

Importance of e-Agriculture in social reforms

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Abstract

This report provides an insight into e-agriculture, which serves as an aid in empowering farmer's so as to increase the absorption of technology in agriculture. The primary target of e- agriculture is to provide relevant information to any farmer by means of accessing hierarchy of information bases. This report also discusses the role of farmers as an entrepreneur, manager; in the area of decision making including acquiring finances, input for farming, production estimates and marketing his produce. This is the cycle in context of end of one agriculture period and the beginning of another.

Key words

Agriculture, social reforms, farmers, rural markets and e-weather.

1. Introduction

Management information systems (MIS) in agriculture have been the subject of intensive study and investigation in its many facets over two decades. MIS has been defined as "a system to provide management with needed information on a regular basis".

The rapid developments that have characterized the past decade in the area of farm management information systems include the increasing interest and requirements among farmers for better information on their farms coupled with the necessity for improved record keeping [4]. The requirement for improved information increases further in a more open and competitive world of agriculture and farming. Changes continue to take place in an array of regulations governing the way food is produced and in future in the environment within which it will be produced. Changes that have and will take place in the common agricultural policy will further alter the economic competitive environment for farmers as further globalization of the Industry continues to take place[1,3].

As information technology continues to develop at an ever increasing rate, access to IT technology

by farmers becomes easier and for some products and services, a little cheaper. However, there are new technologies interfacing with the sector in influencing the control of many aspects of the farming such as the Internet, developing Intranets, mapping, robotics and more sophisticated communication systems. Electronics in agriculture in all its forms will change the control and management systems over the next decade in very significant ways for those who adopt the technologies.

2. Objectives

The main objectives of e-agriculture are as follows

- To provide information to the farmers related to agriculture and farm management.
- To develop a centralized, systematic and a single system to provide all kinds of information needed by farmers.
- To help farmers in decision making in farming business.
- To provide a geographical view of the various agricultural lands in the country to facilitate easier information retrieval.
- To focus and provide various decision making tools for production of crops.

3. Role of Farmers

3.1. Different tasks

Indian farmer plays following four rules simultaneously:

- He is an entrepreneur
- He is a Manager
- He is a Financer
- He is a Labourer or Worker

3.2. Area of decision Making

There are four major areas of decision-making:

- Production of crops and livestock
- Acquiring inputs.
- Obtaining credit.
- Marketing the produce.

3.2.1. Production

The decisions related to production activity are

I. What to produce? Selection of crops and livestock activity. Whether to have dairy, goat keeping or poultry or their combination?

II. How to produce? Adoption of suitable technology. Whether to continue old technology or use new technology or combination of both?

III. How much to produce? To consider family requirements in respect of food grain, vegetable, spices, fruits, milk, etc and also think of producing marketable surpluses. In that case, think of demand supply position availability of market and prevailing prices. This will also apply to production of cash/commercial crops.

3.2.2. Acquiring inputs

In modern commercial farming, wide range of inputs is required. They include seeds of high yielding and hybrid varieties, fertilizers, pesticides, plant growth regulators (hormones), improved implements and machinery, etc. There are commercial and specialized agencies dealing in these inputs. The farmer has to take decision and make choices relating to -

- From whom to buy?
- At what price to buy?
- How much to buy?
- Whether to buy on cash or on credit?

3.2.3. Obtaining credits

Although the farm family supplies some finance, it is not adequate considering larger financial requirements of modern agriculture. Therefore, farmer has to borrow from outside sources. In this

connection he has to take following decisions. There is risk in borrowing.

- How much to borrow?
- From whom to borrow?
- At what rate to borrow?
- What security/mortgage to offer?
- How repayments to be made?
- How to face risk situation?

3.2.4. Marketing the produce

When surplus produce is obtained or created, its disposal or marketing advantageously becomes necessary. Following decisions are involved in the marketing of farm produce.

I. Where to sell? This is the most important decision because in rural areas big, wholesale and organized markets are limited. As far as an individual farmer is concerned, his produce is of small quantity, he has no transport facility, and there are no good roads to go to distant markets. The farmer has to make choice within limited alternatives.

II. Whom to sell? There are various types of agencies such as villager trader, wholesale cum commission agents, co-operatives and government (for selected commodities). He has to make choice from among them.

