

Training programme – cum - Workshop
on
Improving eGovernance in Agriculture

Reading Material



NATIONAL INSTITUTE OF AGRICULTURAL EXTENSION MANAGEMENT

An organisation of Ministry of Agriculture, Government of India

Rajendranagar, Hyderabad – 500 030.

Tel. Nos. 040 – 4016702 – 706 : Fax 040 – 4015388

Website: www.manage.gov.in

CONTENT

1. National eGovernance Role in Agriculture	03
2. ICTs: Concepts and Relevance	13
3. Agricultural Websites	36
4. Annexure:	
a. Using eTools for Good Governance & Administration Reforms	40
b. Common Service Centers – Enabling Service Delivery	57
c. Marketing Research and Information Network – AGMARKNET	71
d. Use of ICT in improving governance and social accountability	95
e. ITC eChoupal - A Case study	98

■ Compiled by K. Venkateshwar Rao

The Department of Agriculture and Cooperation (DAC), Ministry of Agriculture has decided to implement National e-Governance Programme (NeGP) in the Agricultural Sector as a Mission Mode Project (A-MMP), covering the Agriculture sector, Livestock sector and Fisheries sector. The A-MMP aims to address the needs of the farming community and its other related stakeholders, through provision of relevant information and services through the various delivery channels available in their vicinity for assisting them in making rational decision. The objectives of the mission are:

- Bridging farmer centricity and service orientation to the programs
- Enhancing reach and impact of extension services
- Improving access of farmers to information and services throughout crop-cycle
- Building-upon, enhancing and integrating the existing ICT initiatives of Centre, and States
- Enhancing efficiency and effectiveness of programs through process redesign
- More effective management of schemes of DAC
- Promoting a common framework across states



The states are considered, as pilot in the scheme are Assam, Himachal Pradesh, Jharkhand, Madhya Pradesh, Maharastra, Karnataka and Kerala. These pilot states will implement with

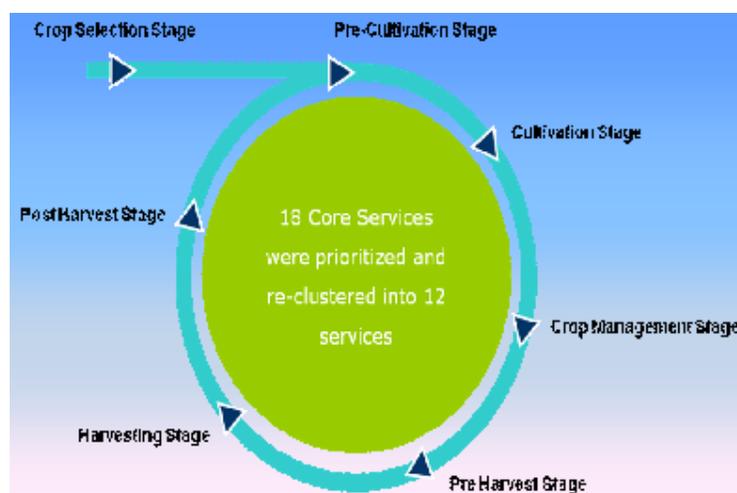
a definite scope defined in the project – there should be a centralised Agriculture portal supported and connected with state level Agricultural portals and providing about 12 information services which are defined in it. These services are clustered into 12 categories for better management and implementation of services to the needy farmers across the country. Such categories are:

- Information on pesticides, fertilisers and seeds
- Information soil health
- Information on crops, farm machinery and, training and Good Agricultural Practices (GAPs)
- Information on forecasted weather and agro-met advisory
- Information on prices, arrivals, procurement points, and providing interaction platform
- Electronic certification for exports and imports
- Information on marketing infrastructure
- Monitoring implementation/evaluation of schemes and programs
- Information on fisheries
- Information on irrigation infrastructure
- Drought relief and management
- Livestock management

The services are planned and start implementing under these categories are in various states. The basic needs of each farmer-centric are considered as a service under 30 types, which are listed below:

1. **Service-1:** Providing information on quality pesticides
2. **Service-2:** Providing information on quality fertilisers
3. **Service-3:** Providing information on quality seeds
4. **Service-4:** Providing information on soil health
5. **Service-5:** Providing information on crop diseases
6. **Service-6:** Providing information on forecasted weather and Agro-met advisories
7. **Service-7:** Providing market information on prices and arrivals of Agricultural commodities
8. **Service-8:** Providing related market information to facilitate farmers gets better prices
9. **Service-9:** Providing interaction platform for producers, buyers and transport service providers

10. **Service-10:** Providing information on minimum support price and government procurement points
11. **Service-11:** Providing electronic certification of imports and exports
12. **Service-12:** Providing information on marketing infrastructure and post harvest facilities
13. **Service-13:** Providing information on storage infrastructure
14. **Service-14:** Monitor the implementation of schemes/programs
15. **Service-15:** Providing information on training support to farm schools for adoption of good agricultural practices
16. **Service-16:** Sharing good agricultural practices with farmers and trainers and providing extension support through online video
17. **Service-17:** Providing information on fisheries
18. **Service-18:** Providing information on irrigation infrastructure



NIC proposed additional services to the above list to be included in the project. They are:

19. **Service-19:** Providing information on crops development programme and production technologies to increase production and productivity
20. **Service-20:** Providing information on farm machineries and implements
21. **Service-21:** Providing information on drought related aspects
22. **Service-22:** Providing information on livestock development
23. **Service-23:** Providing information on financial services available from PACs, RRBs and Public sector banks

24. **Service-24:** Providing information on financial security to persons engaged in Agriculture and allied activities through insurance products and other support services (Agricultural insurance services)
25. **Service-25:** Providing information on use of plastics in Agriculture, Horticulture and Floriculture
26. **Service-26:** Providing information on medicinal plants
27. **Service-27:** Providing information on patent on traditional practices
28. **Service-28:** Providing information on allied sectors like Sericulture, Floriculture, Horticulture and Bee-Keeping
29. **Service-29:** Providing information to farmers on food processing technologies
30. **Service-30:** Providing quality information about ways to increase milk production

These services are having key stakeholders and beneficial, which are listed below:

- **Farmers:**
 - Individual farmers
 - Self Help Groups (SHGs)
 - Farmers Club (more than 75000 out of which 25000 are having Internet connectivity)
- **Central Level Organisations**
 - DAC, ICAR, SAUs etc
 - DMI
 - National Informatics Centre (NIC)
 - National Institute of Agricultural Marketing (NIAM)
 - National Institute of Agricultural Extension Management (MANAGE)
 - National Horticulture Board (NHB)
 - NAFED
 - Department of Consumer Affair
 - Directorate of Economics and Statistics
 - Krishi Vignan Kendras (KVKs)
 - Commodity Directories
 - Commodity Exchanges
- **State Level Organisations**
 - State Agriculture Marketing Boards (SAMBs)

- Agricultural Universities / Colleges
- RMC/APMC
- State Agricultural Departments (Agriculture, Horticulture, Marketing, Engineering, Livestock, Dairy development, Fisheries, etc)
- PACS
- Public Sector Banks
- ATMAs
- NGOs etc.
- Private Sector Organisations
 - Importers and Exporters of Agriculture produce
 - Traders
 - Commodity Exchanges
 - Mobile Phone Operators
 - Buyers
 - Call Centers
 - Agri-Business Clinics & Centres
 - Agri-Business Firms/Consultants
 - Media
 - Content Providers
 - Farmer's Cooperatives

Now let us see the 12 clustered services details taking each one for the benefit of farmers who are going to use such services made available to them under this project.

