshop is organised to understand the Knowledge Modeling aspects of rice part the *Agropedia Indica*. *Agropedia Indica* is a collection of knowledge objects; however above it there is a knowledge model. In a very general sense a knowledge model is like an index section of a book. There are not many variations or no variations in index of one book from another. There exists a substantial agreement on what an index of a book looks like and how it should be organized, and built. The same is the case with a knowledge model. Thus a knowledge model cannot be built by one scientist. For example for a particular kind of problem Tata Chemical will have their own perspective, research scientist another, and extension worker may have another view. In actual terms of use what farmers use are a set of knowledge derived from multiple sources, may be of two or three different types of scientists. The task is thus to create knowledge models from multiple points of view by individual scientist and then combine them to a unified form for the use of the farmer. The purpose of this workshop thus is to address some of these issues:

What are these maps/models?

How they are constructed?

Who is going to be the end user of it?

What should be the map consists of?

Title: Knowledge Models for "Agropedia Indica" – Rice (Keynote address)

Speaker: Johannes Keizer

Theme: FAO is a specialised agency of UN working on rural livelihood issues. The World Food Summit (1996) aimed at reducing poverty and hunger by 50% by the year 2015. In reality the goal is far-away from its realization. The millennium goal of FAO is to ensure food security for every one across the Globe. However FAO is not a funding organization rather FAO's aim is to identify and disseminate appropriate scientific knowledge most useful for agriculture across the globe. Thus FAO is primarily a knowledge organisation and foster partnership, collaboration, and culture for knowledge sharing. FAO follows the mechanism of "offerability," "usability" and "co-operation" for operation. In order to achieve its goals FAO advocates the use of common standards. In the last three years there is an enormous increase in people who use internet. A lot of digital tools and technologies have been developed such as Wiki and blogs to promote social networking and

knowledge sharing through web. However from a technological point of view Wikis and blogs are not a new phenomenon. Wiki technology was developed in the year 1998. In the same year FAO has developed a kind of blog for rapid publishing. The real revolution is not of technology but of numbers of users using the technology. Irrespective of enormous growth one cannot deny the lack of "critical mass" and "infrastructure" in this domain. But one can assume that if we can develop interesting business applications to be used, infrastructure is likely to follow them. The problem current computer technology has is in terms of meaning and interpretation. While human beings can interpret the difference between similar categories of objects computer can not. Thus there is a need to create a structure that computer can understand. In this direction semantic identification and meta-coding becomes essential. Invalidated meta-data are useless. We need validated meta-data to create ontology registries making it possible for different organisation having own machine readable forms can use one registry through out the world. *Agropedia Indica* is a global compendium of agricultural knowledge. There are various kinds of data bases stored by different organisation. It aims to provide value added services to different user groups through multiple portals, combined to one i.e., *Agrovoc*. The technological structure of *Agropedia* consists of Wiki, Blogs, Statistical data, eGovernance, and question answer forums. The success of *Agropedia* depends on three factors:

Amount of content

Prototype regarding partner and topics

Involvement of number of partners

FAO want to broker that one country's experience and results can be useful for other countries in the world, where ever people want to set up knowledge sharing system to work for a better life.

Discussants:

Drs. Patil, TVP, and Jayanta

Questions:

Is role of the end user (farmer) in the prototyping process is structured?

Replies:

The Role of end user is an open issue.

The target user group of *Agropedia* is likely to involve agricultural scientists, social scientists, extension professionals and well as computer scientists. There fore the assumption that end users are farmers does not make much sense.

The experiences of DEAL shows that with current literacy and language barriers it is best possible way that our farmers are represented through the extension workers. However the issue is not limited to farmers, but several other groups like traders, retailers and self help groups, this is just a beginning with all of them.

Title: Agrovoc in Web 2.0 Flavour

Speaker: Margherita Sini

Theme: *Agrovoc* multilingual thesaurus was first developed in a text format in 1982. In the year 2000 it was converted to a data base and various other forms of data bases were included in it. Today *Agrovoc* stands at a collaborative platform. Partners in *Agrovoc* can create, translate or even create new terms in *Agrovoc* thesaurus. The aim of this collaboration is to create a full fledged ontology for the thesaurus by standardizing them to a commonly agreed ontological structure. The focus of present collaboration is to develop both ontology and tools for creating common standards. By developing a common set of tools and standards (URI) we assume that every one can access the same copy through web services. Primarily *Agrovoc* is based on mapping concept trees. A concept tree sees hierarchy between concepts. Our aim thus is to extract concepts from various resources which have rice and related to rice and then organise them in a concept tree format as well as to define the relationship between them in a semantic way. Our partners in the consortium are expected to focus on this issue. Broadly the partners are expected to find out ontology and tools to represent resources, competency, and expert's map of existing schema as well as desired user interface.

Title: Agricultural Extension

Speaker: V. C. Patil

Theme: The aim of extension education is to transfer latest technology from the lab to the field. In Dharwad the front line extension work is primarily carried out by the Directorate of Extension, Karnataka beside several transfers of technology centers also carries extension activities in the state. Currently UAS Dharwad has two partners for extension activities; KVK at Gulbarga and Extension education unit of Dharwad. The research and extension activity of the university are published through publication centre of the university. The university also has an ATIC established in the year 1996 to cater the needs of the farmers in the region. The university carries training progarmmes for the extension professionals and scientist through its Staff Training Unit. The extension activities of the university are carried out through field demonstration, trainings, farm visits, exhibition, print media seminars and other electronic mass media. The university believes in

the approach “one scientist to one farmer” across the country. Currently the university also promotes contractual farming among the farmers. Since 1998 the university has started recording the experience and achievements of outstanding innovative farmers in the region.

Discussants:

Drs. TVP, Kulsherstha, Jayanta, Patil, Balaji, and Keizer

Questions:

What is Contractual farming?

What are the mechanisms for knowledge auditing and capturing?

What are the ways to involve various market agencies?

Are we restricting ourselves? How many years it will take to develop a full fledged ontology?

Why should not we use locally available dictionaries for agriculture?

How to fulfill ICAR’s expectations?

Replies:

Contractual farming is just like a project for farmers. It is a form of agricultural service where farmers who perform actions are contracted. University in this case acts only as a service provider.

The field studies conducted by the DEAL team shows that out of 74 KVKs investigated, not even three of them were neither using available knowledge in Web nor contributing any thing. They demanded contents in vernacular languages for use and share. Also In agriculture the team did not find any vocabulary in Hindi. The only available vocabulary was Govt. of India’s Standard agricultural vocabulary having 4000 terms, where as the current FAO vocabulary contains 30,000 terms. So a gap exists there. To create a new, particularly in digital format there is a need to define standards and terms. This is also the reason why there is a necessity to develop an agricultural ontology combining different sources and views. The *Agropedia* is a journey and it requires networking between various agents to achieve the goal. The final outcome would be a technology independent, literacy and language independent product. However there is a difference between *Agropedia* the vision and the project. In the project the aim is to develop ontology for four crops in a time bound frame work. With a limited time frame work it is impossible to include the farmers, traders, etc in the project; rather it is possible to reach them through the organisations who are working with farmers such as KVKs and SAUs.

We have multiple streams and action can be done in parallel ways. Information on trader and market can be done immediately with collaboration of Drs. Jayanta, Balaji, Patil, and AIMS.

Agriculture today has a crisis in reaching globally through web and this is just a beginning to address that crisis.

Currently the DEAL team has collaboration with NCDEX for prices on commodity trading exchange. But our aim here is to empower people who work with farmers perhaps in this way we can empower farmers as well.

Product is an out come of stage wise movement. In the beginning we have to start with one component in the system then through step wise momentum we can achieve the goal. The FAOs observation on Question Answer forum shows that farmers hardly use it. If we start doing something directly for farmers it may not work.

If people are ready content will be there, if farmers are ready we can have content from them.