III. When to sell? Immediately after harvest when prices are the lowest or wait for better prices. He is also constrained by cash requirements for family expenditure. He has to take decision under most unfavorable situation.

IV. At what price to sell? Here the position of farmer is very vulnerable. He has almost no choice. Prices in organized markets (Regulated markets) are fixed by open auction and he has to accept the price quoted by the highest bidder even this price may not be remunerative [6]. In unorganized markets, traders fix prices and farmer is hardly consulted. He has very limited scope for decision making

4. Information provided by e-agriculture

- **Climatic data:** This type of data is used for a wide range of purposes. It is needed, for example, to determine the variability and distribution of rainfall within and

between seasons. To adequately describe rainfall variability and estimate climatic risk, researchers require detailed, daily data from a sufficient number of sites and years. Long-term data is essential to detect the effects of global warming.

- **Topographic data:** This data is used for mapping the elevation, slope, and aspect of an area. An example of the use of this type of information is determining the erosion risk or irrigation potential of an area. It can also be very useful to characterize sites in mountainous areas. Being relatively stable, this type of data usually needs to be gathered only once.
- **Soil data:** Soil data includes the physical, chemical, and biological characteristics of soils. The data is used, for example, to determine the production potential or erodibility of soils. For maximum benefit from measurements, soil samples should represent large areas. Research for sustainable land use requires soils to be regularly monitored at well-defined sites, using uniform and standardized methods.
- **Vegetation and faunal data:** With this type of data the flora and fauna of a country can be established and monitored. Natural vegetation can provide clues about the climate and soils of an area. This information needs to be collected periodically (e.g., once a year or every season) to monitor developments in the environment. Remote sensing from satellites can make monitoring much more efficient.
- **Production data:** This data, which includes qualitative and quantitative information on the distribution of crops and livestock production, is essential for understanding farming systems and their productivity. With production data that has been gathered over a long period of time, researchers can detect trends and determine the sustainability of farming practices. Satellite remote sensing contributes greatly to obtaining geo-referenced information on crop production
- **Hydrological data:** This type of data includes depth, duration, and variability of flooding, providing highly relevant information for research on rice-producing areas. It is also very useful in the development of swamp areas. Data on surface and groundwater resources can help in the development of supplementary irrigation in rain fed areas. Researchers also often require

water- quality data as an indicator of sustainability

- **Socioeconomic data:** This data must be considered in any classification of agricultural environments. Researchers need socioeconomic data to describe farming systems, diagnose problems, and determine recommendation domains for comparable groups of farmers. However, there are many different kinds of socioeconomic data that are used for a variety of purposes, and researchers have not yet agreed on a standard set. Links between socioeconomic data and other types of data (such as production data) must be established to determine relationships between socioeconomic processes and the biophysical environment [4,5]. As no standard methods for collecting socioeconomic data have been developed yet, this data may be difficult to interpret. Standard checklists for rapid appraisal of rural environments can contribute to such standardization.

Because many different institutions are involved in the collection of environmental data, a major challenge will be integrating the different data collection and analysis efforts.

5. Reason for adoption of technology

The acquisition of computer technology on farms is probably driven by many factors in common with other sectors. There are probably many reasons driving the adoption of computer technology on farms. Some are:

1. Household adoption of computer technology generally in the country has increased dramatically. Access to information technology in many schools and colleges by children continues to grow [2].

2. The demands of children for all kinds of computer technology in households probably have an inevitable consequence for many families.

3. The publicity of the Internet and the perceived gains that may be available in educational terms will further enhance household adoption of computer technology over time.

4. Farm households have the potential for dual gains, if that is what is wished, for using computer based technology for the twin purposes of farm household use and farm business purposes (though this may not be a preferred way in many instances).

5. Computers have become less expensive and better understood as to capability and the benefits of access to the technology have become better known.

6. The range of software systems suited and appropriate to farm enterprises continues to increase and is competitively priced.

6. Potential tools of e- agriculture

a) Rural portal

Rural portal is envisaged as a search engine that can act as guide to the existing agriculture related web information and web services. It will support locating relevant information on the portal or other farming rural websites via the area wise classification. For e.g. Rajasthan government has launched a pilot project on ground water information system that ground water availability of the selected locations. Rural portal cannot go a long way without facilitating interactions amongst farmers and agricultural experts. A panel of agricultural experts could be identified for providing consultation with the help of interne chat facility to the farmers using the assistance of extension workers.

