

# **Role of Information Technology in Agriculture and its Scope in India**

**S.C. Mittal,<sup>1</sup>**

\* \* \*

## **Abstract**

*Information of the required quality always has the potential of improving efficiency in all spheres of agriculture. The emerging scenario of a deregulated agriculture, thanks to WTO, has brought in a greater 'need' and urgency to make it an integral part of decision making by Indian agricultural community. Information Technology (IT) has a major role to play in all facets of Indian agriculture. In addition to facilitating farmers in improving the efficiency and productivity of agriculture and allied activities, the potential of IT lies in bringing about an overall qualitative improvement in life by providing timely and quality information inputs for decision making. The personnel who work for the welfare of Indian farmers, such as extension workers, do not have access to latest information which hinders their ability to serve the farming community effectively. This paper focusses on the scope for e-powering people who live in rural India as well as those who work for their welfare. The latest developments in IT that facilitate effective IT penetration to rural India, changing pattern of information requirements & role of IT, type of systems required in the post-WTO environment, the bottlenecks in e-powering rural India along with possible solutions are examined.*

\* \* \*

## **Information Technology and its Components**

Induction of IT as a strategic tool for agricultural development and welfare of rural India requires that the necessary IT infrastructure is in place. The rapid changes and downward trend in prices in various components of IT makes it feasible to target at a large scale IT penetration into rural India. Some of the broad factors to be noted with respect to various components of IT are listed below :

1. Input devices : Radical improvements are witnessed with respect to the means of communication by human beings with computers such as key boards, mouse devices, scanners. The advent of touch screen monitors that allow users to give *input to computers by touching on the appropriate location of the monitor* has made it possible to develop user-friendly interface for farmers which is easy, intuitive, circumvents language barrier and at the same time provides a relaxed environment to the users. The present day digital cameras make it possible to capture and store good quality graphics and large video clips. The small size and low weight of these digital cameras, which are increasingly becoming affordable, open up the possibilities of providing computer based demonstration clips to educate the farmers. The digital cameras can also be used to upload plant stress related images, movie

---

<sup>1</sup> General Manager, Management Services Division, Indian Farmers Fertiliser Cooperative Limited, 34, Nehru Place, New Delhi, 110019

clips which can facilitate an expert residing at a far of location to quickly recommend a solution.

2. Output devices : Monitor screens, printers & plotters, data projectors support high resolution and good quality output. The quality of these output devices have the potential of generating renewed interest in the farmers in using IT based services. The light weight portable data projectors can be easily carried by the agricultural extension personnel for serving larger audience. Similarly, speakers can also be attached to the computers to incorporate voice based trainings for farmers.
3. Processors : The processing speeds of computers have gone up. At present, Intel P-IV based processors @ 1.5 Ghz are available in the PC range which makes it possible to undertake substantial processing of data at the client side.
4. Storage Devices : 40GB and even higher hard disk drives have become common in PC range of computers. This makes it possible to store substantial information at the local level which facilitates faster access. Similarly, high capacity floppy disk drives, CDs make it possible to transfer large volumes of data to locations which can not be connected to networks immediately. These storage devices are also used for backup of crucial data. As a precaution, many corporates store their backups at locations away from the place of work.
5. Software : Various operating systems are available which act as interface between the user and the machine. The graphic user interface (GUI) has become an accepted prerequisite for end users. Microsoft's 'Windows' continues to be a favourite in India. Application softwares which can support complex user requirements are available. Of the shelf solutions for office automation packages, groupware applications, complex database solutions, communication products, solutions based on remote sensing & geographical information systems are available. In addition, solutions based on some or all of these are also readily available. The present downward trend in the IT industry provides an opportunity get customised application for any specific task developed at an affordable price. Rapid Application Development and Deployment (RADD) is a popular model for quick development and deployment of applications. Development environment itself is simplified with tools that quicken the pace of software specialists. Project management and monitoring software are available that facilitate efficient execution of large and complex applications that are required for rural India
6. Networking devices : The capacity of modems, used to convert the data from digital to analog and vice versa, which are popularly employed to use telephone lines have increased. Internal modems are available integrated into the computer so that they are not exposed to outside environment. The capacities of other networking devices such as routers have also gone up which makes it possible to create large networks with smooth data transmission.
7. Transmission Media : The media through which the data transfer takes place has also undergone revolutionary change. Telephone lines are still the popular source in India although the reliability and low bandwidth are still major issues. High capacity cables, optical fibre, radio, wireless local loops, satellite transmission and various solutions based on a combination of these are already being used in many parts of the country.
8. Other accessories : Uninterrupted Power Supply (UPS) devices are crucial to ensure the longevity of the IT equipment as well as provide backup mechanisms. The potential of solar power packs to provide a feasible solution to shortage of power in the rural areas needs to be exploited.