1. **Information on pesticides, fertilisers and seeds:** This service aims at providing information on - good agricultural practices, prevalent prices and availability in an area closest to the farmer, information on dealer network, quality control and assurance mechanism for Pesticides (including insecticides), Fertilisers and Seeds. The service will also automate registration and licensing for manufacturing and marketing of pesticides and fertilisers and process of license to retail seeds, log sale transaction records for different seed varieties down to the district level, process registration of seed growers and certification of seeds, publicly display quality testing of the samples drawn for pesticides, fertilizers and seeds. It will also provide expert advice and grievance management related to pesticides, fertilisers and seeds through multiple service delivery channels to the farmers.

2. **Providing information on soil health:** This service aims at providing information on - soil health conditions, package of practices suitable to the soil type, balanced use of fertilizers, automation of soil testing labs for quick dissemination of results, soil surveys, organic farming, details of soil testing labs, expert advice and grievance management through multiple service delivery channels to the farmers. Farmers would be able to get information on recommended doses based on the recommendations of University or IISS (Indian Institute of Soil Science) formulae. Results of the front line demonstrations conducted on different crops for proving efficacy of soil health management would be listed for different agro climatic zones. Farmers will also be advised about right kind of seeds of the same crop or an alternative crop depending on expected yield and maturity period after considering soil condition and other agro-climatic parameters.

3. **Information on crops, farm machinery and, training and Good Agricultural Practices (GAPs):** This service aims at providing information on agronomic practices for different crops as per the recommendations of the Scientific Institutions. Such practices would inform about the week-by-week calendar of activities from pre-sowing to harvesting stage of crop cycle. Best practices for each crop stage for management of plant population, crop stand and monitoring of pests and diseases. Service would be provided through automation of dissemination of information of pest roving survey, expert advice on different aspects of crop management and grievance management through multiple service delivery channels to the farmers. It will also provide information services addressing farm machinery availability, quality and guidance to farmers. It also aims to provide digital tool-kits to trainers and progressive farmers using ICT, and SMS based alerts on training calendar. In addition, the service aims at collecting, storing, indexing and disseminating information on good agricultural practices (GAP) generated by farmers, research institutions.

4. **Information on forecasted weather and agro-met advisory:** This service aims at providing - disaggregated district/block level information in each agro-ecological sub-region on forecasted weather, agro-met advisory, SMS alerts for weather forecast and crop impact and grievance management through multiple service delivery channels to the farmers.

5. **Information on prices, arrivals, procurement points, and providing interaction platform:** This service aims at providing information on - prices, including minimum support prices (MSPs), SMS based information on MSPs, crop quality associated with MSP and historic prices. It will also provide information on arrivals of different standardized commodities at the market yards, SMS alerts for prices, arrivals and commodity indices, SMS alerts and expert advice on issues related to future prices and arrivals trends and mechanism for grievance management. It will also provide an e-platform for marketing of agricultural produce, SMS based alerts for buyers and sellers and details of transporters.
6. **Electronic certification for exports and imports:** This service aims at providing information on - certification procedure, fees, competent authorities; automation of certification process on a workflow basis, SMS based status alerts and mechanism for grievance management.
7. **Information on marketing infrastructure:** This service aims at providing information on - marketing infrastructure at the regulated market yards, post harvest facilities available at the yards. This service also aims at providing information on storage infrastructure like availability, capacity and fees for storages / warehouses of both the private and public sector. This service will also address the information needs of the farmers on credit linkages.
8. **Monitoring implementation/evaluation of schemes and program:** This service aims at providing information on - schemes and programs implemented at the state with respect to physical progress and fund utilization, automation of issue and submission of utilization certificate and mechanism for grievance management. It will also provide information on list / categories of beneficiaries and will help remove duplication by codifying and linking them with land records database. This service will also provide the facility to common public and government officials to search for relevant information using customisable queries. Monitoring mechanism for each scheme would be defined and the reports of the monitoring teams would be posted at the end of the scheduled work. Evaluation reports would be listed for different schemes for the past five evaluations. There would be calendar of activities listed for approaching and ongoing evaluation work. There would be calendar of activities listed for approaching

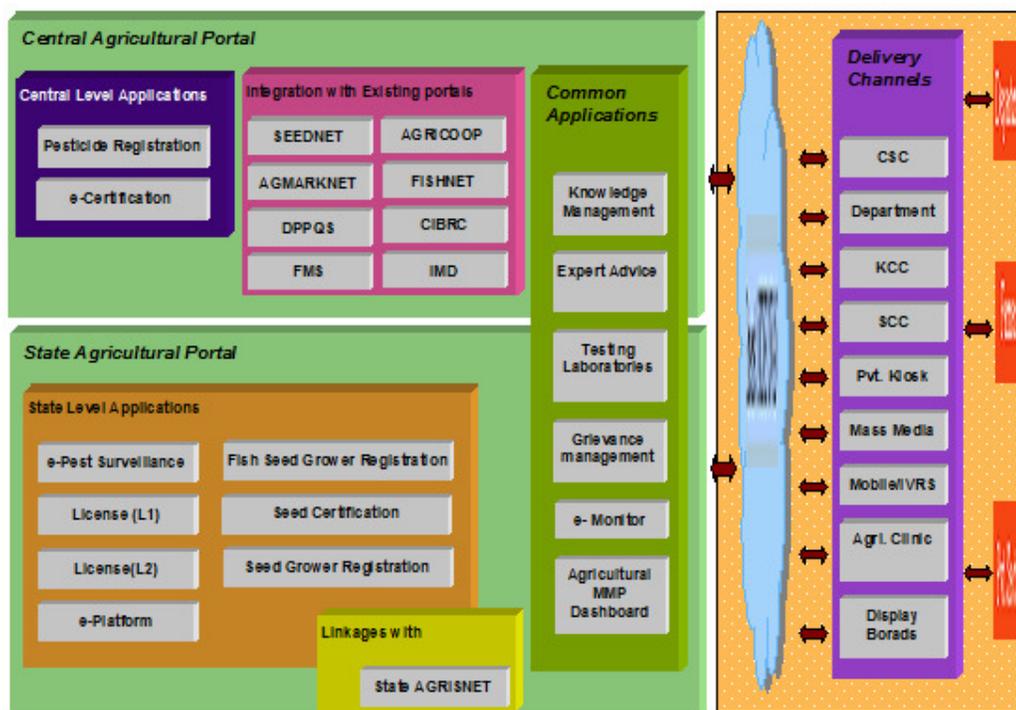
and ongoing evaluation work such as – implementation of farmer’s friend, demonstration plot concept and farmers’ club are major.

9. **Information on fisheries:** This service aims at providing information on - good practices for fish farming, efficient use of feed material etc, dealer network, quality control, fishermen safety, fish diseases, schemes for fishermen and fish production statistics, automation of fish seed grower registration, vessel registration, expert advice and mechanism for grievance management.

10. **Information on irrigation infrastructure:** This service aims at providing information on - water release schedule, best practices on irrigation, web based interface for selection of beneficiaries under amended NREGA clause, information on ground water, availability and viability of tube wells etc in an area, water level in reservoirs and likely area of different crop mixes that can be irrigated from it, irrigation equipment, expert advice and mechanism for grievance management. The service would list the command area created planned and actually serviced at the end of each crop season under different projects including the Government Tube wells, Lift irrigation and Canal irrigation (including information on distribution network in a command area).