Title: Agricultural Knowledge Portal for Knowledge Services

Speaker: Asanee Kawtrakul

Theme: Agriculture domain is a highly embedded system consists of various segments such as agritronics, service science and management, knowledge management and tracking systems. A knowledge portal consists of knowledge assets of knowledge providers and knowledge consumers. We need knowledge portal for two purposes: first to capture various forms knowledge assets involving multiple tools and techniques and second to promote knowledge extension in the domain through knowledge services. Currently information in the web lies scattered. At present neither no single page seems to have all the facts nor no one fact seems to be in all pages. The required information is usually over load since there is no content aggregation. There fore there is a need to create knowledge ontology in the domain. To construct knowledge ontology we need topic maps which facilitate aggregation, organization and exchange of information. Topic maps consist of topics, associations between subjects and occurrences. Once we have topic maps we can extract salient information from the text using information extraction which can enable the user consume those information faster. To achieve this we need a synergy between knowledge content owner and knowledge engineer. We also need to focus on user interest in each level and social network with domain specific stakeholders. There is also need of support from top level people. Above all we need attractive tools to construct knowledge ontology. Our success depends on community's knowledge sharing, continuously maintenance of the tools and services as well as collaboration of related stakeholders with different roles.

Discussants:

Drs. Keizer, Jayanta, Patil, and Balaji

Questions:

How information extraction is different from knowledge extraction?

How do you extract information?

Why price is not an agenda in the farmer's preferences?

Replies:

Information is extracted from various data bases while Knowledge is extracted particularly from information data base.

Currently at NECTEC extraction of information occurs through natural language processing from html versions of news paper.

Price is an important agenda because when farmer choose a crop price is the first consideration of the farmer. However the situations in North India are quite different. Here at the time of sowing seed and pest are prime considerations of the farmers while at the time of harvest it is price, because in UP the farming practices are of Wheat and Rice cycle. Farmers here have bad experiences in terms of Jetropa cultivation where they were paid a very low price than the promised one. So farmers here did not want to change the farming cycle.

This has happened here because of international pressure, where some international agencies are pushing a particular crop in this part of India and do not encourage a variety of agriculture in Gangetic plains.

Title: Some thoughts on Rice Modeling

Speaker: Manoj Kulshrestha

Theme: There are three components of knowledge modeling; knowledge objects with tags, knowledge structure with links and perspectives based on user needs. Crop knowledge modeling specifically has two dimensions. It consists of knowledge objects and user perspectives. Knowledge objects of crops are defined by their uniqueness, key characteristics and relationships between them. Similarly users perspectives are designed by who are they, what their needs are and what are their approach to access this knowledge? In terms of rice knowledge objects can be classified in to nine categories; basic description, production technology, protection technology, farm resource

management, natural resource management, sustainability issues, harvest and post harvest management, Agri- business management and others (such as helpful tips, conversion tables , etc.).There are four types of possible users of agriculture knowledge models; academic, administrators/policy makers, farmers/extension workers and industrial markets. Based on these we can say that there are four types of possible knowledge models that the consortium can develop; time line model, diagnostic model, market oriented model and socio-economy based model.

Discussants:

Drs. TVP, Kulshrestha, Keizer, Balaji, Jayanta, and Runa

Questions:

How farmer's perspectives are different from extension perspective?

If farmer's perspectives are different from KVKs perspective, is there any form of consensus on unifying these different perspectives to one? For example price information, NCDEX portal collects information from various sources, but there is a consensus among different stake holders about the price of a particular crop. Is it similar in the case of farmers and KVK scientist?

Replies:

There are differences in farmer's perspective and extension workers perspective. For example from a patient's perspective a disease is a form of pain while form a doctor's perspective in is a symptom of abnormality.

Farmers may have pest problem can explain it as a leaf with a red spot, while and extension personnel may understand it in a different way from his past experiences. But what crucial at present context is capacity building.

If the farmers have more capacity to explain a problem, the more it is easy for the experts to find a solution for the problem. The aim of this project is to build capacity. There are a few tools with ICAR and we can also use them if we need in future.

There are many organizations working on price information the consensus that is asked here is related to the project.

KVK scientist besides looking at the regular problem of farmers has to look at the mandate of ICAR, which is possibly reflected in their approach to the problem.

What the project aim at is really looking not how different people approach to a problem differently, rather trying to address the issue that there is a problem, which is true for both the farmers and experts and there is a consensus among the two how to solve the problem.

Title: Use of Semantic Tool to build a Repository of Reusable Information Objects in Agricultural Education and Extension

Speaker: Gerard Sylvester

Theme: Agricultural information is diverse and there is no unified view to integrate resources. Unification of information in the domain is challenging. One way to approach the problem is through semantic tools and topic maps. Schematic tools such as wiki can work as primary tool where topic maps as secondary. Presently ICRISAT aims at better and more efficient extraction and aggregation of agricultural information resources along with better content navigation and better content organization. The topics maps are constructed based on *Ontopedia* and information are derived from websites and VASAT, which in itself is a semantic wiki.

Discussants:

Drs. Jayanta, Patil, Balaji, TVP, and Keizer

Questions:

How do you decide to break up the information?

Can we use Microsoft multilingual package for our purpose?

Have you taken resources from Cabicompendium?

From our perspective how we are going to built *Agropedia* and how big it is going to be?

Replies:

Break up of information are done by the experts of the domain. For this their collaboration is essential. Also understanding of some kind of domain knowledge is essential for the technical people to break up the information.

Using Microsoft multilingual package is just a matter of choice and resources can be taken from any URL you like.

There is no limit or scaling about *Agropedia*. You van make it as big as you like. However the problem of scaling is not about information. Problem comes when we try to infer with very big files. Thus the modular technology is going to be a big idea in *Agovoc* project. Thus instead of a large container there will be multiple numbers of modules in the *Agreopedia*.

Title: Agropedia the Vision and the Project

Speaker: T. V. Prabhakar

Theme: There are many ways to build index; concepts, topic maps and so on. Further more one can be transferred from one to another. Out of them concept map is both easy to use and manipulate. The aim of the workshop is to understand how to construct knowledge models, how to tag them properly and generate a time line to achieve these objectives. The IIT will build the content (some of them), a platform to use. When people follow *Agropedia* they have to follow the *Agropedia* model developed by us. *Agropedia* is an agricultural knowledge repository of universal meta-models and localized content for a variety of users." The essential features of *Agropedia* are appropriate interface and multiple languages built in collaborative mode. *Agropedia* consists of NAIP portal, having windows for each participant. The content has to come from different partners of the consortium such as AQAA and IITB, ICAR. There will be a central repository to be hosted at PUSHA New Delhi. The back end of the *Agropedia* the technical platform will be developed by IIT Kanpur. IITB will use the taxonomy we generate. Once we give them the knowledge model they will create questions and answers. If several users will start to use same knowledge model then it will eventually become interoperable. Agricultural experts will build repository which is localized our partners in the consortium such as GB Pant and Dharwad will build knowledge models which is globalised and we will provide a technological platform to support it at the backend.

Thus the agenda for the workshop is to understand:

What are perspectives?

What are Knowledge Models?

What standard to use?

What technology to use and how to build it?

What are the processes?

And finally apply all this to rice.

Discussants:

Drs. Jayanta, TVP, Patil, Keizer, Balaji

Questions:

Is IITK going to address the issue of interface?

Does the knowledge model have to be all inclusive?

Should IITK focus on collection of content and acquisition?

Are there are possibilities to integrate other schemas such as if I want to see no of articles on a particular topic I can see it?

What are Wiki possibilities?

What we should do for dynamic content?

Replies:

The task of IITK is not user interface; it has to done by AQUAA, IITB and IIITM Kerala. We have only to do with back end.

Knowledge models certainly have to be all inclusive and should contain all the information.

The focus of IITK is on backend. The collection of content and user interface has to be done by IIITM Kerala. The content source can be sponsored, mined, co-created or external sources. However at current scenario harvesting of external sources might not be possible as there are issues related to IPR.