Thus using rural portal farmer can easily seek answers to his specific questions like

- i) Cropping strategy for farmers field based on integrated information on soil, weather, fertilizers and pest management models.
- ii) How and where to get proper seeds or nursery plants.
- iii) Prevailing prices of the various tools and farming machines and products and series of such set of information, which can lead to most efficient yield and optimum cost benefit to the farmer.

b) Rural cam

A web cam is a device that sends picture from a video or a still camera onto the Internet so that can view the images on someone webpage. When web cam is used for the benefit of farmer, it is called rural cam. For e.g. a corn cam monitors a designated cornfield, a Soya cam

monitors a designated soybean field and a dairy cam monitors parts of a dairy operations. This concept is called as virtual farming. Web cams can be useful for farmers by viewing live pictures from experimental field located around the on Internet. Farmers can compare their fields response with experimental fields .web cam can be useful to educate farmers about the diagnosis and treatments for new pest and diseases.

c) e- agricultural markets

Farmers needs vary with seasons, crops, weather and locations. so most of the agric business services need to be regional in scope .many farmers don't have so much time or information access to make implement informed marketing decisions because commodity prices always changing . So that they can get information on comprehensive grain marketing and risk management programs from any e commerce sites based on agriculture just by clicking on a link. This also gives the farmer peace of mind and ability to concentrate on producing their crops.

d) e-weather

The growing of crops to feed the populations of the world is directly affected by climate change. Food production is totally dependent on favorable growing conditions. Role of IT in weather is two folded i.e. generating weather forecasts and its distribution to the farming community.

The agro-meteorological advisories are very useful to farmers for scheduling of irrigation to save water and choosing the optimum timing for spraying of pesticides, application of fertilizer etc. Need of the hour is to make bulletins available on the Internet so that farmer can make use of this data in planning his routine agricultural activities.

e) Agriculture Information Systems

e.1) Inform:(information system for agricultural research management)

Inform is a computer-based management information system that provides agricultural research managers with the facts they need for their prime tasks of priority setting, budgeting, monitoring, and evaluation. It also compares this information for the current and previous years.

With just a glance at the figure a manager can see the much greater resource use within one research discipline, and additionally, that this difference increased in the current season. The manager may then want to explore the reasons for this disparity and find out whether it is in accordance with agreed research priorities and policies.

Inform raise the efficiency of agricultural research in order to maximize the output of enhanced technology to farmers.

e.2) WFIS (world food information system)

It helps in improving the quality, gives latest improvements in technology and is working as a consultancy regarding diseases, pests-alerts, animal health and any abnormal conditions, which are the key, needs of farming community.

e.3) CRIS (Current Research Information System)

The Current Research Information System (CRIS) is the U.S. Department of Agriculture's documentation and reporting system for ongoing agricultural, food and nutrition, and forestry research. CRIS contains over 30,000 descriptions of current, publicly supported research projects of the USDA agencies, the State Agricultural Experiment Stations, the State land-grant colleges and universities, State schools of forestry. It help users to keep abreast of the latest developments in agricultural and forestry research, plan future research activities, avoid costly duplication of research, and establish valuable contacts within the research community.