11. **Drought relief and management:** This service will provide information on - past / present trends and management by linking with inputs from the States and expert bodies such as Indian Space Application Centre (ISRO), National Remote Sensing Centre (NRSA), India Meteorological Department (IMD) etc. Drought Management Information System (DMIS) will also be upgraded to make it Tehsil centric and, if possible, convert the information to GIS. The service will provide a template for online submission of memorandum on drought relief under NCCF (National Calamity Contingency Fund) based on the manual of drought management published by the department. A template for the report of the central team would also be prepared for online submission of the report. Decision making tools would be backing the report for making recommendations. It will also provide relevant information through up-gradation of Drought Management Information System and linkages with efforts of Department of Space.

12. **Livestock management:** This service will provide information on - livestock management related activities at the state level; It also aims to provide information and expert advisory on live-stock during normal circumstances and also during drought; it will also provide information on availability of fodder in the nearest region of the farmer.



The implementation of plan was proposed, designed and implemented by NIC was shown above. The central and state agriculture portals form the part of it to provide services to farmers under e-Governance plan. These two portals are integrated with AGRISNET of each state for knowledge dissemination to farmers in language sensitive way. The delivery of services is spread across various mediums to reach to the needy farmers across the villages. These delivery devices include CSCs, KCC, SCC, Private Kiosks, Mass Medias, Department, Agri-clinics, Display boards etc.

AGRISNET (Agricultural Information System Network)

A Mission Mode Project for Agriculture Department of each state specific concerned. Government of India, Department of Agriculture & Co-operation (DAC), Ministry of Agriculture has decided to launch a Central Sector Scheme titled, ‘Strengthening / Promoting Agricultural Informatics & Communications’ of which one component is

AGRISNET. The objective of AGRISNET (Agricultural Information System Network) Project is to create a sustainable data bank of all Agricultural Inputs in the State concerned containing entries for all relevant information pertaining to Agriculture and its related activities and to access the same through a secured Network. Objective of the Project is to network all Agricultural Offices up to Block level with State Department of Agriculture for improving information access and to provide advisory services to the farming community through use of ICT. Under AGRISNET project (A Mission Mode Project under National e-Governance Plan), the offices of Agriculture Department including the District/Sub-Division/Block level offices will be connected through a Network based on State-SWAN / NICNET. The services provided through are: G2C, G2B, G2G and G2E. Expected impact of the project on e-Governance scenario at national/State level include:

- Improved information access and effective delivery of services to the farming community
- Establishing Agriculture on-line services across
- Faster and efficient redressal service to farmers' grievances
- Efficient and improved communication system among all the offices of the department
- Use of e-mails services across the department
- Improved transparency and accountability of the department
- Direct feedback from farming community to the decision makers
- Better monitoring of government schemes, which directly impact on farmers
- Efficient management (development, conservation, allocation and utilization) of resources
- Improved productivity and profitability of farmers through better advisory systems
- Efficient and increased utilization of information by stakeholders for their decision-making
- Foundation for development of e-business in Agriculture
- Better organizational efficiency and productivity

References:

Open source NIC and DAC documents and presentations.

ICTs: Concepts and Relevance

Introduction

ICTs or Information and Communication Technologies are emerging as an important tool for the development of societies and have driving forces in the economies world-wide. ICTs are no more confined to assist high-end research and development; the new technologies have made significant improvements in the life-styles and the efficiency-levels all sectors of economy. The positive impact of ICTs is most visible in service-sector, where the efficiency levels have gone very high. New businesses like “Business Process Out-sourcing (BPOs)”, Banking and Insurance, the entertainment industry and other industries and organizations, are all taking maximum advantage of the ICT revolution.

The Agriculture sector is gearing itself to make optimal use of the new information and communication technologies. At the Government of India level, a number of important initiatives have been taken to provide IT Hardware and connectivity to all organization involved in Agricultural Education, research, development and dissemination. Simultaneously Agricultural content development initiatives have been take by Ministry of Agriculture, in collaboration of National Informatics Centre (NIC), to provide marketing information of various agricultural commodities to the farming community. Another content-creation and aggregation initiative is being supported by Indian Council of Agricultural Research (ICAR), under its World Bank aided project – National Agricultural Innovations Project (NAIP), wherein the Leading ICT institutions like IIT Kanpur, IIT Mumbai, IITKM, Kozikode and International Crop Research Institute for Semi-Arid Tropics (ICRISAT) have been roped in to guide National Agricultural Research System to design, development and implement Knowledge Management Systems (KMS) in Agriculture. ICTs are thus emerging as very important tools for Agricultural Extension, and it is now a must for every Agriculture graduate to have working knowledge of Computers, Communications, Internet and World-Wide-Web.

Changing Agricultural Scenario and Information Needs

So far, we are adopting the traditional systems such as pamphlets, posters, radios, and television to disseminate the agricultural information to the farmers. In this system, there is

a plenty of time gap in reaching the information to the farmers. The information should be accurate and should reach at right time. The rapid growth of the Information Technology and Communications Systems (ICTs) has changed the world scenario entirely. And, now linking two computers from anywhere in the world is an easy task. The emergence of Internet and E-mail systems has changed the inter-relations of personal contact so fast. To reduce the gap between rural and urban people, the Government, NGOs and private companies have initiated various ICT projects. The result was linking of villages with wired network has come to true in some parts of the country.

As an information source, the usual forms "coffee shop" cannot serve for local specific needs of farmers. Farmers need local relevant information for better farming. Farmers, whose operations have numerous characteristics - different soil types, crops, whether, pest complexes and marketing arrangements etc. The relevant information of above all will benefit the farmers to achieve the maximum profits. These factors will lead to disseminate location specific information system for agriculture development as a farmer centric model. The extent and rate of change now occurring in the development of ICTs have opened the way for significant change in crop production management, agricultural decision-making and information dissemination.

The farmers may depend on extension personnel to get the proper advice to cultivate the crop. The information related to different schemes, crops, technologies, seeds, fertilizers, pesticides, availability of fertilizers, seedlings, bio-pesticides, soil fertility, pest and disease diagnosis and many more. The agricultural marketing information is essential for farmers to increase their profits. Information such as price details of seeds, fertilizers, pesticides and availability of these products in the market gives the farmer to take decision in choosing right seed, fertilizer and pesticide required for the better farming. The vital information, that flows from the agricultural policy maker's desk, such as fixation of procurement price, procurement targets and policy relating to exports to farmers to get maximum profits.

Weather forecasting is also one of the important requirement of farming will highly helpful to the farmers to take right decision at right time. The research is advancing rapidly with the advent of high performance computing and communications systems to predict weather forecasting. The different types of weather forecasting: short-range, usually referring to the upcoming 36-48 hours; medium-range, referring to the 1-2 week time frame; and long-

range, referring to periods one or more months, which became more useful and help the farmers to take right decision in farming timely.

ICTs: The Definition and Relevance

ICT or Information and Communications Technology in simple terms, can be defined as the basket of technologies, which assist or support in storage, processing of Data/ Information, or in dissemination/ communication of Data/ Information, or both. ICT thus includes technologies such as desktop and laptop computers, software, peripherals and connections to the Internet that are intended to fulfill information processing and communications functions.

According to Wikipedia (2008), the term ICT is the broader term of Information Technology (IT), to explicitly include the field of electronic communication, in addition to IT. The term IT is defined as "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information, securely.

ICT is thus used as an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning.

The importance of ICT lies, less in the technology itself, than in its ability to create greater access to information and communication among the hitherto un-reached geographies and populations. Appropriate ICT interventions are yielding very positive results in developing and under-developed economies. The "Grameen Phone" initiative in Bangladesh, Kothamale Radio Project in Srilanka, and ITC's e-Chaupals in India, are examples of such innovations. Many countries around the world have established organizations for the promotion of ICTs, because it is feared that unless less technologically advanced areas have a chance to catch up, the increasing technological advances in developed nations will only serve to aggravate the already-existing economic gap between technological "have" and "have not" areas.