The agricultural scientists who are going to put content will use a word template “Agris.” This is where the Wiki has a role. Mostly it will deal with uncertified knowledge.

The experts at Dharwad can take the knowledge from different partners and other sources which are not digitized and should say which are valid and which are not.

Currently collection of content is responsibility of Dharwad and GB Pant. In the case of dynamic content it is their responsibility as well. They can use their own approach to do so. IITK can use its own approach if necessary.

Day 2 Title: Rice Production Technology

Speaker: K. Manjappa

Theme: Rice has five varieties of ecosystem. Practice in rice cultivation depends on the ecosystem, However it can be classified into eight categories; seed selection, land preparation, nursery rising, transplanting, fertilizer management, weed control, irrigation management and pest management. Currently Dharwad Agriculture University has developed inter cultivation process for rice by using a rotary weeder. The weeder can remove the weed as well as cut roots of the plants partially which helps in their better growth. The weeder has to be used three times during the entire cultivation period (Shown a movie on how to use rotary weeder).

Discussants:

Drs. TVP, Balaji, Patil

Questions:

Replies:

If we want to embody videos to our portal then videos should be cut into segments just like learning objects

It is better if we can have a Wikipedia model where images/videos can go in parallel with text.

Videos should of very small size so that download times are less and they should be combined with informative audios.

Title: Agropedia the Vision and the Project

Speaker: T. V. Prabhakar

Theme: The over all aim of *Agropedia* is to create knowledge in the agriculture domain so that productivity of agricultural product is substantially increased. *Agropedia* is an agricultural knowledge repository of universal meta-models generated through collaborative effort. Agropedia broadly aims at three processes; generation of knowledge models, content aggregation and building Agri-knowledge societies (communities). Knowledge models are just functions of its use. The future *Agropedia* is like to have a feature of much more similar to a call center operator. At the current stage of development *Agropedia* involves three sets of actors; users (IIITM Kerala and IITB), populators (GB pant, Dharwad and ICRISAT), and platform designer (IITK). Knowledge models of the

Agropedia will be constructed form sponsored as well as collaborative knowledge objects. Content to the *Agropedia* has to come from different partners of the NAIP Project and IITK's KVKK partners. AQAA, farmers' and agriculture experts will decide the user interface channel of the *Agropedia*. The final version *Agropedia* will consists of two components conceptual architecture and deployment architecture. The Deployment architecture will carry three layers; interface layer, semantic layer and resource layer. At the interface layer there will be NAIP portal, *Agropedia Indica* and other user interfaces such as question answer forum (AQAA). The resource layer will carry contributions made by different partners particularly of AQAA, GB Pant and Dharwad. The IITK Kanpur will design the semantic layer which will have domain specific URI, conversion, a set of standards and knowledge models.

Commentators:

Drs. Keizer, Patil, TVP, and Kulasherstha

Questions:

Are we going to maintain identity of the source?

Is it possible to make a portal with our own repository and indexes, and simultaneously provide link to other libraries which can be accessed through our portal?

Is something clear about the project now?

Replies:

Maintaining identity is just respecting an IP.

We can make a portal with our own repository and indexes, and simultaneously provide link to other libraries which can be accessed through our portal. This can be done through *Agropedia Indica* models and services.

The following things are clear:

What we are going to do?

Why we are going to do?

Know what content to give?

Our agricultural experts and partners have exactly what the content are and types. They have to make a structural arrangement of all of it and give it to us.

Day 3 **Title: Synergy in Collaboration**

Speaker: Paolo Dini

Theme: OPAALS aims at creating knowledge through collaboration among community of researchers. At the present era there is an enormous growth in the domain of knowledge. The complexity in the knowledge can be equated with complexities in human dwelling. Thus today we have single phenomena with different names. Focus of study becomes only the object of attention when a researcher works alone. However in collaborative teams it leads many times to disagreement among different researcher particularly on language, focus and objectives of the research. This some times leads to frustration and put motivation of others at stake. Individual agendas are OK but what we need is to help to develop a culture of sharing. Interpretation of text varies from culture to culture; to understand various meaning attached to a text requires collaborative participation and reflexiveness. Within the social science discourse there are two philosophical divisions; phenomenology which looks at the social process in terms of what we perceive and social constructionist who is based on traditions of what we agree. The later refers to the importance of collaboration in contemporary theoretical discourses. Knowledge models are never finished products they are continuously made and thrown away through reflexive practices. It is this requirement of knowledge made that demands collaboration from different disciplines and unusual actors to make it meaningful.

Title: Final Objectives of the project and Outcomes of the Workshop

Speaker: T. V. Prabhakar

		Responsibility				
Task		IITK TVP/ team	ICRISAT Balaji/ team	FAO Keiz/Sini/ team	Dharwad Patil/ Team	GB Pant Kulashrestha/team
Standard	Guide line to build KM	✓				
	URI			✓		
	Define relationship			✓		
	Template	✓				
	Technology/Tools	✓				
	Reports guidelines		✓			
Knowledge Models	Coordination				✓	
	Sample KM				✓	
	Targeted Group	✓	✓		✓	✓
	Indigenous Technology				✓	✓
Content	Template	✓				
	Content putting				✓	✓
Process	Manpower training	✓			✓	✓
	Targeted group	✓	✓	✓	✓	✓
	Monthly report	✓			✓	✓
	Publication	✓	✓	✓	✓	✓
	Agropedia Technical report series	✓				
	Promotional activity	✓	✓		✓	✓
	Team building	✓			✓	✓
	Evaluation criteria			✓		

The objective of *Agropedia Indica* is to create a community of agricultural scientist and built a most used agricultural portal in India.

Rice Knowledge Model (RKM)

Rice Knowledge Model provides access route to knowledge repository in the Agropedia Indica. RKM will precede Meta Knowledge Models for other crops. RKM would consist of explicit knowledge and farmers' extensive tacit knowledge obtained through knowledge capturing process. Knowledge auditing will be carried out before developing RKM in collaborative mode through iteration with multi-agent participation and social network of stake holders.

Degree centrality- the measure for the farmers' connectedness and tendency towards networking has been reported to be the single most significant and positively correlated variable to adoption, which highlights the importance of farmers' interactions in deciding the adoption levels (Hartiwich *et al*., 2007).Therefore user participation will be ensured in developing the model.

The RKM will initially have a two tier approach directed to 1-KVKs (in English/Hindi and Kannada) and 2-Farmers / NGOs / Farmers organizations (in Kannada and Hindi), which can be later extended to several other end users including Scientists, students, policy makers, finance institutions, market agencies, etc.

The various components of RKM would be production and processing technologies, inputs, finance, market intelligence, Government policies and schemes.

The structure of RKM will be built by using concept maps encompassing different domains / sub-domains with the distribution of responsibilities as given below.

Domain 1: Production Technologies

A) ICRISAT, Patancheru

Sub-domains: - Origin and History of cultivation

- Area, Production and Productivity
- Soil and climatic requirements
- Genotypes

B) GBPUAT, Pantnagar

Sub-domains: - Land Preparation

- Nursery preparation
- Sowing and Planting
- Rice based cropping systems / Farming Systems
- Organic rice cultivation including scented / Basmati rice

C) UAS, Dharwad

Sub-domains: - Nutrient Management

- Weed Management
- Insect Management
- Disease Management
- Water Management
- SRI method f rice cultivation
- Aerobic rice cultivation

Domain 2: Post Harvest Management and Processing Technologies (GBPUAT, Pantnagar)

Domain 3: Inputs (Seeds, Manures, Fertilizers, Pesticides, Fungicides, Herbicides etc. (ICRISAT)

Domain 4: Finance Issues (ICRISAT).

Domain 5: Market Issues (ICRISAT).

Domain 6: Policy Issues (ICRISAT).

Domain 7: Government Schemes (ICRISAT).

Suggestions / Comments on the write up are solicited.