7. Conclusion

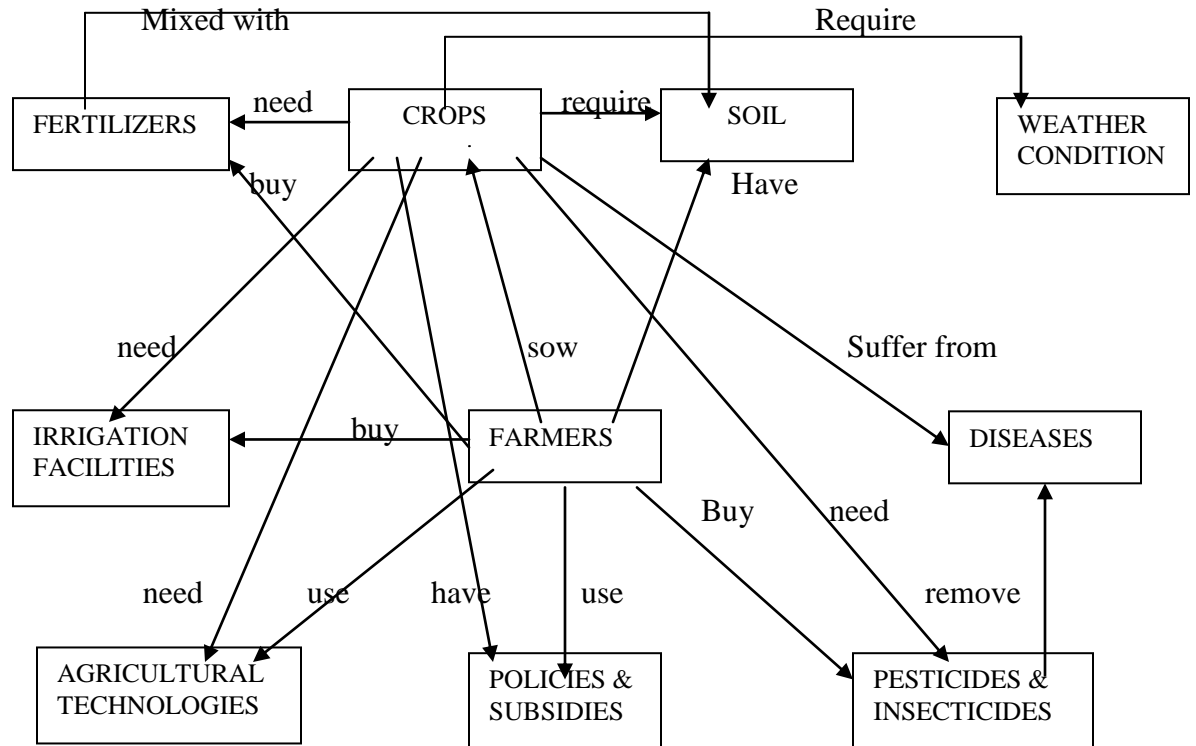
In developed countries like U.S there are a percentage of framers that are utilizing Precision Farming Techniques using detailed agronomy maps; incorporating fertility rating etc. a beginning is essential for Indian framers also. Access to information technology resources need not mean a computer in each farmer household, but a concept of e-agriculture node is required. Data Model of e-agriculture is shown in Figure 1. The resources can be treated, as community resources in the same fashion as telephones and television were when they were initially introduced in villages. Considering the present infrastructure of Indian villages, it is very

difficult to develop even one e-agriculture node at each village level. Thus one node can be set up per five villages presently, but with a target of one node per village later on. E-agriculture enabled sites in collaboration with agriculture and agribusiness experts should be developed. Extension workers need to be trained in e-commerce transactions to assist framers in availing the services offered by e-agriculture.

References

1. Esty, Daniel C. "Bridging the Trade-Environment Divide." *Journal of Economic Perspectives*, vol. 15, no. 3, Summer 2001, pp. 113-130.
2. Hanrahan, Charles E. *Agriculture in WTO Negotiations*. CRS Report for Congress. Washington, D.C.: Congressional Research Service, December 7, 2001.
3. World Bank. *Global Economic Prospects and the Developing Countries, 2002: Making Trade Work for the World's Poor*. Washington, D.C.: The World Bank, 2001.
4. World Trade Organization. *Ministerial Declaration: Adopted on 14 November 2001*. Document WT/MIN(01)/DEC/1. Ministerial Conference, Fourth Session, Doha, 9 - 14 November 2001.
5. Dollar, David and Aart Kraay. *Trade, Growth and Poverty*. World Bank Policy Research Department Working Paper No. 2615. Washington, D.C.: The World Bank, 2001.
6. Aaronson, Susan Ariel. *Taking Trade to the Streets: The Lost History of Public Efforts to Shape Globalization*. Ann Arbor, Michigan: The University of Michigan Press, 2001.

Figure 1. e- agriculture DATA MODEL



Relationships

1. Farmers sow crops
2. Farmers buy fertilizers, agricultural technologies, pesticides & insecticides ,irrigation facilities to enhance his production
3. Crops require a particular type of soil, weather conditions, fertilizers, insecticides & pesticides, irrigation facilities and agricultural technologies.
4. Crops suffer from diseases.
5. Pesticides & insecticides remove diseases.
6. Farmers use agricultural policies and subsidies.
7. There are different policies for different types of crops