Abstract: Indian Agriculture is the backbone of the country as majority of people earn their livelihood from it. Electronic Agriculture is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. Many software are being used for application of computers for e-agriculture. The office automation is application of computers, computer networks, internet, email, telephone networks, and other office automation tool such as photocopy machines, scanners, printers, cleaning equipment, and electronic security systems to increase the productivity of organizations. MS-Office is popular in India as an office automation tools. Acrobat Reader is popular software to read e-books and e-paper which is freely available on internet. Internet Explorer is an internet browser which is provided and available in windows operating system. Most popular search engine amongst the Indian agricultural sector is the www.google.com. Many GIS software are used for decision making in agriculture. The Village Resource centres and Village Knowledge centres (VRCs-VKCs), leverage best-fit Information and Communication Technologies (ICTs), and function as a conduit for information, knowledge, and skill transfer to rural communities. They bridge the knowledge, gender, and digital divides and empower the rural community by fostering participatory communication through lab-land, land-lab, lab-lab and land-land approaches.

Keywords: E-Agriculture, Computer Software, Office Automation, Information Communication Technology, Indian Agriculture, VRC-VKC, MSSRF.

I. Introduction
In India, agriculture is the backbone of the country as majority of people earn their livelihood from it. It bestows about 11.70 per cent of country’s Gross Domestic Product (Economic Survey of India, 2012-13), feeds more than 1.25 billion people and employs 58 per cent of the Indian workforce derive their livelihood from the agricultural sector. Because of the green revolution, India’s agricultural productivity has improved to the point that it is both self-sufficient and a net exporter of a number of food grains. The agricultural system has traditionally been unfair to primary producers. Farmers have only an approximate idea of price trends and have to accept the price offered them at auctions on the day that they bring their grain to the market (mandi). Today’s farmers not only want the two-time bread for their families, but also surplus food production that can be sold in the market to earn them sufficient money to fulfill their other needs. Along this line, private sector initiatives like contract farming have commercialized the Indian agricultural sector. Many new concepts and theories that substitute traditional methods have also been seen. One of them is the introduction of Information and Communication Technology (ICT), which enables the dissemination of requisite information at the right time to right person by a right person. This revolution in information technology has made access to information easy and cost-effective. ICT includes computers and communication technology along with associated software for agricultural data processing. The activities of generating, processing, transmitting, disseminating, sorting, archiving and retrieving information constitute the information industry.

II. ICT and E-Agriculture
The application of information and communications technology (ICT) in agriculture is increasingly important. Electronic Agriculture (E-Agriculture) is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (ICT) in the rural domain, with a primary focus on agriculture. E-Agriculture is a relatively new term and we fully expect its scope to change and evolve as our understanding of the area grows. E-Agriculture is one of the action lines identified in the declaration and plan of action of the World Summit on the Information Society (WSIS). The “Tunis Agenda for the Information Society,” published on 18 November 2005 and emphasizes the leading facilitating roles that UN agencies need to play in the implementation of the Geneva Plan of Action. The Food and Agriculture Organization of the United Nations (FAO) has been assigned the responsibility of organizing activities related to the action line C. 7 ICT Applications on E-Agriculture. The main phases of the agriculture industry include crop cultivation, water management, fertilizer application, fertigation, pest management, harvesting, post-harvest handling, transport of food products, packaging, food...
preservation, food processing/value addition, quality management, food safety, food storage, and food marketing. All stakeholders of agriculture industry need information and knowledge about these phases to manage them effectively and efficiently. Any system applied for getting information and knowledge for making decisions in any industry should deliver accurate, complete, concise and reliable information in time.

![Fig.1. Agricultural Information and Knowledge Management system: E-Agriculture](http://www.e-agriculture.org/blog/ict-revolutionize-indian-agricultural-sector)

The information provided by the system must be in user-friendly form, easy to access, cost-effective and well protected from unauthorized accesses. The information communication through ICT has to undergo the following steps:

- Record text, drawings, photographs, audio, video, process descriptions, and other information in digital formats,
- Produce exact duplicates of such information at significantly lower cost,
- Transfer information and knowledge rapidly over large distances through communications networks.
- Develop standardized algorithms to large quantities of information relatively rapidly.
- Achieve greater interactivity in communicating, evaluating, producing and sharing useful information and knowledge.

### III. Operating Environment of computers

Mostly, Windows operating system environment have been used in India. Windows operating system is GUI and user friendly. It is very easy to operate by using the images or pictures called as icons. Windows environment have file manager called as windows explorer and program manger called as all programs or simply programs. In programs menu one important program menu is available called as accessories. In accessories so many important programs such as calculator, command prompt, math input panel, paint, wordpad, notepad, windows explorer and other software are available which are frequently used by the agricultural people for different types of application as and when needed. Macintosh operating systems are used and available on the desktops, laptops and notebook computers of apple make computers. Windows Server, Linux and other operating systems are used for managing servers. Windows, Linux and other operating systems are also used for managing the files and folders on long term basis. It is used to take backup of valuable and important data onto to the auxiliary storage media like portable hard disk, pen drives, magnetic tape, CD, DVD, Blu-Ray disk, etc. as well as to restore it onto the computers and servers for processing of agricultural related data.

