Towards Indian Agricultural Information: A Need Based Information Flow Model

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ABSTRACTS: *Information is crucial for agriculture and rural development. ICT based services in agriculture is gaining importance day by day. Paper proposes to study the nature of agricultural information its uniqueness and problems of handling and organization. Agri informatics and use of different web portals for agriculture also discussed. Paper also highlighted the ICAR and IARIs contribution towards development of NARS (National Agricultural Research System) and models showing Information flow and strategic plan for organization of agricultural information. Some recommendations for proper organization and dissemination of agricultural information have been made to reach grass root level with desired agricultural information.*

Keywords: *Agricultural information, Agricultural Informatics, E resources, Information flow model, Information & Communication Technology, Library and Information Centre*

I. Introduction

Agriculture (arguably the backbone of India's economy) is highly dependent on the spatial and temporal distribution of monsoon rainfall. In third world countries like India, Countries economy is based on Agriculture. Agriculture is such an enterprise in which crop productivity depends on seasonal fluctuations, that affects yield potentiality of Agricultural Crops. On the other hand most of the Agricultural Crops are perishable in nature. Therefore timely, appropriate and area specific information is very vital in absence of which it may adversely affect countries economy.

Indian Agriculture faces challenges due to Biotic and Abiotic stresses (impact of disease, insect and pest infestations, soil salinity, heat, cold, drought, flood etc.), Climate Change, Changes in food habits and nutritional requirements, Population pressure, Pressure of global trade and competitiveness, and Technological development. Strategic intervention of Information and Communications Technologies (ICTs) in Agricultural Input, Production and Output systems, integrate and facilitate trade, technology and food security, through effective Value-chain and Supply-chain Models. This is a priority engagement.

Information like Seed, water, plant protection chemicals etc is considered as one of the key inputs for successful sustainable agriculture and intensive farming. For qualitative improvements in farming including improved crop production technology effective & efficient research and developmental programme is the need of the hour.

Farmers need information on agricultural resources, inputs, marketing and practices in planning and managing their agricultural production activities to increase productivity, profitability and to sustain their livelihood. Government and other stakeholders associated with agriculture equally needs the information for planning and improving delivery of their services to farmers. Agriculture being a state subject, the Department of Agriculture and Cooperation (DAC) formulates policy at national level for sustainable development of agriculture and for achieving the development targets. To fulfill the same, the Department plans, implements and monitors central sector and centrally sponsored schemes/projects. State Agriculture Department with its offices at District and Block level provides wide range of pre harvest and post harvest services to farmers in the areas of Agriculture, Horticulture, Animal Husbandry, Fisheries and other allied sectors. Soil Health Card based Balance and integrated use of Nutrients, Integrated Pest Management, Quality Control and Distribution of Inputs, Registration of Dealers/Service Providers and Issue of License, Risk Management, Artificial Insemination Centres, Infrastructure and Resource development, and subsidies are some of the important services.

Agricultural libraries have to play pivotal role to face these challenges by providing quick access to right information in right time to the researchers .Information Need and Information seeking behavior will be assessed for proper planning and policy making of agricultural libraries for rendering qualitative services to its most vital user groups i.e. Researchers and Scientists Community. Agriculture supports directly or indirectly about 70% of Indian rural population for their livelihood. Both Central and State Governments are involved in the formulation and implementation of policies and programs to achieve rapid agricultural developments. We have achieved self sufficiency in food production during so called" Green Revolution". Again the yield per hectare of cultivable land for most of the agricultural crops is still low compared to other developed countries.

Land is the free gift of nature. So available land for cultivation is limited and it goes on decreasing due to ever increasing demands of industries, roads, building constructions. So unless we are capable of improving our crop production level we may face again food shortage. For this reason researches conducted throughout the country and as a result of which new information generated. Agricultural libraries and information centers have been playing pivotal role by rendering qualitative services and supports the teaching, research and extension function of Agricultural Universities in India.