## **Role of IT in Agriculture**

In the context of agriculture, the potential of information technology (IT) can be assessed broadly under two heads : (a) as a tool for direct contribution to agricultural productivity and (b) as an indirect tool for empowering farmers to take informed and quality decisions which will have positive impact on the way agriculture and allied activities are conducted.

Precision farming, popular in developed countries, extensively uses IT to make direct contribution to agricultural productivity. The techniques of remote sensing using satellite technologies, geographical information systems, agronomy and soil sciences are used to increase the agricultural output. This approach is capital intensive and useful where large tracts of land are involved. Consequently it is more suitable for farming taken up on corporate lines.

The indirect benefits of IT in empowering Indian farmer are significant and remains to be exploited. The Indian farmer urgently requires timely and reliable sources of information inputs for taking decisions. At present, the farmer depends on trickling down of decision inputs from conventional sources which are slow and unreliable. The changing environment faced by Indian farmers makes information not merely useful, but necessary to remain competitive.

## **Changing Pattern of Needs - Post WTO**

While relevant information of the required quality always had the potential of improving efficiency in all spheres of activity of Indian farmer, the emerging scenario of a deregulated agriculture, thanks to WTO, has brought in a 'need' and urgency to make it an integral part of decision making. *Consequently, deploying IT as a strategic tool for the benefit of rural India has assumed importance.* Since information needs of the Indian farmers in general are documented extensively, it is more pertinent to focus on the theme in the context of challenges raised by WTO.

The broad information inputs required by farmers in the new scenario can be classified as (i) Awareness Databases - those that facilitate proper understanding of the implications of the WTO on Indian agriculture, (ii) Decision Support Systems - information that facilitates farmers to make a proper SWOT analysis to take appropriate decisions, (iii) systems that facilitate Indian farmers to forge appropriate alliances for collective benefit, (iv) information on new opportunities (iv) monitoring systems for corrective measures.

### **(i) Awareness Databases**

First and foremost, it is essential to provide unambiguous interpretation and implications of WTO for ordinary people. The jargon and the language under various articles of WTO require to be distilled by experts and their implications are clearly to be spelled out for all the segments of Indian agriculture and allied activities. The implications for all the stake holders and the time frames are to be spelt out. This is a priority item which is to be addressed immediately. The mandatory changes in government policies on tariffs, imports, yearwise phasing of the same, the impact on various subsidy schemes would be of concern to people.

An area of immediate concern to farmers is to get an analytical input on how his/her life is going to be affected. Since removal of restrictions throw open Indian agricultural markets, the macro economic situation related to foreign exchange, inflation, the current tariff structure within and outside the country etc. and their likely impact on Indian agriculture will have a direct bearing on the decisions of segments of Indian agriculture.

(ii) Decision Support Systems for farmers

Indian farmer is cautious and usually tends to avoid risk. It is suggested that the provisions of WTO stipulating reductions in export subsidies on farm products will make Indian exports more competitive. It is estimated that the export potential may touch \$ 1.5 billion by 2005. In order to take advantage of the emerging order, the enterprising Indian farmer needs to be equipped with information that facilitates undertaking a proper SWOT analysis and compare it with conventional wisdom and satisfy himself on an appropriate course of action.