### IV. Office automation software

The office automation is application of computers, computer networks, internet, email, telephone networks, and other office automation tool such as photocopy machines, scanners, printers and electronic security systems to increase the productivity of organizations. There are many governments, private and non-government organizations involved in agriculture sector and rural development. They all have to work together to give better service to farming community. Therefore, application of office automation is one of the solutions to enhance the efficiency and inter-nectivity of the employees work in all above mentioned organizations. Many computer
applications software such as Word Pad, Notepad, Lotus Suites, MS Office, OpenOffice.org, Internet Explorer, outlook express, ms-outlook and other tailor-made office automation software packages and web sites like Gmail, Yahooemail, rediffmail, Hotmail, etc. are providing unlimited potential to organizations and individuals to fulfill their day to day data processing requirements to give an efficient service to their agriculture related persons and customers.

V. MS-Office Software

Office Automation software like MS-Office includes the software for word processing (MS-Word, Openoffice.org Writer, etc.) for managing different types of reports, technical notes, memorandum, creating and management of all type of information and files. MS-Excel is an electronic spread sheet and graphical software for management of worksheets, charts, graphs. MS-Power point is software which is used for agricultural education, training and agricultural human resource capacity building of farmers and used by the extension workers, trainers, etc. MS-Access is a relational database management system (RDBMS) which is used to store the agricultural related database and manipulate and retrieve the data as when required according to query submitted by the user. MS-Outlook is email, address and diary management system. It is used to send and receive agricultural related emails to the needy persons for direct communication. MS-Office is most popular in India as an office automation tools. It is used in agricultural sector as e-Agriculture software.

VI. Acrobat Reader

Acrobat Reader is most popular software which is freely available on internet and can be downloaded and install and use it for reading portable document file (PDF). This software are used by all the computer users who uses internet and download PDF files from internet. Internet is the ocean of all type information. Most of the agriculture related information are available in book format called as PDF which can be only read by acrobat reader. Acrobat reader is e-book reader and helps in reader the online journals, research papers, books, etc. Hence, in agricultural sector the use of acrobat reader is must for reading the online information.

VII. Internet Browser

Internet Explorer is an internet browser which is provided and available in windows operating system. Most agriculture people uses internet explorer to surf and search the data on the internet. There are many facilities in this browser. It has title bar, menu bar, address bar, file menu, edit menu, View menu, favourites, tools, help and tool bars for easy access of the software. With this browser you can open many windows of internet or many new tabs for opening many web pages simultaneously and to read it whenever it is completely downloaded on the computer. Internet Explorer can also be used for web based email system like BSNL mail, gmail, yahoo mail, rediffmail, hotmail, etc. Nowadays, other browsers like Mozilla Firefox, Google Chrome, Bing, etc. are becoming popular in agricultural sector because these browsers give quick response to the search for the web site and web pages.

VIII. Search Engines

Search Engines are the web site which helps the user to find out the related information on the given keywords on the internet. There are many web sites that work as search engines. Different types of searches have been used by the search engine to include, exclude, exact phrase, all phrase search, etc. Most popular amongst the Indian agricultural sector is the www.google.com or www.google.co.in. It has only text, doodle and no images and home page size is small. Therefore, it downloads quickly on to the computer of users on low speed Indian internet backbone. It searches the data immediately and gives the result quickly. Other search engines like www.yahoo.com or www.yahoo.co.in, www.rediff.com, etc. are also used by the agricultural related people.

IX. Geographic Information System Software

Geographic information system, or GIS, are extensively used in agriculture, especially in precision farming.

Fig. 2: Crop area near Dholka Region in Gujarat as viewed by RISAT-1 on Oct. 01, 2013 - View2

Source: http://www.isro.org/Imagegallery/satelliteimages.aspx#5
Land is mapped digitally and pertinent geodetic data such as topography and contours are combined with other statistical data for easier analysis of the soil and land use planning. GIS is used in decision making such as what to plant and where to plant using historical data and sampling. With the help of GIS we can find cropping system can be identified, drought like situations, pest attacks, rain affected area, water reservoirs, water shed management, etc. and this information and knowledge can be used for planning and decision making the precision, integrated agriculture. The ability of applications such as Esri ArcGIS, the primary GIS program used at USDA, to handle growing streams of data — from satellite imagery to old-fashioned tabular data — and then to display the data in a visual geographic fashion, make them ideal portals for coordinating many kinds of department operations. Some GIS softwares like ERDASS, Geomatica, SPANS ver. 7.0, AGROMA ver. 7.0, PAMAP ver 5.0, IDRISI ver. 2.0, ERDAS Imagine ver. 9.3, ER Mapper ver. 7.2, Arc GIS Desktop ver. 10, Geomatica ver. 10.0.1, ecognition ver. 8.7 and TNT mips ver. 7.7 and ScanEX ver. 3.0 are used. Software’s like Adobe Photoshop and Coral Ventura are being used for reports generation in agriculture related sectors.