The relevance of ICTs for Agricultural Development in general and for Agricultural Extension in particular is extremely high for a country like ours. ICTs are most natural allies to facilitate the outreach of Agricultural Extension system in the country. Despite a large, well-educated, well-trained and well-organized Agricultural extension manpower, around 60% of farmers in our country still remain un-reached (NSSO, 2005), not served by any extension agency or functionary. Of the 40%, who have some access to Agricultural Information, the major sources of this information are Radio and Television. The telephone has just started to make its presence felt on this scenario. During last less than 4 years of its operations, the Kisan Call Centres (KCC) Helpline- 1551, has registered over 2.4 million (24 Lakh) calls. Internet-supporting Information-Kiosks are also serving the farming community, in many parts of the country. Hence ICTs are highly relevant for Agricultural Extension scientists, researchers, functionaries and organizations.

Trends in Agricultural Information Management

Virtual Community

A virtual community, e-community or online community is a group of people that primarily interact via communication media such as letters, telephone, email or Usenet rather than face to face. If the mechanism is a computer network, it is called an online community. Virtual and online communities have also become a supplemental form of communication between people who know each other primarily in real life. Many means are used in social software separately or in combination, including -based chatrooms and forums that use voice, video and/ or text.

Virtual Information Networks

A number of virtual information networks with the objective of linking agricultural institutions for facilitating better access to information resources have been initiated successfully. While some of these network agricultural institutions within a country, some link agricultural institutions around the globe. Some of these are profiled here.

International Initiatives

a. Agriculture Network Information Center (AgNIC) www.agnic.org

AgNIC is an Internet based network of public and private agricultural libraries and information centers, coordinated by the National Agriculture Library (NAL), USA. The

network aims to provide global access to agricultural information. AgNIC Members represent 40 land-grant universities and other national and international partners including universities and research institutions, government agencies, and a non-profit organization. Through its website the network provides access to a network of electronic sources on research and teaching in agriculture, food, renewable natural resources, forestry, and physical and social sciences. AgNIC is a distributed discipline-oriented source of agricultural information in electronic form on the Internet. The goals are to: identify major collections of agriculture-related information; provide mechanisms to facilitate access/retrieval from these information resources; create mechanisms to encourage organizations to collaborate in creating/using AgNIC. AgNIC partners select important information sources for inclusion in the system. Services include: Resource database with web sites, image collections, lists of publications, documents, databases, and other resources; Calendar of events which includes meetings, seminars, national and international symposia and conferences, conventions, and workshops in agricultural and related sciences; News items; Specialized Services – such as Plant Disease Announcements; discussions on emerging plant diseases around the world; Expertise where specialists respond to individual questions (NAL, 2006). There are partnerships between libraries and United States Department of Agriculture (USDA) Cooperative Extension programs; between libraries and academic departments within colleges; between states and between technologists and librarians. Member participants take responsibility for small, segments of agricultural information and develop Web sites and reference services in their specific subject areas. Nearly all participating AgNIC institutions have developed partnering relationships with a variety of internal and external institutions, groups, and agencies to develop content and tools for their respective Web sites.

b. Agricultural Libraries Network (AGLINET)

The Agricultural Libraries Network (AGLINET- www.fao.org/library/info_services_EN/aglinet_EN.htm) (1971-) coordinated by the Food and Agriculture Organization of the United Nation (FAO), is a world-wide, voluntary network of international agricultural libraries with regional/country coverage and other comprehensive or specialized subject resource collections. All member libraries provide, upon request, access to the literature originating in the country or region or for a given specialization. AGLINET, aims at combining resources for mutual and rational use through delivery of primary documents, by means of inter library loan provision of reproductions, bibliographic information; with

appropriate regional and subject specialization. Member libraries include Agricultural libraries of national or regional importance with comprehensive collections and strong regional coverage; Libraries in special subject fields within the broad domain of agriculture with worldwide coverage. AGLINET Network members include Libraries from Argentina, Australia, Belarus, Belgium, Benin, Botswana, Brazil, Bulgaria, Brazil, Canada, China Costa Rica, Czech republic, Denmark, Egypt, Estonia, Ethiopia, Finland, France, Germany, Hungary, India, Indonesia, Italy, Japan, Jordan, Kenya, Korea, Latvia, Lithuania Malawi Malaysia, Mexico, Netherlands, Nigeria, Norway Philippines, Poland Portugal, Russia, Slovenia, south Korea, sprain, Sri Lanka, Sweden Syria, Thailand, UK, Uruguay, USA, West Indies, Zambia (FAO, 2006).

d. AGRIGATE (www.agrigate.edu.au)

Coordinated by the National Library of Australia is a project of the libraries of the Universities of Melbourne, Adelaide and Queensland, and the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia. This is a subject information gateway for resources, both online and offline, in agricultural research. The purpose is to support the identification and dissemination of quality research materials selected by an editorial review process consisting of members of the agricultural research community. The content covers agriculture and related areas of value to the Australian agricultural research community. Subject specialist librarians have reviewed the resources selected. The majority of resources identified in the database are available online (AGRIGATE, 2006).

e. AGROWEB CEE network (<http://www.iaaldcee.hu/awnt.html>)

Organizations and individuals involved in agricultural and rural development in Central and Eastern Europe have established AGROWEB CEE network. This collaborative network is maintained by representatives of participating countries, and facilitated by International Association of Agricultural Information Specialists (IAALD) and FAO. Twenty-five countries from the Balkan region, New Independent States, Baltic States, Caucasus region, Central Asia, and European Union are participating in the network. National web pages have been established as portals for the countries in the region, which provide access to information about agriculture-related institutions - ministries, libraries, information centres, universities, research centres, NGOs, agro-marketing organizations and other organizations. The AgroWeb national portals provide Internet links, to these

national institutions and to other relevant national web sites. In addition to the national portal pages, crosscutting subject areas have been identified and a number of thematic sectors of the network are being coordinated by regional focal points.

f. Asia-Pacific Association of Agricultural Research Institutions (APAARI)
(www.apaari.org)

Information exchange among the Asia-Pacific national agricultural research systems is one of the primary objectives of the Asia-Pacific Agricultural Research Information System (APARIS). Components of APARIS include Management Information System (MIS) Tools viz.: Regional Research Networks (RRN) Database, NARS Database, etc.; information on regional events; access to scientific publications generated by agricultural research in the region; electronic Forums to facilitate dialogue among stakeholders of ARD in the region on issues of strategic importance; gateway/portal service - portal to Regional Research Networks (RRNs), websites of NARS Institutions in the Asia/Pacific region, web-enabled information on key topics/themes of ARD; Knowledge Networks on ARD in the APAARI region; information dissemination through APAARI web site and publications. The web site has linkages to various national, regional and international institutions, networks, and other organizations.

g. The Consultative Group on International Agricultural Research (CGIAR)
(www.cgiar.org)