II.   Objective

Paper proposes to
- Need & importance of agricultural information
- Users and stake holders of agricultural information
- Problems during information organization and dissemination
- Agricultural Informatics and Communication Network & use of ICT in Indian agriculture
- Different agricultural portals and nature of information they provide.
- ICAR and IARI's contribution towards development of NARS (National Agricultural Research System).
- Models showing Information flow and strategic plan for organization of agricultural information

III.   User of Agricultural Information

User community varies greatly with their diversified need, educational, social, economic, physical and mental makeup. User community includes teachers, students(both PG and UG), scientists, research scholars, in one hand as well as progressive, small and marginal farmers, extension personnel, local shopkeeper(dealers of fertilizer, pesticides etc), vegetable sellers in local market, persons engaged in nursery, bee keeping ,cattle &poultry farming etc on other hand. Agricultural stake holders include multinational companies, corporate sector, banking, community groups& NGOs, agricultural universities, technology companies and Government.

IV.   Nature of agricultural Information And Problems

The problems of rural agricultural information during handling, storage, organization and dissemination are as follows.[5]

Area specificity: Information is area or locality dependent. Like "formula Index" in chemistry, "Area/Locality Index" in Agriculture proved to be beneficial that surely provide right information to right user in right time.

Poor bibliographic Control: In developing countries like India Poor bibliographic Control of agricultural literature like technical reports, Internal research reports ,lack of comprehensive and up to date lists hinder the availability of materials for acquisition by libraries.[1] Patents, standards played a significant role to research community but many library have no such records.

Lack of formal training: Trainings in rural agricultural information, documentation, and retrieval are considered to be essential both for information professional & user. Library professionals must be well acquainted with computer application as well as they must have some subject knowledge.

Confidentiality factor: Confidentiality of some agricultural reports limits their availability to the user without considering "Right to Information". A Vettorazzi (WHO expert) stated that Government report/official information on the adverse effect of pesticides is kept suppressed before the user community for reason best known to them.[13]

Management problem: Agoulu [1] suggested that management lack of appreciation of the importance of agricultural information centers in realizing parent institutions training needs and research objective is a major problem in developing countries.

V.   Problem of Agricultural Information Indian Scenario

Following problems have been identified.
- Farmer's problem is not unidisciplinary & simple.
- Farmers adopt multidisciplinary holistic approaches to their work.
- Spreads of new technologies are highly uneven across different agro climatic zone, situations depending upon diversity.
- Gap between performance of research station &farmers field has proved highly persistent &latter situation is more complex, diverse & risk prone.
- Introduction of state of the art technologies accompanied by number of short & medium term negative effect as interrelationship between subsystems is functional.

In report of FAO also suggested the following problems of Indian green agriculture. [6]

Lack of market information in general and organic market information in particular is biggest drawback for Indian agriculture. The current information base is low and even the limited information available does not get disseminated due to lack of adequate channels for dissemination. As a result farmers are in a predicament as they are unable to attune their production practices as per the market changes. Marketing network specifically for organic products has not yet developed both in the domestic as well as export market.

Quality of Indian food industry is always a constraint for growth, low consistency of quality and contamination in food products is a hindrance in capturing the available market especially the international market

Given the high levels of transaction costs for getting farms certified as organic it is a major deterrent for enhancing organic production in the country.

Government has shown limited interest for organic agriculture, though the activities from government side are increasing but till date there is no direct support from government side in terms of subsidy or market support towards organic agriculture.

Lack of proper infrastructure in terms of roads from remote villages, cold storage facilities and slow transportation infrastructure affects the cost, quality and reach of producers.

Indian organic agriculture is very fragmented and there are no organizations for managing the entire value chain of organic products.

Agricultural departments, research institutions and extension services have for long been oriented towards chemical input agriculture as a result there is a requirement for reorienting these officials towards organic (green) agriculture.

Changing the cropping and cultivation patterns is slow and time-consuming process given the high levels of illiteracy and large number of small and marginal farmers it makes the change process difficult.

Subsidies on chemical fertilizers and pesticide impede the growth of organic agriculture

Lack of proper infrastructure for distribution and conservation of bio-inputs is a major constraint hinders the access of these inputs to farmers.

Existence of poor quality bio-inputs in market reduces the credibility of input providers. Lack of quality control mechanisms for bio-inputs furthers the mistrust among farmers.

Bio-fertilizers and bio-pesticides are perceived as less yielding.

Some climatic regions and soil conditions are not suitable for specific strains of organic production.