X. Agriculture Knowledge Management Systems

Hub-Spokes Model of VRC-VKC

The Village Resource centres and Village Knowledge centres (VRCs-VKCs), leverage best-fit Information and Communication Technologies (ICTs), and function as a conduit for information, knowledge, and skill transfer to rural communities. ICT is the combination of computer hardware, software, internet, communication media and people. They bridge the knowledge, gender, and digital divides and empower the rural community by fostering participatory communication through lab-land, land-lab, lab-lab and land-land approaches.

Fig. 3: VRC and VKC of MSSRF

Source: http://www.mssrf.org/iec

The VRC-VKCs enshrine the 5 C’s of a thriving knowledge ecosystem (Prof M S Swaminathan, July 2004): reliable and affordable Connectivity and devices, dynamic and relevant Content, Capacity Building of grassroots torchbearers, Convergence of knowledge stakeholders from public and private sectors, and civil society, and community-centric Care and management of knowledge centres. “To create and implement a sustainable, scalable, space technology-supported community infrastructure towards catalysing the transformation of rural India”, this is the vision of the Indian Space Research Organization’s (ISRO) Village Resource Centre which provides geo-spatial information and services like nonformal education and healthcare to the women and men of the rural areas. Spatial information connects every citizen with his/her ‘geographical identities’ and ‘natural resources’ to their ‘native ecosystems’, and brings in the principles of associations and coexistence in their original forms. It also provides the ‘extra mile’ to the overall information empowerment. Empowering the community through spatial information infrastructure, thus, goes a long way in enabling the concept of ‘information empowerment’ to work and strengthen the democratic institutions at the grassroots. They concentrate on the localization and contextualization of services. The services they provide include Education, Health, Weather, Knowledge, Commerce, e-Governance, Entitlements, Spatial information and disaster management support. Currently working on selected locations in the Backward Regions, Islands, Mountaneous terrains and Tribal dominated areas the project hopes to expand its services with strategic alliance with key institutions to evolve suitable VRC/VIK models. The goal of VRC- VKC is to promote equitable access to information and knowledge among households from socially and economically marginalized rural communities to make informed decisions and improve their livelihoods through effective use of ICT in Tamil Nadu, Maharashtra, Kerala, Odisha, Pudhucherry and Andhra Pradesh. The strategies deployed in engaging with the
communities are knowledge and skill transfer through strategic partnerships, gender sensitive approach, advocacy and networking with Panchayati Raj institutions and partners, institutional and capacity building, demand driven and locale specific information in time, knowledge products, research and development, community ownership, and continuous handholding. A bottom-up approach in establishing the VKC ensures that community ownership is factored in to every stage of the project cycle. The hub and spokes model ensures that accurate information, related to agriculture, fisheries, animal husbandry, health, and education, sourced from public and private knowledge partners, reaches the community at the right time to support informed decision making. Its main strategies are to harness ICT to reach every village and trigger transformation through a “knowledge revolution” and facilitate optimal use of available resources to impact agriculture, irrigation, drinking water, basic health care, education and sustainable livelihoods with active partnership of the government, civil society, private sector, donor agencies, academia and institutions. Despite the availability of farming resources in the nearby areas, there always remains a lack of agricultural information, sometimes most basic, related to seeds, farming practices, climate, diseases and pests, harvesting mechanisms, application of farm machinery, post-harvest strategies and finally proper marketing. Lack of information or untimely-given information, when coupled with other factors like environment leads to a huge loss in the crop produce or crop quality or sale price of the crops and ultimately farmer suffers heavily. Therefore, strategies should be made to equip farmers with all kinds of information right from the seed sowing up to the harvesting and marketing of their farm produce from time to time to reduce losses and promote rural livelihood and food security.

XI. Conclusion
Indian agriculture is the backbone of the country as majority of people earn their livelihood from it. It feeds more than 1.25 billion people and employs 58 per cent of the Indian workforce derive their livelihood from the agricultural sector. Computer software which are used in e-Agriculture are Windows, Linux operating systems, MS-Office, Open-Office, Acrobat Reader, Paint, Wordpad, Internet explorer, Mozilla Firefox, google chrome, google search engine, GPS, GIS, VRC-VKC for data processing and dissemination of information to the agriculture related needy person in time for decision making and management of agriculture. ICT is used to store, process and disseminate the agricultural information and knowledge to the needy person in right time by right person irrespective of the distance. Application of computer software and ICT in Indian agriculture can achieve new heights for sustainability and precision agriculture that can change the livelihood of rural India.

References