Dr. V.C.Patil

UAS, Dharwad

AGROPEDIA Indica

Relationships

In order to realize the AGROPEDIA Indica project, one or more knowledge models need to be developed. This activity implies the use of relationships that connects conceptual objects in the model. In order to allow consistent representation of the information about a particular domain, and in order to be able to use the represented knowledge to perform inference, the use of consistent relationships is necessary.

For this reason is highly suggested to create a registry of relationships for AGROPEDIA Indica, which needs to include:

1. URIs for every relationship;
2. one or more names in different languages for every relationship;
3. examples on the use of the relationship;
4. relationships needs to be organized in a hierarchy;
5. domain and range for relationships needs to be defined;
6. relationships types needs to be identified (both from structural point of view – e.g. data Type or object Type – and modelling point of view – e.g. relationships between concepts or relationships at the term level –).

Specific guidelines needs to be identified also for the definition of relationships, in order to follow standards already existing, and specific namespaces may be reused or created.

An example of a registry of relationships can be seen here: http://www.fao.org/aims/cs_relationships.htm or here http://naist.cpe.ku.ac.th/agrovoc/ (registration and login required).

URI registry

For the development of knowledge models in a given domain, the identification of knowledge objects needs to be done. These objects may be concepts or instances, which may be connected by specific relationships.

In order to be able of reuse work already done, and in order to be interoperable with work done by other people within and without AGROPEDIA Indica, it would be necessary to be able to uniquely represent all knowledge objects.

A registry of URI is therefore necessary, which needs to be kept updated while the knowledge models are built.

Additional mappings can be done a posteriori, in case of similarities are discovered into knowledge models, for example with the use of owl:equivalentClass / owl:equivalentProperty, but in order to allow minimum efforts and maximum interoperability the registry of URI will be of great help.

Margherita Sini

GROUP One

What are the perspectives?

Perspectives.....

I. Farmers, Extension workers, Administrators, Agribusiness and market experts

II. Knowledge model

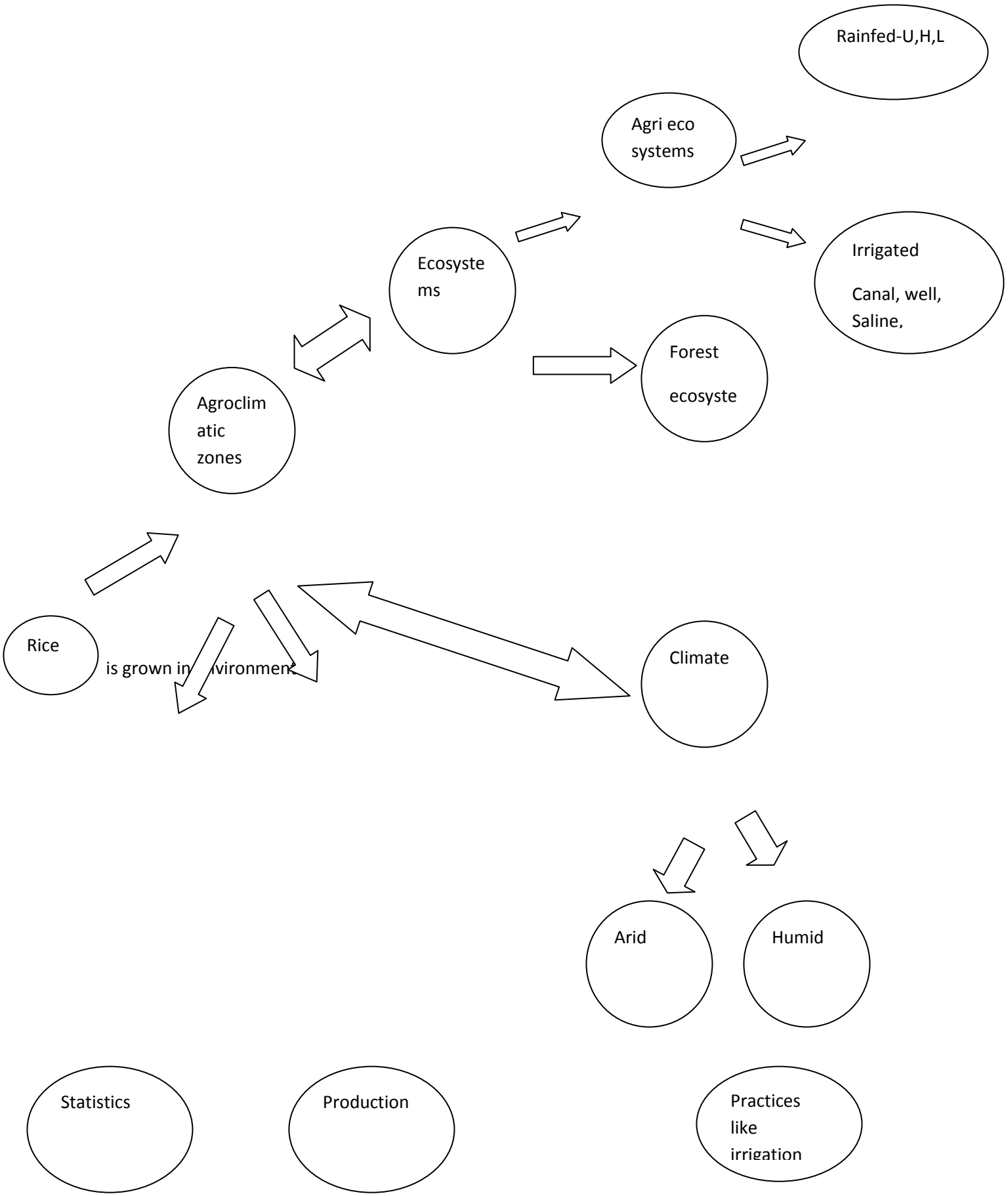
1. Concept model for different agro climatic zones
2. Diagnostic: Weeds, fertilizers, pests
3. Market oriented