VI.   Indian Scenario Computer Literacy

India has 16% of the world's population. 30% people in India live below the poverty line and 40% are illiterates. More than 65% live in alienated rural area and 60% earn their livelihood from Agriculture. Only a meager 3.63% of the 1 billion have access to telephone and less than 1% of Population has a PC. [11]

It is true that many people in rural areas who live below the poverty line can maintain their livelihood without knowing the GDP and NAV value; this is not the worry, but providing access to timely information on agriculture, weather, social, health care, employment, fishing etc which adversely affect the poor is really matters.

Information and communication are considered to be essential components to empower poor communities living in rural India in the development process and to inform development agencies and planners alike and for linking and informing decision making process at every level. Yet information and communication systems are rarely well integrated into development strategies and programmes. G Venkataramani rightly said that "A paradigm shift in the perspective on transfer of technology and dissemination of value added information for agrarian prosperity is the need of the hour. "[12]

Information and Communication Technology (ICT) in Agriculture is gaining momentum throughout the globe. There is a huge demand for Agricultural Researchers and scientists with ICTs skills and profound Informatics Knowledge, to leverage a mix of emerging and existing technologies for effective and inexpensive ICT penetration in agricultural development, and to be the global lead enabler in innovating solutions for productivity increase and prosperity, through Informatics for agricultural development. It requires about 100000 "agricultural graduates-ready" through agricultural informatics, for undertaking S&T based agricultural development, and rejuvenating and ushering in agricultural dynamism in the country, by 2025."[2]

ICT in agriculture, an emerging field focuses on the enhancement of agriculture in India. It calls for application of innovative ways to use Information & Communication Technologies (ICT) in the field of agriculture. The common problems in adopting ICT by farmers are ICT illiteracy, availability of relevant and localized contents in their respective languages, affordable and easy accessibility and other issues such as awareness and willingness for adoption of new technologies etc.

Agricultural Informatics emerges as a discipline which is fusion of Computer Science & Technology and Agricultural Science & Technology. Seed is an embodiment of Knowledge System with built-in "Object programming". Acceleration of the use of information technology (IT) in the field of agriculture is through

"formal education" discipline – Agricultural Informatics – for development and the utilization of information system and technology for better and sustainable agricultural development. The Indian Agricultural Education System produces about 25000 in number from about 300 Agricultural Colleges. They have the bigger role to play in realizing "Agricultural Informatics" to the Farming community in the languages known to them. ."[2]

VII.   Agricultural Information And Community Network

Farmers need information on agricultural resources, inputs, marketing and practices in planning and managing their agricultural production activities to increase productivity, profitability and to sustain their livelihood. Government and other stakeholders associated with agriculture equally needs the information for planning and improving delivery of their services to farmers. Agriculture being a state subject, the Department of Agriculture and Cooperation (DAC) formulates policy at national level for sustainable development of agriculture and for achieving the development targets. To fulfill the same, the Department plans, implements and monitors central sector and centrally sponsored schemes/projects. State Agriculture Department with its offices at District and Block level provides wide range of pre harvest and post harvest services to farmers in the areas of Agriculture, Horticulture, Animal Husbandry, Fisheries and other allied sectors. Soil Health Card based Balance and Integrated   Nutrients Management, Integrated Pest Management, Quality Control and Distribution of Inputs, Registration of Dealers/Service Providers and Issue of License, Risk Management, Artificial Insemination Centres, Infrastructure and Resource development, and subsidies are some of the important services.[3] Planning and delivery of each service involves development of comprehensive database and a sound information management system to facilitate access of information by respective departments, government officials, beneficiaries and service providers. Digital Opportunities are emerging as a positive force for fostering agricultural growth, poverty reduction and sustainable resource use. To facilitate "Information Access" for efficient and effective planning and decision making by the stakeholders, Agricultural Informatics Division of National Informatics Centre has been working to promote informatics in agriculture, in close collaboration with the Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India.[2]

The Consultative Group on International Agricultural Research (CGIAR) also focuses on research designed to meet the needs of developing countries. Based in Washington, D.C., and supported in part by the World Bank, FA0 and the United Nations Development Programme (UNDP), CGIAR supports thirteen specialized international agricultural research organizations such as the Centro Internacional de Agricultura Tropical (CIAT), International Rice Research Institute (IRRI), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and the International Livestock Centre for Africa (ILCA)[7]