This is a research network of fifteen international agricultural research centers. The 15 centers supported by the CGIAR are independent institutions, each with its own charter, international board of trustees, director general, and staff. The institutions are Africa Rice Center (WARDA), Biodiversity International, Centro Internacional de Agricultura Tropical (CIAT), Center for International Forestry Research (CIFOR), International Maize and Wheat Improvement centre (CIMMYT), International Potato center (CIP), International Center for Agricultural Research in the Dry Areas (ICARDA), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Food Policy Research Institute (IFPRI), International Institute of Tropical Agriculture (IITA), International Livestock Research Institute (ILRI), International Rice Research Institute (IRRI), International Water Management Institute (IWMI), World Agro-forestry Center (ICRAF) and World Fish Center. Thirteen of the 15 CGIAR Centers are located in developing countries and the knowledge gathered is shared and disseminated across the

world. The CGIAR website gives access to a Virtual Information Center and Library. One can tap into agricultural information databases, including online libraries of the CGIAR Centers and the Core Collection Database. The CG Library gives access to databases and e-journals and facility to go directly to the full text of publications. One can search CGIAR libraries/other agricultural libraries/by specific topics. The Virtual Information Center provides information on various topics mentioning the source against each topic. Each institutional library is the source for/and responsible for providing information on specific subject areas viz.,: Agriculture in the Dry Areas- ICARDA library; Agriculture in semi arid tropics- ICRISAT library; Agro-forestry- ICRAF library; Aquaculture and fisheries - WorldFish Center library; Food policy- IFPRI library, Agricultural biodiversity – IPGRI library; Water Management-IWMI library; Wheat - CIMMYT library, etc.

h. DAINET - German Agricultural Information Network

The German Agricultural Information Network DAINet is a catalogue of Internet sources in the field of nutrition, agriculture and forestry. DAINet was established in 1995 to guide people interested in subject specific information to sources on the Internet. DAINet has about 7,500 references to information sources and about 800 weblinks to agriculture-related organizations. Three sections cover, 'information', 'service' and 'dialogue'. The 'information section' organized by subjects, structures worldwide existing agricultural information under 'subject fields', 'user groups' and 'topics'. The 19 'subject fields' cover various topics of agriculture. The division into five user groups caters to the specific needs of farmers, economists, scientists, educators and journalists. The 'service section' is structured according to types of data. The 'dialog section' is used for professional communication through Internet. 'Information' and 'service' sections offer links to databases and web pages and also give access to newsgroups and mailing lists (Friedrich and Pohlmann, 1997).

i. ELIN - Entomology Library and Information Network

ELIN project hosted by the Natural History Museum, London, at http://www.nhm.ac.uk/hosted_sites/elin/ aims to establish a global Entomology Library and Information Network to provide entomologists with a co-ordinated and structured electronic information resource including a gateway to a wide range of entomological information. A mailing list was launched in 1998 and has over 100 members from libraries and information centres from around the world, which has encouraged international

communication between specialists working with entomological information. The ELIN project provides up-to-date, detailed information about entomological libraries around the world. (Natural History Museum (NHM), 2006).

Information Network on Post-harvest Operations (INPhO) www.fao.org/inpho/

INPhO is an FAO databank project of the Post-harvest Management Group. It is an international collaborative effort by the FAO, GTZ and CIRAD which aims to support the collection and dissemination of information on proven technologies and products in post harvest systems. Components of the network: include a comprehensive collection of information on post harvest issues, communication/interactive services; links with other databases. The website includes full text documents of training and technical publications, country profiles, crop profiles (main focus is on cereals and grains, fruits and vegetables, oil seeds, roots and tubers). Recipients of this information include people working in the agricultural production and marketing sector viz., producers, researchers, policy makers, private investors and donors (FAO, 2006).

Philippine Agricultural Libraries and Information Services Network (PhilAgriNet). <http://www.philagrinet.org.ph/>

PhilAgriNet aims to create and maintain a central electronic database of Philippine technical agricultural literature and make this accessible to agricultural scientists worldwide. Membership is open to agricultural institutions. The database intends to cover all technical publications on agriculture, generated by member institutions, both published and unpublished, and written in any language or dialect, regardless of format. Affiliation is open to libraries of: Government agencies and corporations engaged in agricultural research; state colleges and universities, whose curriculum includes agriculture and independent or private agricultural agencies.(PhilAgriNet, 2006).

Virtual Extension Research Communication Network (VERCON)

Virtual Extension and Research Communication Network (VERCON) established by FAO aims to use the potential of the Internet and apply it to strengthening and enabling linkages among the research and extension components of the national agricultural knowledge and information system. VERCON aims at improving linkages between and within agricultural research and extension institutions through a human and a technological component. The

human component is a network of staff of research and extension institutions, faculty of agricultural education, NGO workers, in some cases agro producers committed to strengthening collaboration, communicating, sharing information and supporting improved agricultural production. In order to link the human component there is the technological component, which allows members of the network to communicate and develop, share, store and retrieve information. (FAO, 2006) Network members can engage in two-way horizontal communication to address problems, discuss solutions and coordinate local, regional and national agricultural activities. An illustration of how VERCON functions: A farmer visits an extension office with an insect that is causing heavy damage to his cotton crop. The extension worker identifies the insect by consulting a database of digital photographs of various cotton pests that have been photographed in the area and scanned. Using a chat room, a number of integrated pest management specialists are consulted simultaneously about how to accurately identify and control the pest. Relevant information is quickly compiled from research results, pest distribution maps, publications and the photo file into a Fact sheet using a template. A message with the Fact sheet attached is sent to all extension officers in the region, warning about the presence of the pest and providing recommended integrated pest management measures. This is communicated to farmers through IPM farmer field schools, facilitated by extension. The Egyptian Government has established a pilot VERCON to support research and extension interaction and the flow of information between research, extension and farmers in Egypt. (Shaker, 2002).

Web-based Information Service for Agricultural Research for Development (WISARD) <http://www.wisard.org/wisard/home.html>

WISARD is a web-based information platform that provides searchable information on experts, organizations, outputs and projects in the fields of Agricultural Research for Development (ARD), Natural Resource Management (NRM) and Sustainable Development (SD) from the mid-nineties till date. The system can be used at organisation, network, national and international levels. WISARD allows decentralized data input and management through focal points at organization, network or national level. A module has been added for depositing outputs of research another is under development for 'Technologies and Best Practices'. Present partners include among others, CGIAR, IPM-Europe, Rice-Wheat Consortium for the Indo-Gangetic Plains, FAO, donor agencies,

international and national NGOs and European agencies and national agricultural research systems of India, Pakistan, Nepal and Bangladesh. (WISARD, 2006).

Electronic Publishing in Agriculture

Electronic Publishing (e-Publishing) is quickly becoming an important part of publishing mainstream. Recent innovations in this area have made it possible to publish on the information super highway. E-document can be accessed at the computer. It makes much easier for readers to search the information. It is very quick and easy for a reader to browse the table of the contents of previous issues, to jump directly to a particular section of a document or even particular section of an article.

Advantages of e- Publishing

E-Publishing (EP) difference lies in the new levels of value it provides through features not possible in traditional media. EP products may differ to an even greater degree than print products. Nevertheless, there are some common features to distinguish EP from print Publishing in terms of value to end-users. EP products create additional value for the user with regard to following three dimensions: content availability; content transparency and interactivity and content format.

Content availability means that EP products can be delivered and accessed with more independence of time and place than can be traditional print products and that their delivery is less limited with regard to quantity. Content availability includes; time of delivery - available any time; location of delivery - consumption anywhere; amount of information - end of traditional boundaries imposed by paper volume and price. Content transparency and interactivity refers to new tools and opportunities concerning information navigation. The main features are: Interactivity- contextual hyperlinks open new dimensions of information retrieval and lead to new types of information behaviour: browsing, etc. the possibility to integrate content and services; and search tools across one or thousands of documents - interactive information processing.