The data on cost of cultivation, efficient agricultural practices and availability of inputs will facilitate in assessing the strengths of indigenous products *vis a vis* the imports. Availability of information on the weaknesses as evident from the adverse affect of WTO on any specific agricultural product will help in taking the necessary corrective measures. In the emerging scenario, competitive advantage is required to be fully exploited to improve export potential. *India is believed to have competitive advantage in areas like fruits, oil seeds, cotton, milk products. Special thrust may be accorded to these sectors to meet international standards.* Opportunities for specialisation may lead to better export potential. Similarly, forecasts on threats in terms of information related to cheaper imports, macro-economic conditions of other countries are also required.

(iii) Systems that facilitate Indian farmers to forge appropriate alliances for collective benefit

The size of land holdings is a major barrier in exploiting any export potential. In order to remain competitive and derive better price realisations, it will be imperative for the farmers to come together through cooperative alliances. It is possible to relieve the farmers of geographical barriers by facilitating farmers to come together online and facilitate disposal of their produce at attractive prices. Online bidding can be introduced for various agricultural product categories. *This will require development of complicated IT systems which are to be supported by proper bricks and mortar infrastructure and post harvest technologies, storage, etc.*

(iv) Opportunities in the new order

It is necessary to equip Indian farmers to come together for value additions to their agricultural output. This will get them better returns from their produce and at the same time generate new employment opportunities in the rural sector. This will require systems to provide information to farmers on agro processing industries, aqua culture units, animal husbandry,

floriculture, etc. The opportunities for setting up such units, procedures related to exports, the quality norms to be adopted, packaging, etc. Are to be made available.

#### (iv) Monitoring

Since the domestic agricultural scene is exposed to international fluctuations, it is necessary to be vigilant to external shocks. Systems to monitor international market status, international supply - demand scenario, macro economic factors, political disruptions are required to be developed. Advance warning systems to alert the farmers are required to be developed. *It is necessary to promote monitoring cells in all major institutions related to agriculture and allied activities to maintain data, provide periodic analytical reports and raise advance alerts.*

### **IT and Indian Agriculture in the Future**

Technologically it is possible to develop suitable systems, as outlined in the previous sections, to cater to the information needs of Indian farmer. User friendly systems, particularly with content in local languages, can generate interest in the farmers and others working at the grassroots. It is possible to create dedicated networks or harness the power of Internet to make these services are available to all parts of the country.

The task of creating application packages and databases to cater to complete spectrum of Indian agriculture is a giant task. The Long Term Agriculture Policy provides an exhaustive list of all the areas that are to be covered. This can be taken as a guiding list to evolve design and develop suitable systems catering to each of the specified areas. *Our country has the advantage of having a large number of specialised institutions in place catering to various aspects of Indian agriculture. These institutions can play a crucial role in designing the necessary applications & databases and services.* This will facilitate modularisation of the task, better control and help in achieving quick results. As it is, several institutions have already developed systems related to their area of specialisation.

For quick results, it may be useful to get the applications outsourced to software companies in India. This will facilitate quick deployment of applications and provide boost to the software industry in India. In order to avoid duplication of efforts, *it may be useful to consider promoting a coordinating agency which will have an advisory role to play in evolving standard interface for users, broad design and monitoring of the progress.*

In the post WTO regime, it is suggested that it is useful to focus more on some agricultural products to maintain an unquestionable competitive advantage for exports. This will call for urgent measures to introduce state of the art technologies such as remote sensing, geographical information systems (GIS), bio-engineering, etc. India has made rapid strides in satellite technologies. It is possible to effectively monitor agricultural performance using remote sensing and GIS applications. This will not only help in planning, advising and monitoring the status of the crops but also will help in responding quickly to crop stress conditions and natural calamities. Challenges of crop stress, soil problems, natural disasters can be tackled effectively

through these technologies. A beginning in precision farming can be encouraged in larger tracts of land in which export potential can be tilted in our country's favour.

*While developing these systems it is necessary to appreciate that major audience that is targeted is not comfortable with computers.* This places premium on user friendliness and it may be useful to consider touch screen technologies to improve user comfort levels. It is often observed that touch screen kiosks, with their intuitive approach, provide a means for quick learning and higher participation. It is also necessary to provide as much content as possible in local languages.