VIII.   Agricultural E Resources And Web Portals

Many web portals available for agricultural sector are as follows.[8]

www.indiaagristat.com - It is a comprehensive source for Indian agriculture statistics which is regularly updated. It provides authentic statistical information on sectors like agricultural education, agricultural export, agriculture census, agriculture prices, agricultural insurance, animal husbandry, agricultural marketing, horticulture production, agricultural wages and all other relevant agricultural statistics of India.

www.isapindia.org - The site is all about the Indian society of agribusiness professional (ISAP) which works for helping the farmers' community and address the rural- urban income divide. It is a network of agriculture and allied sector professionals in India and developing countries.

www.carrittmoran.com - This site provides, information regarding tea and coffee- statistics (on production and sale), catalogues (of area- wise sale of different varieties of tea and coffee in India), market reports and TASI.

www.fciweb.nic.in - This is the site by Food Corporation of India. It works for effective price support, food security, price stabilization and distribute food grains through public distribution system for the benefit of both farmers and consumers.

www.fredisurti.com - Fredisurti is a flower company specializing in flower seeds. This site offers garden consultancy and distributor for all kinds of seeds.

www.indiancommodities.com - Information on cotton, rice, wheat, oilseeds, pulses, spices, coffee, and tea. This site requires registration, login and payment.

http://agricoop.nic.in/- This website on agriculture will lay stress on the agricultural sector, employment, opportunities, industrial sector and infrastructure. The site also displays the plant protection information network, Rashtriya Krishi Vikas Yojana, and national food security mission.

http://fert.nic.in- The website Department of fertilizers, Govt. of India, gives information on different aspects of fertilizer.

http://mofpi.nic.in/ - Ministry of food processing industries, is the main central agency of the Government responsible for developing a strong and vibrant food processing sector; with a view to create increased job opportunities in rural areas, enable the farmers to reap benefit from modern technology, create surplus for exports and stimulating demand for processed food.

http://www.nationalfertilizers.com/- National fertilizer ltd. is the second largest producer of nitrogenous fertilizers in the country. They produce urea and fertilizers which are beneficial for all types of crops.

http://www.fertindia.com/ - This website gives in detail about fertilizer statistics in India, fertilizer prices and fertilizer marketing in India.

http://www.upagriculture.org/- this agricultural site shows new schemes related to farmers, facilities given to them, latest techniques, new agricultural policies, quality control, useful machines, insects/diseases of crop and much useful information related to agriculture.

http://www.krishi.net/GovtLinks.asp#IO- This websites has a collection of various sites related to agriculture and have links to Govt. institution, agricultural universities, state links, and international organizations

http://www.indg.in/agriculture/- aims to disseminate useful information about improved technology to the farming community and service providers in the rural areas. It aims to create a platform for different levels in the rural agricultural landscape - farmers, cooperatives and professional bodies, farm machinery vendors, fertilizer and chemical companies, insurance regulators and agronomists, consultants, and farm advisors.

www.kissankerala.net/ - this website is a complete argil - info system for Kerala. Information on farming practices, fertilizers & pesticides, planting material are available.