Electronic Publishing in Agriculture in India

The Directorate of Information and Publications of Agriculture, (DIPA), New Delhi, is the official publication wing of the ICAR through which the research and other activities are revealed to the world. DIPA brings out a variety of publications in English and Hindi

languages for the use of scientists, researchers, students, policy planners, extension personnel, farmers and the general public. The e-publications of DIPA include - "Handbook of Horticulture", ICAR Research Projects Information – Research Project Files (RPF) Database, ICAR Vision 2020 Document etc. Some other important institution bringing out e-publications in Agriculture in India include, National Institute of Agricultural Extension Management, MANAGE, Hyderabad (www.manage.gov.in), Indian Agricultural Research Institute, New Delhi (www.iaripusa.org), Indian Farmers Fertilizer Cooperative Limited (IFFCO), (www.iffco.nic.in), Krishak Bharati Co-operative Limited (KRIBHCO), (www.kribhco.net), National Bank for Agricultural and Rural Development (NABARD) (www.nabard.org), National Agricultural Co-operative Marketing Federation of India Ltd. (NAFED) (www.nafed-india.com), Indian Agricultural Statistics Research Institute (IASRI), New Delhi (www.iasri.res.in) and State Agriculture Universities of Tamilnadu, Uttarakhand, Punjab, Haryana and Andhra Pradesh.

Two major open universities namely Indira Gandhi National Open University (IGNOU), Delhi and Yashwantrao Chavan Maharashtra Open University (YCMOU), Nashik and National Institute of Agricultural Extension Management, MANAGE, Hyderabad have taken open and distance learning in Agriculture on a national scale, and all these institutions are in process of bringing out a number of e-publications in Agriculture.

1.4. Open Access to Information Retrieval

1. Open Access (OA) is free, immediate, permanent online access to the full text of research articles for anyone, web-wide. There are two roads to Open Access:
2. The "golden road" of OA journal-publishing, where journals provide OA to their articles (either by charging the author-institution for refereeing/publishing outgoing articles instead of charging the user-institution for accessing incoming articles, or by simply making their online edition free for all);
3. The "green road" of OA self-archiving, where authors provide OA to their own published articles, by making their own e-prints free for all.
4. The two roads to OA should not be confused or conflated; they are complementary. An Open Access Publication is one that meets the following two conditions:

5. The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make small numbers of printed copies for their personal use.
6. A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable standard electronic format is deposited immediately upon initial publication in at least one online repository that is supported by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving (for the biomedical sciences, PubMed Central is such a repository).

According to Directory of Open Access Journals (DOAJ, 2008), open access journals are defined as journals that use a funding model that does not charge readers or their institutions for access.

Acceptance of OA archiving does not mean abandoning peer review or ceasing to publish journals. It merely means the parallel archiving of all research papers in interoperable institutional archives searchable by all on the Internet, a process increasingly accepted by major journals. This process is almost cost-free since it can be carried out by individual researchers themselves, or by their institutions, paper by paper. Software for establishing e-print archives is available free to all. Alternatively, OA can be achieved by publication in the increasing number of OA journals. In these, the contributors or their organisations, rather than the readers meet the cost of document management, so that accessing the content remains free to all.

A number of journals published in developing countries are converting to OA, since the value to their countries of international visibility is recognized as being of far greater importance than the small amount of income the journals generate. For example, the Indian Institute of Science has established an “ePrints” archive and there is now significant OA activity in the sub-continent (new institutional archives being established, workshops on OA being organized).

The recent agreement to provide free or low cost journals to the poorest countries by publishers that make few sales in these areas is a welcome development (eg WHO HINARI and INASP PERI projects), and can alleviate information poverty for some countries in the immediate term. However, these efforts are unlikely to be sustainable and exclude many poor countries where collaborating publishers may lose sales, such as India. In the longer term the worldwide acceptance of OA is the only mechanism, immediately available and at almost no cost, that can provide equality of access as well as professional inclusion for developing country science.

The WHO HINARI Project

HINARI stands for the Health Inter-Network Access to Research Initiative. HINARI is an international initiative to provide free, or low-cost, access to the major journals in biomedical and related social sciences, to public institutions in developing countries. It aims to improve public health by facilitating the flow of health information, using the Internet. The core elements of the project are content, Internet connectivity and capacity building. Eligibility for HINARI membership is based on gross national product (GNP) per capita. Institutions in countries with GNP per capita below US\$1,000 are eligible for free access to the literature. Institutions in countries where GNP per capita lies between \$1,000 and \$3,000 are eligible for access at reduced prices. Within these countries HINARI will benefit bona fide academic, research and government institutions.

HINARI was launched by the Secretary General of the United Nations in September 2000 and is led by the World Health Organization (WHO). The HINARI project brings together public and private partners with the principle of ensuring equitable access to health information. There are 113 countries whose institutions are eligible to join HINARI and currently over 1,000 health institutions are registered for free or very low-cost access to the journal collection. HINARI has partnered with the world's leading biomedical publishers to bring over 2,000 journals to the developing world. HINARI was created to bridge the 'digital divide' in health, ensuring that relevant information - and the technologies to deliver it - are widely available and effectively used by health personnel: professionals, researchers and scientists, and policy makers.

The HINARI portal provides a vast library of up-to-date information on public health. Users can access scientific publications, statistical data and information for health policy and practice, as well as computational health applications such as geographical information systems and epidemiological tools, plus courses and training offered through distance learning. HINARI seeks to establish or upgrade thousands of Internet-connected sites in public and not-for-profit institutions in developing countries. The project hopes to concentrate on building the skills needed to put information into action: information access and use in daily work, basic computer and Internet skills, and hands-on training to use specialized public health information, literature and tools.

Open Access in India

Open Access is gaining momentum in India. Some major Indian institutions, which have joined the Open Access movement include:

1. Indian Institute of Science, Bangalore
2. Indian Academy of Sciences, Bangalore
3. Indian Institute of Astrophysics, Bangalore
4. Raman Research Institute, Bangalore
5. Indian Statistical Institute, Bangalore
6. National Chemical Laboratory, Pune
7. University of Hyderabad, Hyderabad
8. Indian Institute of Technology, New Delhi
9. Indian Institute of Technology, Kharagpur
10. Indian Institute of Management, Kozikode
11. Indian Statistical Institute, Kolkata
12. Indira Gandhi Institute for Development Research, Mumbai
13. G.B. Pant University of Agriculture and Technology, Pantnagar, Uttaranchal
14. National Institute of Oceanography, Goa
15. National Institute of Technology, Rourkela
16. Sri Venkateswara University, Tirupati
17. Indian National Science Academy, New Delhi

Institutional Repositories

Institutional Repositories (IRs) are the digital information warehouses of modern academic institutions. According to Clifford Lynch (2003), the IRs are “a set of services that a university offers to the members of its community for the management and dissemination

of digital materials created by the institution and its community members”. The key features of a professionally managed IR are: Rich digital Content, up to date full-length Institutional Research papers, full participation of all Research Scientists of the organization, and fully supported by top administration.

The benefits of Institutional Repositories include- higher visibility in academic circles, better reach through WWW, efficiency through Centralization of Digital content, Wider access and visibility, Improved impact and citation of their work, Opportunity to share unpublished ideas and know-how, motivation for junior researchers through immediate presence on IR. The IRs also promotes information documentation habit in young researchers and development functionaries.

Institutional Repositories in India

Institutional Repositories in India are less than 5 years old; many are in the testing phase, and none have more than a few thousand papers. The Indian Institute of Science was the first in the country to set up an interoperable institutional repository (ePrints@IISc) in 2002 (eprints.iisc.ernet.in). The archive now has more than 3,000 documents, with over 90% having full text. The Institute has a separate Archives Unit and well documented submission guidelines. Other Institutional repositories are very new and not very rich in content. Many are in the testing phase, and none have more than 500 papers.