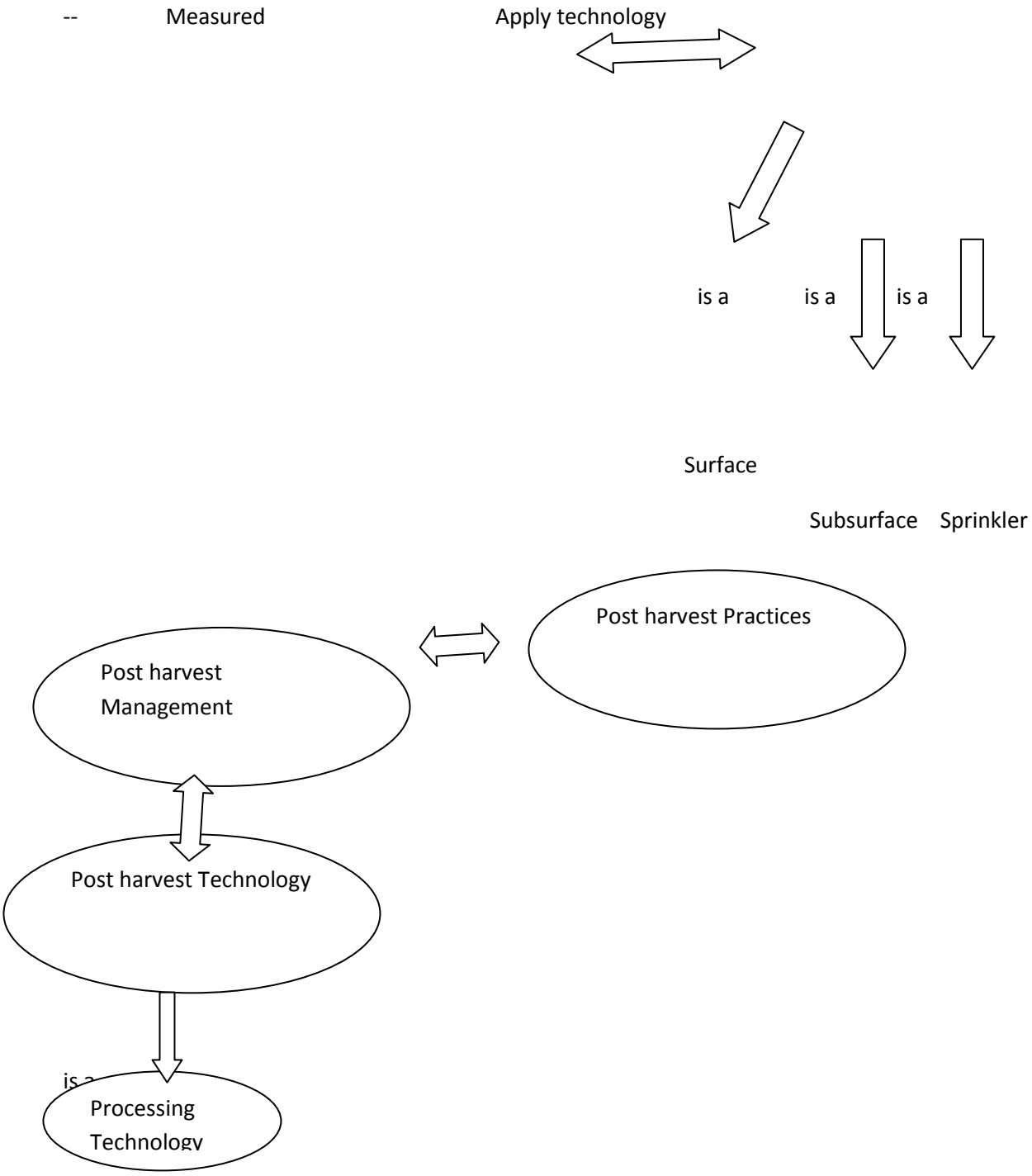
IV. Relationship

Output:

1. Registry a relationships.

2. Produce at least 4 knowledge models


Rainfed-U,H,L
Agri eco systems
Irrigated
Canal, well, Saline,
Ecosyste ms
Forest ecosyste
Agroclim atic zones
Rice
is grown in environment
Climate
Arid
Humid
Statistics
Production
Practices like irrigation



Flow chart is conne cted to Rice **Rice is processed by**

Margherita Sini

A. **List Of The Total PARTICIPANTS ATTENDING THE RICE KM WORKSHOP At IITK**

(14^{th}-16^{th} Feb, 2008)

SL. NO	NAMES	DESIGNATION	INSTIT./ORGANIZATION
1.	Dr. Johannes Keizer	Information systems officer	FAO
2.	Ms. Margherita Sini	Information management specialist	FAO
3.	Dr. Asanee Kawtrakul		NECTEC,Thailand
4.	Asanee's colleague		NECTEC
5.	Ms. Thiranan Damrongson		NECTEC
6.	Ms. Aree Thunkijjanukij		NECTEC
7.	Dr. V.Balaji	Global Leader, Knowledge Management and Sharing,	ICRISAT
8.	Mr. A. Sylvester	Sys. Officer – Research Informatics	ICRISAT
9.	Mr.Ram Naresh	Research Scholars	ICRISAT
10.	Ms. Pritpal Kaur	Research Scholars	ICRISAT
11.	Ms. Shelly Patwar	Research Scholars	ICRISAT
12.	Dr. V.C. Patil	Head of the Division of Plant and Soil Sciences,	DHARWAD AU
13.	Dr. K. Manjappa		DHARWAD AU
14.	Dr. Masthan Reddy		DHARWAD AU
15.	Mr. Shaik Meera	Scientist, Directorate of Rice Research	ICAR
16.	Dr. K.Murlidhar	Dean, R&D	IITK
17.	Dr. Dhande	Director	IITK
18.	Dr. A.K. Singh	Zonal coordinator	ICAR
19.	Dr. Dhananjay Singh	Agricultural Extension	Rai barelly KVK
20.	Mr. Naveen Singh	Agronomist	Pratapgarh KVK
21.	Dr.Bhupendra Singh	Agricultural Extension	Kannauj KVK
22.	Dr. Vinod Kumar	Agronomist	Daleep Nagar KVK
23.	Dr.Shailesh Kumar	Agronomist	Unnao KVK
24.	Dr. Manoj Kulshreshtha	Professor (Process & food engineering)	GB PANT AU
25.	Dr.D.K. Singh		GB PANT AU
26.	Dr. C. Tewari		GB PANT AU
27.	Mrs. Deepti Tewari		GB PANT AU
28.	Dr. S.S. Singh		GB PANT AU
29.	Dr. Paolo Dini		
30.	Chiara Briganti		

31.	Ms. Rita Sangal + 3 other team members		WIZMIN
32.	Dr. Raghvendra Pratap Singh		HBTI Kanpur
33.	Mr. Dharmendra Pratap Singh		HBTI Kanpur
34.	Dr. Jayanta Chatterjee	Professor	IIT Kanpur
35.	Dr. TV Prabhakar	Professor	IIT Kanpur
36.	Dr. Runa Sarkar	Asst. Professor	IIT Kanpur
37.	Dr. Debashish Pattanaik	Research Scholar	IIT Kanpur
38.	Mr. Jeetendra Singh	Project Engineer	IIT Kanpur
39.	Mr.Vikas Awasthi	Programmer	IIT Kanpur
40.	Mr. Govind Murari	Programmer	IIT Kanpur
41.	Ms. Shriddha Mishra	Programmer	IIT Kanpur
42.	Ms.Nidhi Singh	Programmer	IIT Kanpur
43.	Ms.Purnima S Iyer	Programmer	IIT Kanpur
44.	Dr.Vimlesh Yadav	Agronomist	IIT Kanpur
45.	Dr. Vinod Kumar	Agricultural Economist	IIT Kanpur
46.	Mr.Ajay Dwivedi	Field Investigator	IIT Kanpur
47.	Ms.Sugatha Chaturvedi	Office Admin	IIT Kanpur
48.	Mr.Krishna Kumar Dubey	Office Admin	IIT Kanpur
49.	Mr. Deepak Kumar	Graphics Designer	IIT Kanpur
50.	Ms. Vimla Devi	Content Creator	IIT Kanpur

Annexure – II

RECORDS ON TRAINING WORKSHOP ON KNOWLEDGE MODELS IN AGRICULTURE (July 31 – August 2, 2008; held on GBPUAT)

A. List Of The Total PARTICIPANTS ATTENDING THE KM WORKSHOP At GBPUAT

(31st July-2nd Aug, 08)

Sl.No.	Name of Participant	Designation	Tel/Mobile no.
1.	Dr. K.P. Singh	Director Extension Education	09412120705
2.	Dr. B. Kumar	Director Communication	0941132458
3.	Dr. S.P. Singh	Joint Director Research, M&E	09411159943
4.	Dr. M.K. Kulshreshtha	Professor, PHT	09411160067
5.	Prof. S D Samantray	Professor & Head, Computer Engg.	09452987200
6.	Dr. R.L. Lal	Professor, Horticulture	09411300422
7.	Dr. J.P. Jaiswal	Assoc. Prof., Genetics & Plant Breeding	09411159751
8.	Dr. Yogendra Singh	S.R.O., Plant Pathology	09412121152
9.	Dr. N.C. Singh	Assoc. Prof., PHT	09997917349
10.	Dr. D.K. Singh	S.R.O. Agronomy	09411320066
11.	Dr. C. Tewari	Programme Co-ordinator, KVK Kashipur	
12.	Dr. S.S. Singh	Programme Co-ordinator, KVK Dhakrani	09412042444
13.	Dr. Deepali T. Pandey	SMS, Horticulture	09412996448
14.	Dr. Kanchan Nainwal	SMS, Agronomy	09412969305
15.	Dr. Rajeev Shukla	JRO, Agronomy	09411320357
16.	Dr. Amit Bhatnagar	JRO, Agronomy	09411159845
17.	Dr. Ashutosh	SRF	09411166154
18.	Gyan Prakash Singh	SRF	09412986220
19.	Mr. Jeetendra Singh	Project Engineer	09450838830
20.	Vimlesh Yadav	Project Scientist	09415526379
21.	Vikash Awasthi	Project Associate	09839026722
22.	Govind Murari	Project Associate	09918789801
23.	Ms. Margherita Sini	Computer Science, FAO Rome –IITK	09794173264
24.	Dr. Akhilesh Kumar		9411159936
25.	Ms. Nidhi Rathore	SRF	09411468454

B. **SALIENT POINTS** From The **'CONCLUDING DISCUSSIONS & PLANNING SESSION'** Of Training Workshop On **"KNOWLEDGE MODELS IN AGRICULTURE"**

- After this workshop scientist are now well acquainted with knowledge models and the development of concept maps. Soft copies of concept map, along with the presentations by IITK team shall be provided to agri-scientists of the GBPUAT. Some modifications are to be made in concept maps by IITK-team. Once these maps are modified, these would be sent to GBPUAT by IITK team.