Figure 1: Home page of Agri informatics showing soil, inland mapping, and topography
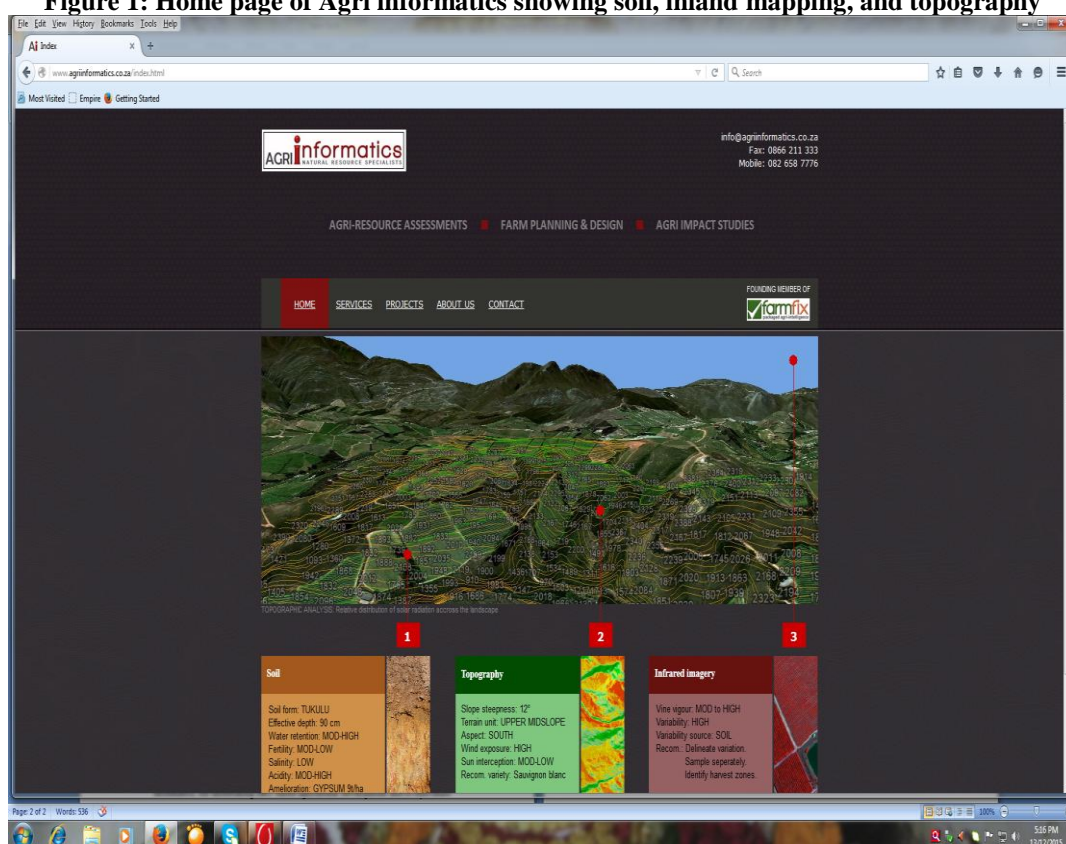

IX.   ICAR And IARI 's Contribution Towards National Agricultural Research System(NARS)

To cope with the changing situation it is essential to develop NARS i.e. National Agricultural Research System. Indian Council of Agricultural Research (ICAR) during 8th 5 year plan [(9)] embarked upon a project called ARIS (Agricultural Research Information System in order to provide efficacy to the NARS. This was financially supported by the World Bank under National Agricultural Research Project (NARP). The coverage of the project being extended up to 9th 5 year plan under National Agricultural Technology Project (NATP).All libraries of ICAR and State Agricultural Universities (SAUs) will be automated and linked with IARI, which has been considered as National Agricultural Library (NAL).Agricultural Research Information Center (ARIC), New Delhi is serving as a National Input Center for International Information for Agricultural Science & Technology (ACRIS) , Current Agricultural Research Information System (CARIS) projects of FAO & SAARC Agricultural Information Center(SAIC).

X. Strategic Plan For Agricultural Information Handling And Information Flow Model

Agricultural information with its vastness and uniqueness played a significant role in countries development. It is essential to handle, organize agricultural information with proper care with introduction of state of the art technologies. In decision stage by employing intelligence, design the framework selecting best alternative take feed back after trial run if implemented successfully. Information required in every stage specially when data become insufficient choose alternative sources of Information.

Figure 2: Strategic plan for Agricultural Information handling and organization
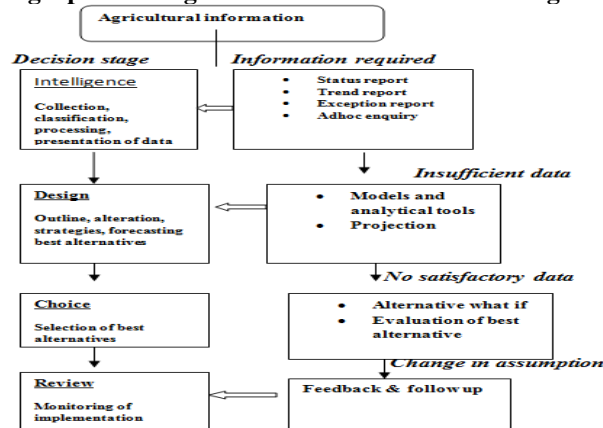
XI. Agricultural Information Flow Model

Information flow model suggests creation of information leads towards identification & capturing of information with the help of e resources and web portals towards storage phase (may be in digital storage in Library) sharing benefits through agri informatics and finally for application & use. Use of this information always enjoyed by agricultural stake holders like multinational companies, corporate sector, banking, community groups& NGOs, agricultural universities, technology companies and Government. Use of information is always catered by ICT intervention. Side by side researchers and scientists used data from database, conducted research and disseminate the output to the farmers in Block level towards subdivision level with the help of extension personnel. The information stored in state database used by the State Head Quarter/Dept of Agriculture and Centre of Agriculture, Ministry of Directorate of extension .