OA and IR movement has certainly helped the Indian journals to reach an international audience, as could be seen by the number and distribution of article downloads. The Journal of Postgraduate Medicine, a quarterly journal with a print circulation of less than 1,000, attracts close to 100,000 visitors with more than 110,000 article downloads per month. The increased accessibility and visibility has also increased the citations received by this journal (Sahu, Gogtay and Bavdekar, 2005). Professor Subbiah Arunachalam of the M. S. Swaminathan Research Foundation, Chennai, is the greatest OA advocate in the country. He organized a workshop on ‘Open Access and Institutional Repositories under the aegis of the MSSRF, Chennai in May 2004. A special session on OA was held at the 93rd Indian Science Congress held at Hyderabad in January 2006, which came up with the some far-reaching recommendations for the ‘Optimal National Open Access Policy’. According to their recommendations, “The Government of India expects authors of research papers resulting from publicly-funded research to maximize the opportunities to

make their results available for free. To this end, the Government requires electronic copies of any research paper that has been accepted for publication in a peer-reviewed journal, and is supported in whole or in part by Government funding, to be deposited into an Institutional OA repository immediately on acceptance for publication.”

Concept of Information Kiosk

The concept of ‘ICT kiosk’ is to provide various services including agricultural information to the rural people to enhance the accessibility of information at village level. The Kiosk has gained wide popularity and is being promoted by various governments and private agencies to address the digital divide, little is known about the critical components required to make such a venture successful.

According to a research conducted by Digital Partners, India is way ahead of other countries and regions in the development and use of ICT kiosks. The findings are part of the interim research report titled ‘ICT Kiosks: A Comparative Study’. The report covers India, Latin America and Africa and attempts to find out the best practices among various models to guide its investments.

The research indicates that initiatives being taken in India are much stronger than those in any other country. Not only does India leads in e-governance initiatives being taken in all Latin American and Asian countries, many of the Indian projects are also profit driven. "It seems that in India, the tiered franchised business model is the most common or at least the projects that are using this model are the most visible," the interim report says.

India also boasts of the highest number of local ICT promoters—most likely because unlike in other countries, technical training in India is available much easily. However, some of the projects in India had to contend with limited success because of lack of awareness within the community. People in villages some time are not aware of the services that these ICT kiosks can bring to them. Perhaps the key issue here would be to consider promoting such facilities before setting up the kiosks and ensure that the effort continues in a sustained manner. The maintenance of equipment at these centers is one of the biggest issues that these projects need to address in order to sustain the effort on a long-term basis. While few of the big projects are already addressing this issue (ITC e-chaupal and CSC

centers), it could definitely hamper the sustainability of the ICT kiosks, particularly those located in rural areas that lack connectivity and infrastructure.

ICT Indicators and Network Readiness Index of Countries

In technological terms the ICTs have been defined as the core Computer technologies coupled with communication technologies. For the development sector, however, the ICTs are much more than only digital communication. The Television and Radio have been the key Communication medium for the Agriculture sector not only in developing countries, but also in developed countries as well. And hence the wider definition of ICTs, cover all the modes of Information sharing mechanism, which facilitate development communication. To have a clear understanding of ICTs and for monitoring and evaluating the impact of ICTs on economic and social developments, an International definition of ICT Indicators was required and the same has been developed by the Partnership on Measuring ICT for Development, under the aegis of a consortium supported by a number international agencies which include- ITU, UNCTAD, UNESCO Institute for Statistics, UNESCWA, Eurostat and the World Bank.

The Partnership on Measuring ICT for Development was launched in Sao Paulo, Brazil in June 2004 with the aim to accommodate and develop further the different initiatives regarding the availability and measurement of ICT indicators at the national, regional and international levels. It provides an open framework for coordinating ongoing and future activities, and for developing a coherent and structured approach to advancing the development of ICT indicators globally, and in particular in developing countries. Its main objectives are:

1. To achieve **a common set of core ICT indicators**, to be harmonized and agreed upon internationally, which will constitute the basis for a database on ICT statistics.
2. To **enhance the capacities of national statistical offices** in developing countries and build competence to develop statistical compilation programmes on the information society, based on internationally agreed upon indicators.
3. To develop **a global database on ICT indicators** and to make it available on the Internet.

Core ICT Indicators

The core list of ICT Indicators as suggested and adopted by the “Partnership on Measuring ICT for Development” contains four sets of indicators:

- (i) ICT Infrastructure and Access;
- (ii) Access To and Use of ICT by Households and Individuals;
- (iii) Use of ICT by Businesses; and
- (iv) ICT Sector and Trade in ICT Goods.

ICT Indicators for Infrastructure and Access

The ICT Indicators for Infrastructure and Access take account of Telephone (including Mobile Phones) connectivity, Internet Connectivity, Telephone and Internet access and Radio and Television infrastructure. These Indicators are further categorized as basic core and extended core indicators:

Basic core:

- A1 Fixed telephone lines per 100 inhabitants
- A2 Mobile cellular subscribers per 100 inhabitants
- A3 Computers per 100 inhabitants
- A4 Internet subscribers per 100 Inhabitants
- A5 Broadband Internet subscribers per 100 inhabitants
- A6 International Internet bandwidth per inhabitant
- A7 Percentage of population covered by mobile cellular telephony
- A8 Internet access tariffs (20 hours per month), in US\$, and as a % of per capita income
- A9 Mobile cellular tariffs (100 minutes of use per month), in US\$, and as a % of per capita income
- A10 Percentage of localities with public Internet access centres (PIACs) by number of inhabitants (rural/urban)

Extended core

- A11 Radio sets per 100 inhabitants
- A12 Television sets per 100 inhabitants

Indicators for Access to and Use of ICT by Households and Individuals

Basic core Indicators for Access to and Use of ICT by Households and Individuals include the Indicators on Radio, Television, Telephones and Internet availability at Household level. These Indicators are:

- HH1 Proportion of households with a radio
- HH2 Proportion of households with a TV
- HH3 Proportion of households with a fixed line telephone
- HH4 Proportion of households with a mobile cellular telephone
- HH5 Proportion of households with a computer
- HH6 Proportion of individuals who used a computer in the last 12 months
- HH7 Proportion of households with Internet access at home
- HH8 Proportion of individuals who used the Internet in the last 12 months
- HH9 Location of individual use of the Internet in the last 12 months
- HH10 Internet activities undertaken by individuals in the last 12 months

Extended core Indicators for this category are:

- HH11 Proportion of individuals with use of a mobile telephone
- HH12 Proportion of households with access to the Internet by type of access
- HH13 Frequency of individual access to the Internet in the last 12 months

Reference indicator:

- HHR1 Proportion of households with electricity

Indicators for Use of ICT by Business

Basic core indicators for use by Business are:

- B1 Proportion of businesses using computers
- B2 Proportion of employees using computers
- B3 Proportion of businesses using the Internet
- B4 Proportion of employees using the Internet
- B5 Proportion of businesses with a Web presence
- B6 Proportion of businesses with an intranet
- B7 Proportion of businesses receiving orders over the Internet
- B8 Proportion of businesses placing orders over the Internet

Extended core:

- B9 Proportion of businesses using the Internet by type of access
- B10 Proportion of businesses with a Local Area Network (LAN)
- B11 Proportion of businesses with an extranet
- B12 Proportion of businesses using the Internet by type of activity

Indicators for ICT Sector and Trade in ICT Goods

Basic core Indicators for ICT Sector and Trade in ICT goods are:

- ICT1 Proportion of total business sector workforce involved in the ICT sector
- ICT2 Value added in the ICT sector (as % of total business sector value added)
- ICT3 ICT goods imports as a percentage of total imports
- ICT4 ICT goods exports as a percentage of total exports

ICT Indicators and India

Twenty years ago, India faced tremendous challenges when it set on its journey. The PC revolution was yet to encompass the country, the telecom infrastructure was low and there was virtually no indigenous software or hardware development to talk about. The ICT industry, at a very nascent stage, appeared far behind its Western counterpart. Today, in 2008, the scenario has undergone an amazing transformation. The Indian ICT Industry in particular the IT software and services and ITES (IT Enabled Services) sectors, have not only managed to catch up with their more technology savvy global leaders, but they are also being actively sought by companies worldwide for their onsite, offshore expertise and wealth of manpower resources. Indian ICT organizations are now counted among the well known and reputed ICT solutions and services providers across the world and scores of global ICT leaders have invested in India, making the country their hub for software development, offshore outsourcing and R&D.