Once the required application packages & databases are in place, *a major challenge is with respect to dissemination of the information.* The Krishi Vigyan Kendras, NGOs and cooperative societies may be used to set up information kiosks. Private enterprise is also required to be drawn into these activities. These kiosks should provide information on other areas of interest such as education, information for which people have to travel distances such as those related to the government, courts, etc. Facilities for email, raising queries to experts, uploading digital clips to draw the attention of experts to location specific problems can be envisaged.

### **Constraints and Remedies for Effective Dissemination**

Some of the major constraints delaying the spread of e-revolution to rural India are listed below :

1. Haphazard development : It is observed that some initiatives have already been made to provide IT based services to rural community. However, duplication of efforts are witnessed as most of the services revolve around limited subjects. Keeping in view the giant task involved, it is necessary to form a coordination mechanism to strive for a concerted effort to support farming community in the country. Such a *coordination agency may only have advisory powers such as user interface, broad design, delivery mechanism of the content, standards for setting up kiosks.*
2. User friendliness : The success of this strategy depends on the ease with which rural population can use the content. This will require intuitive graphics based presentation. Touch screen kiosks are required to be set up to encourage greater participation
3. Local languages : Regional language fonts and mechanisms for synchronisation of the content provides a challenge that needs to be met with careful planning.
4. Restrictions : Information content based on remote sensing and geographical information systems can provide timely alerts to the farmers and also improve the efficiency of administration. These applications can have a major impact on the farmers and help them to appreciate the potential of information technology. However, government's *map restriction policies* often threaten to stifle the optimal utilisation of these tools.
5. Power Supply : In most of the rural India, power supply is not available for long hours. This will reduce the usefulness of the intended services. Since almost entire country receives sunshine for most part of the year, it is useful to explore *solar power packs for UPS as well as for supply of power.* The Ministry of Non-conventional Energy Sources may pay special attention in this area which can be a major contributor to the growth of IT in villages.

6. Connectivity : Despite the phenomenal progress made in the recent years, the connectivity to rural areas still requires to be improved . Reliable connectivity is a prerequisite for a successful penetration of IT into rural areas. Many private ISPs are setting up large networks connecting many major towns and cities. Since some of these networks pass through rural areas, it is possible to provide connectivity to a large number of villages. Several technologies exist that can be utilised for connecting rural areas. Cable network is a possible medium for providing the last mile connectivity to villages.
7. Bandwidth : Even in areas where telephone and other communication services exist, the available bandwidth is a major constraint. Since internet based rural services require substantial use of graphics, low bandwidth is one of the major limitations in providing effective e-services to farmers. As already stated, networks with high bandwidth are being set up by several companies passing through rural segments which can be utilised. Until this materialises, a two pronged strategy of storing *static information at the kiosks and providing dynamic information from remote locations* can be examined. The graphic oriented content which does not change frequently, such as, demonstration clips for farmers, can be stored on the local drives at the kiosks and arrange for periodic updation of this information over the network during non-peak hours. The dynamic information which changes more frequently can be accessed from remote locations to obtain the latest status.
8. Dissemination Points : *Mass deployment of information kiosks is critical for effective use of the Internet based content and services.* In order to ensure that the information kiosks are economically feasible, it is necessary to make the proposition sustainable and viable. This requires a major focus on a viable revenue model for such kiosks. *In the new information era, the kiosks should be designed to become electronic super markets that can, in addition to being information sources, handle other services of use to the people living in rural areas.* The revenue available through such sources can make a kiosk attractive for prospective investors. The Government can provide finance facilities to unemployed rural agricultural graduates who can be expected to have greater commitment and at the same time act as an efficient interface for less educated rural visitors. *The objective should be to transform rural information kiosks into 'clicks and mortar' gateway to rural India for 'Bricks and mortar' industry.* Some of the sources that can generate revenue for rural kiosks are :
  - a) Distance education - A large number of people travel substantial distances to attend educational courses. It is possible to set up virtual class rooms right in their villages
  - b) Training - People living in rural areas require training and a means for upgrading their skills in their area of work. It is possible to provide quality education right at their door steps with facilities for online interaction with experts. For example, a village teacher or a paramedical staff can keep abreast latest developments without disturbing his/her routine. Similarly, training can be imparted on various aspects of agriculture such as correct practices, irrigation practices, efficient utilisation of tools used in farming such as tractors.
  - c) Insurance : The advent of private players into insurance has brought about advanced IT systems that can render services over networks. The kiosks can be insurance agents for insurance firms which, in turn, can compensate the