Figure 3. Agriculture information flow model (proposed)
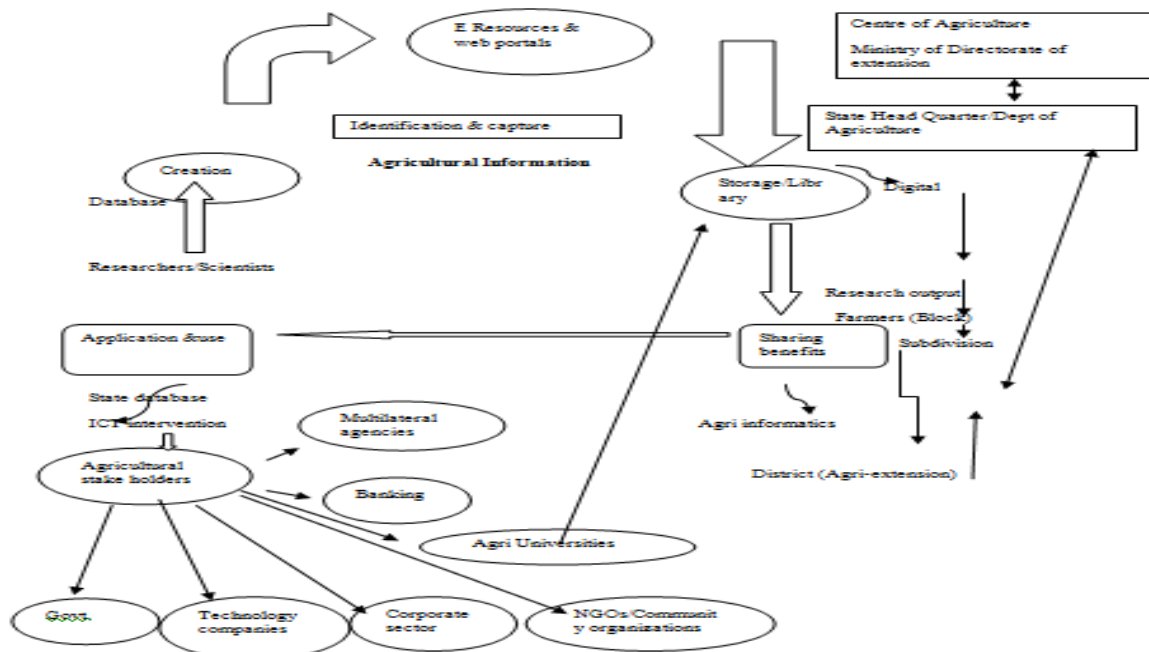
XII.   Conclusion And Suggestion

It is essential to conduct comprehensive need assessment study to develop an understanding of the agricultural related ICT needs and problems faced in using ICT by the farmer's in various agro and socio-economic situations; with emphasis on the small and marginal farmers. A primary survey was conducted using structured Schedules / Questionnaires, Focus Group Discussions and Participatory Rural Appraisal. The different types of ICT based delivery systems providing agricultural information such as Community Radio, Internet kiosk / web portal, Mobile and Call Centers etc were considered as effective tools.

Ramaraju1 and others [10] in their study suggested the following measures for successful and sustainable agriculture

- There is a need when catering to the farmer queries in multimedia mode i.e. voice mode (in local language) along with text, image and video.
- Requirement of farmers through friendly and simple interfaces to access information and advisory services in effective manner preferably through smart phones.
- It is essential to develop a combination of push and pull based interactive system (essentially pull based) so that the communication can be possible in both ways, i.e. from farmers to expert and vice versa.
- It is essential to interlink location specific information from various service providers to cater to the specific needs of the farmers.
- A necessity for maintaining farmer's database with their farming details, to enable an expert to provide appropriate solutions to the concerned farmer's.
- Requirement of expert support system which has user friendly interfaces and reference content (e.g. SAU's Knowledge repository, farmer's details, FAQs from the farmers query, etc) for fast and proactive delivery of advices. The system should also facilitate an expert to be virtually available by giving him any time anywhere access

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