  [Action: Jeetendra]

- The scientists can now start developing simple concept maps for their own respective discipline/crop. In case any help is needed, the scientists may e-mail Jeetendra at jsingh@iitk.ac.in . They may also send their concept maps to Jeetendra with a copy to Dr. Manoj Kulshreshtha manojkul@gmail.com . They may also suggest modifications in the existing concepts maps developed by IIT Kanpur.

  [Action: Individual Scientists]

- A list of scientists of Pantnagar team with their respective e-mail ID would be prepared & sent to IITK team. [Action: Dr. Manoj Kulshreshtha]
- Upon receipt of the list User ID of Agropedia Indica will be created and communicated to individual scientists through email with a copy to Dr. Manoj Kulshreshtha. It would also be desirable to include the names of agri-scientists from GBPUAT in the Agropedia India team. [Action: IITK-Team]

- In Agropedia Indica, for every class/subclass, there would be on introductory material / information about that topic/aspect followed by links to different resource objects in different categories. Also, a list of the ports that need to be opened at GBPUAT for accessing Agropedia Indica shall be communicated to Dr. Manoj Kulshreshtha, who in collaboration with IITK team shall settle the networking / communication problems in content uploading. [Action: Jeetendra]

- There will be monthly follow-up meetings between the teams of GBPUAT and IITK team members, at either place. These meeting may preferably be held on 30th or 31th of every month. A quarterly review on the progress of the work done can be planned for 30th October, 2008.

  [Action: Dr KP Singh / Dr Jayanta Chatterjee]

- A 2-3 page write up on farmer's needs and expectations from such portal will be prepared & communicated to IITK-Team [Action: Dr KP Singh]

- The shared unrestricted contribution feature of agrowiki need to be preserved. However, the original content provided by a contributor in agrowiki would not be modifiable by others. Other scientists / contributors may add their remarks or comments to any article. A contribution list will be provided to the public in agrowiki indicating the name of scientist giving notes / remarks / comments etc.

[Action: IITK-Team]

C. PANTNAGAR WORKSHOP MINUTES By IITK

The workshop was very effective and more than half of the participants (domain experts) got the idea and could successfully understand, comprehend, and put in practice the topic. Basic concepts given (KM, concepts, instances, subclass, etc...) were fully understood and the general feeling is that they are mentally prepared for this work. For few participants I still see that more practice was needed (some KVK experts), and in general more guidelines will help to generate less mistakes.

Experts try the CMap tool and the Agropedia Indica web site, and could put in practice what learned. After the first session, they could be involved in the topic and be ready to produce, both for Knowledge models as well as content production and update in the system. After the second session (more on guidelines), they could even more organize their work and give more organized and logic content. Exercises were essential to make them understand better the guidelines and put in practice.

To some extent, I was very impressed how they really could deeply follow the topic and even be ready to get and give more... "Get more" in the sense on knowledge representation of complex situations (e.g. "Gross income" calculatedBy ["Yield" multipliedBy "Price"]", or "varieties X can be planted under conditions X and W", "methodology of fertilizers would require the spray methods of fertilizations with 10 lit. of water, or 20 lit. of water n other conditions", rice cropping rotations based on locations or field type, etc...). "Give more" in the sense of having these examples represented in CMap, which actually allow limited semantics.... So investigations would be needed in order to accommodate this, or decisions at representation level... (= to what extent we want to represent?).

Concerning the wished deliverables from the workshop:

1. Comments/improvements on existing knowledge models: this was done but I personally could manage to process only a little part of one map (we divided in groups). More time would have been needed to get the full model processed, BUT, they know now how to make it better, how to comment and provide feedback. Therefore, I suppose a remote participation is now possible. The director of Extension Education Dep. was keen to ask for this for the next 3 months (see later). Jeetendra proposed eventually also to send Vimlesh for 1 week to Pant Univ. which could eventually help this, but it was noticed that could be done after some time so that they meantime exercise more and try on their own before.

2. Developing domain specific knowledge models: this was also possible to a limited extent. I could see in the exercise sessions many maps ongoing (experts KM, crop fields KM including varieties, Mango KM, diseases KM, sugarcane KM, wheat KM, etc.). Many of these were only started but they could start in the right way.

After the session on guidelines the maps were even better organized. The director assigned homework over night, done by some of the participants, which could let me see what was the improvement after 2 days. These maps (prepared on paper) will now be put in CMap and send to IITK. I could review 3 of them on paper.

3. Commitment to provide content on the template provided, to be followed by mail with time bound plan of when each content nugget will be provided: this also was perfectly achieved. I could see and feel the interest by most of the participants (I start even to receive emails from them...) and the commitment of Prof. Manoj and Prof. Singh make me thinking the project will be a success. At the closing session a workplan was proposed (see below).

Some other feedback (also from conclusion session):

1) The list of relationships can be extended (also by them). They expressed the need to have them organized hierarchically. This is actually already available in AOS online (http://agrovoc.icrisat.ac.in/agrovoc/relationstree.php) BUT, I have the feeling on paper maybe more practical (BUT problem may be update!). Another problem is how to update the list online... 2 possibilities: IITK and PANT-UNIV interact with FAO and FAO take care of update the registry online OR IITK creates a registry in Agropedia Indica and keep it updated online.

2) The Metadata schema was discussed: comment is that some fields should be not mandatory (e.g. publisher).

3) Some KM for the indexing may be different from KM to solve farmers problems.... we need to accommodate this (maybe not?)

4) It was requested to show specific information on a concept when selected in the Agropedia Indica (e.g. even with more info as definitions). Jeetendra & team can do this.

TO DISCUSS: how to pass more info from CMap to OWL for final visualization in Alfresco.

5) We need to complete the document I was drafting about guidelines (I can do this with Vimlesh; will require some days....) + add a session on more complex knowledge representation patterns (agreed?).

6) To discuss if modification will be done in local or with connection to server.

7) During Agrowiki presentation some discussion concerned desired moderation of the updates... but conclusion was no moderation for now, but they wish to get a list of who is doing what.

8) Some limited discussions (particularly from Prof. Singh) were about the role of Agropedia Indica in general and role of other sources... + how involve other universities and other KVKs... if possible.... + how will be the KM used from final users (KVKs, farmers). à example of services needed News: how to give through the portal? How to get from other sources?

9) The collection of material for the upload was perceived as requiring time.

10) It was proposed to have meetings every month (1 day every month better than a 3 day meeting after 3 months). I see this as ok for the management of tasks, but I see a problem for revision of maps.... This

requires some time (maybe 1 full day for a medium-map), 2 days for a bigger map. For revision of maps, it may be done remotely or assign specific days to very specific and involved people so that not everybody is there as time may be expanded.