kiosk operators for online transactions for new business as well as maintaining the old.

- d) Local Agent : Many companies have difficulty in working out logistics for their supplies to rural outlets. A rural kiosk can act as conduit for such 'bricks and mortar' companies. This has the potential of transforming a rural kiosk into a profitable venture.
- e) Rural Post Office : The kiosks can facilitate sending and receiving emails, facilitate 'chats' with experts. Several successful rural kiosks are already available in many states which run essentially on this model.
- f) e-Governance : Rural kiosks are the stepping stones for effective implementation of e-governance. Details related to central / state / local governments, formats and procedures, status verification such as case listings in courts, filing of applications in electronic format where admissible, etc. are some of the areas where kiosks can be of major use.
- g) Online examinations : Online certification examinations are 'in things' with many organisations and certification agencies. Many people are forced to stay at metros to take the examinations. *Eventually* it should be possible to conduct these examinations through the rural kiosks.

9. Who should take up the task ? : At present, several initiatives have been taken in the form of websites / portals targeting rural India. These are at best sketchy information sources catering to pockets of rural India. It is to be noted that strong interlinkages exist within entire rural India and concerted and coordinated effort is required for carrying the benefits of IT to rural India. The magnitude of the task is such that no single institution or organisation can accomplish it. *It is necessary for stake holders in rural India, such as fertiliser industry, to come together to provide adequate thrust to the effort initially.* The fertiliser industry distributes more than 15 million tonnes of nutrients per annum in the country involving complex production, logistics and storage operations. A small savings made possible through better management of information upto the point of delivery to farmers can mean significant savings. The success of e-powering Indian agriculture is high if fertiliser industry makes a concerted and coordinated effort to set up Business to Business (B-B) market place with dealer / cooperative networks. The consumer industry also benefits from efficient operations in rural India. The corporate India may be willing to participate in a joint effort that proves beneficial to them as well as the rural India. The Government of India may, as outlined above, initiate a coordinating agency where various stake holders can join hands to spread e-culture to rural India and at the same time benefit from efficient operations.

## **Conclusion**

The Indian farmer and those who are working for their welfare need to be e-powered to face the emerging scenario of complete or partial deregulation & reduction in government protection, opening up of agricultural markets, fluctuations in agricultural environment and to exploit possible opportunities for exports. The quality of rural life can also be improved by quality information inputs which provide better decision making abilities. *IT can play a major role in facilitating the process of transformation of rural India to meet these challenges and to remove the fast growing digital divide.*



The rapid changes in the field of information technology makes it possible to develop and disseminate required electronic services to rural India. The existing bottlenecks in undertaking the tasks need to be addressed immediately. A national strategy needs to be drawn for spearheading IT penetration to rural India. *A national coordinating agency with an advisory role can act as a catalyst in the process.*

No single institution or organisation alone can succeed in the task of e-powering farmers and rural India. At the same time, scattered and half hearted attempts can not be successful in meeting the objective. *Industries with major stake in villages, such as fertiliser sector, should come together to provide the initial impetus.*

The success of any IT based service to rural India hinges on evolving a proper revenue model for the dissemination points. *The 'clicks & mortar' rural kiosks should be integrated with the 'bricks & mortar' industry to make them sustainable ventures by making them a business gateway to rural India.* The information kiosks can draw revenue from the industry by providing and disseminating required services. *Once these dissemination points prove to be economically viable, the IT revolution in rural India will require no crusaders.*

\*\*\*