The Use of Personal Computers has tremendously increased from 5.4 million PCs in 2001 to 14.5 million in 2005. In 2005, only one in every hundred persons had a personal computer, which was much less compared with any developed country.

Internet Users per 100 populations

Though we have a rapid positive trend for this indicator, compared to the developed countries, we are still at the infant stage. However, every 35th person is using Internet in India.

The Government vision is to use Information Technology as a tool for raising the living standards of the common man and enriching their lives. Towards this end an ambitious programme of PC and Internet penetration to the rural and under-served urban areas has been taken up. The Department of Information Technology has initiated a programme of

establish State Wide Area Network (SWAN) upto the block level with a minimum Bandwidth of 2 MBPS to provide reliable backbone connectivity for E-Governance. The National Policy of the government recognizes the potential of E-Governance not only to improve governance but also to facilitate people's access to government services. Ministry of Communications and IT is working on a National E-Governance action plan that seeks to lay the foundation and provide impetus for a far more pervasive spread of E-Governance to reach the Common man particularly in far-flung areas. Seeking to do so Government India is putting together various elements that are needed for leveraging the enormous power of ICT for the economic development of our country and enable the common man to access Government services in an efficient, convenient and cost effective manner.

Network Readiness Index

The ICT Indicators are the basic tools for the national government to collect relevant data and then prepare a time-series of the same to assess its progress on ICT front. The ICT Indicators do not capture the policy environment and the ICT readiness of its major stakeholders like the government, business, and most importantly the public. The World Economic Forum (WEF), a Geneva-based foundation whose annual meeting of top business leaders, national political leaders (presidents, prime ministers and others), and selected intellectuals and journalists is usually held in Switzerland, has addressed this issue. WEF is bringing out the Global Information Technology Report (GITR), since 2003. The Global Information Technology Report (GITR) has become the world's most respected assessment of the impact of information and communication technology (ICT) on the development process and the competitiveness of nations.

The WEF has defined the Networked Readiness Index (NRI), which measures the propensity of countries to leverage the opportunities offered by ICT for development and increased competitiveness. It also establishes a broad international framework mapping out the enabling factors of such capacity. The Networked Readiness Index examines the preparedness of countries to use ICT effectively on three dimensions: the general business, regulatory and infrastructure environment for ICT; the readiness of the three key stakeholders- the individuals, businesses and governments, to use and benefit from ICT; and their actual usage of the latest information and communication technology available.

The Network Readiness Index (NRI) comprises of three indices:

1. The environment for ICT offered by a given country or community;
2. The readiness of the community's key stakeholders - individuals, business and governments; and
3. The usage of ICT among these stakeholders.

According to Dr. Soumitra Dutta (2007) , Chaired Professor of Business and Technology, Dean of External Relations at INSEAD and co-editor of the Report, "The Networked Readiness Index (NRI) provides a snapshot of countries' weaknesses and strengths with regard to ICT development and capacity to leverage the latter for increased competitiveness, thus offering policy-makers and business leaders a neutral platform for discussion and a useful tool in drawing a roadmap towards increased networked readiness."

Agriculture Websites

1. Acharya N.G.Ranga Agriculture University <http://www.angrau.ac.in/home.aspx>
2. Agri. Market Rates website (NIC) <http://www.agmarknet.nic.in>
3. Agricultural and Processed food products Export Development Authority (APEDA)
<http://www.apeda.com/>
4. Agriculture Cooperative <http://agricoop.nic.in/>
5. Agriculture <http://www.agricultureinformation.com/forums/organic-farming/103535-need-details-regarding-organic-forming-telugu-language.html>
6. Agriculture <http://www.indg.in/agriculture/>
7. Agriculture http://www.indg.in/india/home-page/view?set_language=en
8. Agriculture Statistics www.indiaagrstat.com
9. Agriculture Today <http://www.agriculturetoday.in/>
10. Agriwatch Portal <http://www.agriwatch.com>
11. Agro e-commerce Portal <http://www.agroecommerce.com>
12. Agronet Website <http://www.indiaagronet.com>
13. Commodity Portal <http://www.indiancommodity.com>
14. Department of Agriculture & Cooperation <http://www.agricoop.nic.in>
15. Department of Fertilizers <http://www.fert.nic.in>
16. Digital Mandi, IIT Kanpur <http://www.digitalmandi.net>
17. eFresh <http://www.efreshindia.com/efresh/>
18. Fertiliser Statistics <http://www.fertindia.com/>
19. Fertilizer Association of India <http://www.faidelhi.org>
20. FIEO <http://www.fieo.org>
21. Flower Portal www.fredisurti.com
22. Food Corporation of India www.fciweb.nic.in
23. HAFED <http://www.hafed.nic.in>
24. IFFCO <http://www.iffco.nic.in>
25. Ikisan Portal <http://www.ikisan.com>
26. Indian farmers <http://indianfarmers.org/>
27. Indian Society of Agribusiness Professionals <http://www.isapindia.org/isap/>
28. ITC <http://www.itcibd.com>
29. Jalaspandana <http://www.jalaspandana.org/>

30. Kisan Ayog Website <http://www.kisanayog.org>
31. Kribhco <http://www.kribhco.net>
32. Krishi World Website Portal <http://www.krishiworld.com>
33. KrishiWorld <http://krishiworld.com/>
34. Mahindra Kisan Website <http://www.mahindrakisanmitra.com>
35. MCX Commodity Exchange <http://www.mcxindia.com>
36. Ministry of Agriculture Portal <http://www.dacnet.nic.in>
37. Ministry of food processing industries <http://mofpi.nic.in/>
38. Ministry of Rural Development <http://rural.nic.in>
39. NABARD <http://www.nabard.org/>
40. Nafed <http://www.nafed-india.com>
41. National fertilizer ltd <http://www.nationalfertilizers.com/>
42. National Multi Commodity Exchange <http://www.nmce.com>
43. Navdanya <http://www.navdnya.org>
44. NCCF <http://www.nccf-india.com>
45. NCDC <http://www.ncdc.nic.in>
46. NCDEX Commodity Exchange <http://www.ncdex.com>
47. NCUI <http://www.ncui.net>
48. NDDB <http://www.nddb.org>
49. Press Information Bureau (PIB) <http://pib.nic.in/newsite/rssenglish.aspx>
50. Sasyasri <http://sasyasri.cgg.gov.in/theproject.do>
51. SRI-RICE <http://sri.ciifad.cornell.edu/extmats/>
52. Tea Coffee statistics www.carrittmoran.com
53. Uttam Krishi Portal <http://www.uttam.krishi.com>
54. Village Organics <http://www.villageorganics.in/>