Action points:

1. Finalize the time frame we discussed at Pantnagar University
2. IITK will finalize the existing KM and send to Pantnagar for further edition
3. Pantnagar experts will represent in CMAP the ones proposed at workshop
4. PU to prepare requirements for services and for CMAP (examples of problems to represent) + FAQ from farmers;
5. IITK to send more detailed guidelines
6. Prepare maps on:

1st Month build KM on (August'08)

1. Cropping Systems
2. Geographical areas
3. Varieties of Rice
4. Varieties of wheat
5. Varieties of Potato
6. Varieties of Mango
7. Varieties of Chickpea

2nd Month build KM on (September'08)

i. Wheat management
ii. Water management
iii. Nutrient management
iv. Pest management
v. Disease management
vi. Post Harvest Management

3rd Month build KM on (October'08)

i. Harvesting (commercial context)

ii. Harvesting (seeds)

iii. Primary processing

iv. Secondary processing

v. Storage

Annexure – III

A. **Report On VISIT To GB PANT AGRICULTURAL UNIVERSITY, PANTNAGAR** – 4th To 6th October 2008,

The NAIP team members from IITK, Prof. T.V. Prabhakar- the PI of NAIP, Jeetendra Singh- senior project engineer and Sugatha Chaturvedi- a project associate, visited the GB Pant Agricultural University at Pantnagar. The meeting was conducted on 5th of Oct. The purpose was to visit the Kisan Mela and meet the NAIP team members of GB Pant University and have general discussion about the NAIP project, C-Map, Rice and Knowledge models. The members who attended the meeting were Mr.K.P. Singh Director Extension Education, Mr. Manoj Kulshreshtha, Mrs. Deepali .T. Pandey, Mrs. Kanchan Nainwal, Dr. A.K. Singh Rice Expert, Dr. Jai Prakash Jaiswal and two Senior Research fellows Kiran Yadav and Kamini. Kiran Yadav an employee in the NAIP project and also works as a compeer and Kamini a PhD student is also an employee in NAIP.

We visited the Kisan Mela and saw various stalls on hybrid seeds, fertilizers, Tractors, students made models on how to interact with the farmers. We bought some seeds and medicinal plants from the Kisan Mela. People from almost all over India came to visit the mela and some came to participate in it. Mr. K.P. Singh told us about a couple who came from IIM Ahmadabad to visit the mela.The Kisan Mela emphasized on the need of increasing agriculture productivity. In the Kisan Mela the scientist gave information about quality seed, good agriculture practices model, use of chemical fertilizer and information about soil health and use of organic manures. Information was also provided on insect/pest and disease control management of crops. The highlights of the fair were technological displays' made by all faculty of agricultural technology university.

In the mela number of private agencies and firms engaged in agricultural inputs, implement, machinery and seed, fertilizer, insecticides and pesticides and field management participated and put up stalls for exhibition.

Then we attended the questionnaire session where the farmers had the opportunity to come in direct interaction with the scientists. The farmers came with their agricultural related problems and had the chance to meet the scientist and clear their doubts. The scientists and the experts gave appropriate advises on how to overcome the agricultural problems.

Some food stalls were also organized where we had some bread pakora and tea. In the evening, some entertainment programmes like magic show was also organized to make the stay of farmers during Kisan Mela.Our team member Jeentendra Singh attended the magic show and enjoyed a lot.

Action Points:

1) The GP Pant team will visit Kanpur in Nov. to release C-maps for Knowledge Model work.
2) Workshop on Knowledge Model at Kanpur.
3) Workshop on the Rice knowledge model at IIT Delhi in the month of January 2009.

4) Send E-mail to all C- map makers to have 1 GB RAM.
5) Invite N.P.Mishra to Kanpur.
6) Content Management System for the University.
7) After dusshera the SRFs Kiran and Kamini will visit IITK to learn C-map.
8) Some Do's and Don'ts
9) Frequently asked questions (FAQs) for each crops.
10) Checklist – Time base. (Every timeline should have a deadline)
11) Monthly Calendar for each crop.
12) While making KMs look for click option.
13) Quantity Conversion.
14) Send email to Deepali mam and get Kamini and Kiran's mobile nos., email ids.
15) Crop production practices and question and answers in three Formats – Textual, Audio and Video.
16) Magazines (Subscribe)—Kisan Bharti, Kisan Diary, monthly calendar

Recommendation:

1) All C-Map clients must have minimum 1 GB RAM.
2) Send reports to K.P Singh and Manoj Kulshrestha of GBPUAT
3) Send reports to Dr. Runa Sarkar of IITK.

Second Day:

Training Session:

1) Uploading of C-map in the IITK server. The GB Pant team uploaded their C- maps of Wheat and Litchi in the IITK server.
2) How to access Knowledge Models from agropedia.net.
3) The following comes under agropedia portal development:
    i) How to upload the contents in agropedia.
    ii) How to write in Agro wiki.

Lastly we visited the **Agriculture technology and Information Centre *(ATIC)*** of the university and identified that major agropedia user is ATIC. This centre is consists of Kisan call centre where the farmers from all over India call and tell their agricultural problems. The centre provides the farmers appropriate remedies for it. The centre has a touch screen computer were all the crops are shown in images. The farmer can simply touch the image of the crop and can get all the information related to the specific crop. The centre provides information on various crops, soil, fertilizer, pesticides etc.The centre also has audio and video room and various magazines related to agriculture, horticulture, floriculture, vegetable, livelihood, fishries, Kisan Bharti, Kisan Diary, Monthly Calendar of all crops, and a booklet on farmers and scientist question and answers. We bought some magazines related to fisheries, floriculture, vegetable production and Kisan Bharti from the centre.

B. PROCEEDINGS of the MEETING of the NAIP PROJECT "Re-Designing Farmer-Extension-Agricultural Research/Education Continuum In India With Ict-Mediated Knowledge Management" with NAIP MEMBERS of IIT KANPUR held on October 5, 2008

A meeting of the project members of GBPUAT, Pantnagar and IIT, Kanpur was held on **October 5, 2008** at **10:00 A.M**. Following members were present in the meeting:

Members from IIT Kanpur

- Dr. T.V. Prabhakar, Professor, IIT Kanpur
- Dr. Jeetendra, Project Engineer, IIT Kanpur
- Ms. Sugatha, Project Associate, IIT Kanpur

Members from GBPUAT, Pantnagar

- Dr. K. P. Singh, Director Extension Education, GBPUAT, Pantnagar
- Dr. M. K. Kulshrestha, Professor, PHT, GBPUAT, Pantnagar
- Dr. R. L. Lal, Professor, Horticulture, GBPUAT, Pantnagar
- Dr. J. P. Jaiswal, Assoc. Prof., Genetics & Plant Breeding, GBPUAT, Pantnagar
- Dr. D. K. Singh, S.R.O. Agronomy, GBPUAT, Pantnagar
- Dr. Rajeew Shukla, J.R.O. Agronomy, GBPUAT, Pantnagar
- Dr. Deepali T. Pandey, SMS, Horticulture, GBPUAT, Pantnagar
- Dr. Kanchan Nainwal, SMS, Agronomy, GBPUAT, Pantnagar
- Dr. Gyan Prakash, SRF, GBPUAT, Pantnagar
- Ms. Kamini Bisht, SRF, GBPUAT, Pantnagar
- Ms. Kiran Yadav, SRF, GBPUAT, Pantnagar

The following points emerged in the meeting:

1. It was proposed that a knowledge model on agro-chemicals along with their trade names will be developed which includes all the details related to their application etc.
2. Dr. Prabhakar suggested that each knowledge model be divided into small topics to make it effective and easily understandable. Also, that there should be clear cut demarcation of topics so that the content should rightly be placed under each heads and subheads
3. Dr. Prabhakar also suggested to have audio-visual clippings, audio only and textual version of Do's and Don'ts of related crops, FAQs and Monthly Calendar. In monthly calendars each step should be supported by text and video clippings.
4. It was agreed by all the members that the consistency of colour and font be maintained through out the knowledge model(s).

5. It was decided that the knowledge models prepared by different scientists would be sent to IIT Kanpur by 13th October, 2008.
6. It was agreed by all concerned scientists of the project that the concept maps of all crops should be finalized by 30th October, 2008. Incorporation of any minor changes would be done by 30th November, after which the concept maps shall be frozen.
7. Dr. Prabhakar proposed to have a workshop in January, 2009 at New Delhi where the final knowledge models on different crops shall be released.

The meeting ended with thanks to all.

(K. P. Singh)

Director Extension Education

C. PRECEEDING Of The MEETING (held on October 5, 2008 at GBPUAT), By IITK Team

a) Knowledge model on agro-chemicals along with their trade names will be developed which includes all the details related to their application etc.
b) Each knowledge model should be divided into small topics to make it effective and easily understandable. Also, that there should be clear cut demarcation of topics so that the content should rightly be placed under each heads and subheads
c) The consistency of colour and font be maintained through out the knowledge model(s).
d) To prepare Frequently Asked Questions (FAQs) and monthly calendar for each crops. In monthly calendars each step should be supported by text and video clippings.
e) The content of every crop should be carried the Do's and Don'ts of related crops, FAQs and Monthly; and they should be in three Formats – Textual, Audio and Audio-Visual clippings.
f) To link the different knowledge models of related concepts the click option/tagging should be used carefully
g) In the knowledge models and the content the different quantity measurement of fertilizers, pesticides etc. should be presented in such a way that it is easily understandable by farmers
h) All C- map makers must have 1 GB RAM
i) After dusshera the two project employees Kiran and Kamini Yadav will visit IITK to learn C-map.
j) The knowledge models prepared by different scientists would be sent to IIT Kanpur by 13th October, 2008.

k) The concept maps of all crops should be finalized by 30th October, 2008. Incorporation of any minor changes would be done by 30th November
l) The GP Pant team will visit Kanpur in Nov. to release C-maps for Knowledge Model work.
m) IITK to subscribe the Magazines published by GBPUAT like Kisan Bharti, Indian Farmer Diagest and also the Kisan Diary, monthly calendar
n) Workshop in January, 2009 at New Delhi where the final knowledge models on different crops will be released

Annexure – IV

MEETING WITH THE GBPUAT MEMBERS AT GBPUAT ON 23rd OCTOBER, 2008

A. List Of The MEMBERS ATTENDING The MEETING on 23rd OCTOBER, 08

Sl. No.	Name	Designation	E-mail
GBPUAT Members			
1.	Dr. Deepali T. Pandey	Subject Matter Specialist, (Horticulture)	deepalitewari@gmail.com
2.	Dr. Kanchan Nainwal	Subject Matter Specialist, (Agronomy)	kanchannainwal@rediffmail.com
3.	Dr. Yogendra Singh	SRO, (Plant Pathology)	drysingh@rediffmail.com
4.	Dr. S.P. Singh	Prf. Agri Eco. & Joint Director Research	
5.	Dr. Kulshreshtha	Prof.	manojkul@gmail.com
6.	Dr. J.P. Jaiswal	Assoc. Prof, GPJ	jpj.gbpm@gmail.com
7.	Dr. D.K. Singh	Assoc. Prof. (Agronomy)	
8.	Dr. Rajeev	Junior Research Officer - Agronomy	shuklarajeev@gmail.com
9.	Dr. K.P. Singh	Director Extension	Kamal_p_singh@rediffmail.com
IITK Members			
1.	Dr. Vimlesh Yadav	Project Scientist	vimlesh @iitk.ac.in
2..	Dr. Vivek Singh	Project Scientist	vivek_singh387@rediffmail.com
3.	Dr. Sharwan Shukla	Project Scientist	sharwan@iitk.ac.in
4.	Yogesh Sahu	Project Scientist	Yogesh_iitk.ac.in
5.	Vikas Awasthi	Project Associate	vikasha@gmail.com
6.	Govind Murari	Project Associate	mgovind@iitk.ac.in

B. Proceedings of the meeting of the NAIP project "TYPES OF CONTENTS TO BE UPLOAD IN AGROPEDIA INDICA" held on October 23nd, 2008.

A meeting of the project members of GBPUAT, Pantnagar and IIT, Kanpur was held on **October 22nd, 2008** at **10:15 A.M**. Following members were present in the meeting:

Members from GBPUAT, Pantnagar:

1. Dr. K. P. Singh, Director Extension Education
2. Dr. M. K. Kulshrestha, Professor, PHT
3. Dr. J. P. Jaiswal, Assot. Prof., Genetics & Plant Breeding
4. Dr. D. K. Singh, S.R.O. Agronomy
5. Dr. Rajeev Shukla, J.R.O. Agronomy
6. Dr. Deepali T. Pandey, SMS, Horticulture
7. Dr. Kanchan Nainwal, SMS, Agronomy
8. Dr. S.P. Singh, Professor, Agricultural Economics & Jt. Director Research
9. Dr. Yogendra Singh, SRO, Plant Pathology

Members from IIT Kanpur:

1. Dr. Vimlesh Yadav, Project Scientist
2. Vikash Awasthi, Project Associate
3. Govind Murari, Project Associate
4. Yogesh Kumar Sahu, Project Scientist
5. Dr. Sharawan Shukhla, Project Scientist
6. Dr. Vivek Singh, Project Scientist

Points Discussed In the Meeting:

1. In the meeting Vikash stated the reasons for organizing the meeting. He spoke on the **Types of Containers** and **Knowledge Maps** which are required for the project Agropedia Indica.
2. Vimlesh gave his opinion in detail about **Types of Agri-Contents.**
3. Dr. K.P.Singh gave some suggestions and highlighted on some of the main points like **Availability of Inputs and Flow Charts.** He also added that **the Contents** should be such that they are directly related to the **Farmers** and the **Market**.
4. Dr. Deepali Pandey queried about **Content Management System (CMS)** and their links. Govind answered the raised queries.
5. Dr. Kulshrestha instructed to keep **Calendar** and **Scientists Comment** in the **Types of Content** section.
6. Dr. Deepali asked to provide one link to **Conversion Calculator / Table**.
7. Dr. Kulshrestha advised the GBPUAT members to start content creation on one crop for better understanding and providing better suggestions on the type and form of content.
8. After the suggestions of all the experts the content was finalized and it was also decided that time to time there should be new additions to the contents section.

The meeting is ended with Thanks.

By AI Team, IITK

C. **Final Draft On TYPES OF CONTENT IN AGROPEDIA** After Discussion With **GBPUAT on 23rd Oct, 08**

1. **Basic Description:** Importance, Area and distribution, origin, plant morphology and genetic classification.
2. **Climate:** Agro climatic zones (ACZ), Agro ecological zones and weather forecasting.
3. **Soil management:** Silo type, Soil testing, physical, chemical and biological characteristics of soil and land preparation.
4. **Crop management practices:**
   (a) **Suitable varieties:** Selection of varieties, area specific and resistant varieties.
   (b) **Production technologies:** Field preparation, seed and sowing, water management and nutrients management.
   (c) **Protection technologies:** Diseases management, insect pests' management and weed management.
   (d) **Harvesting and threshing:** Time and methods of harvesting and threshing.
   (e) **Post harvest management:** Drying, cleaning, processing, storage and value addition.
5. **Farming system approaches:** Crop based farming system, cropping system and crop rotation.
6. **Marketing and agribusiness:** Prices of products, Availability of inputs, economics of production.
7. **Socio-economical approaches:** Credit, finance policies and census.
8. **New approaches:** Promotional content, Success stories, entrepreneurial opportunity, specialized training, upcoming technologies, good agricultural practices, secondary agriculture.
9. **Do's and Don'ts.**
10. **Help:** FAQs, conversion table and talk to the scientists.
11. **Q & A Forum.**
12. **Diary / Calendar.**
13. **Related Links.**