

# Importance of Information Technology in Indian Agriculture – A Review

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**Abstract**—IT is to fine-tune the agricultural production system by emergence and convergence of several information based technologies for enhancing profit and reducing environmental risks. These technologies benefit the farmers as well as reduced environmental stresses in the developed world. Present paper provides an overview of IT application in Indian agricultural system. There is a scope of many information technologies to be implemented in the country. In this perspective, farmers and government authorities should look forward to adopt new and sustainable technologies to increase the efficiency of available resources and reduce the input costs. Before this, the effectiveness of Information technologies needs to be popularised in India through field experiments and land management practices.

## 1. INTRODUCTION

Agriculture is a major sector which is vital for the survival of modern man. Plants are the producers in the food chain, and without them, the life cycle would just not be possible. Agricultural produce, though highly perishable compared to other food sources, is essential for survival. Crops are used to produce several food sources by themselves or through by-products such as bread, powders, organic additives to other goods and the like. The produce from agriculture drives trade from one country to another, brings income for farmers, makes productive use of otherwise idle land, and brings food on the table. It is such an important part of everyone's daily life, although it may not be seen as a direct factor since the produce goes a long way before reaching the hands of everyone who benefits from it. Because of its importance to society, it is but a must to evolve with the times and adjust to meet the needs of modern people. By adapting and making use of IT to help improve agricultural progress, everyone benefits from the union of these sectors.

Information technology is utilizing computers along with telecommunication equipment for the storage, retrieval, transmission, and manipulation of data, among other tasks, which are aimed to improve the efficiency of different sectors. With the advancement of IT, other sectors benefit from it as well since it can be used as a tool for improving efficiency and overall productivity. Successful integration of IT in different sectors has made it possible for people in the IT industry to make changes which can help other sectors, such as agriculture, as well. While people may be thinking that IT

applications are only limited to those which make use of modern gadgets, or those who focus on numbers and such, the agricultural sector and its production may also benefit from it (Singh & Singh, 2006).

## 2. GLOBAL IMPACT OF IT ON AGRICULTURE

IT has become a bridge for people from all over the world. You may be asking yourself, what is the importance of this when it comes to agriculture? Agriculture may be seen as a craft which has been handed down from generation to generation from the very first men who learned how to plow the fields and grow their own crops. Techniques and secrets for efficiency and increased yields are also part of the knowledge passed on from one generation to another.

Agricultural practices and advancements differ globally - since plants have their own differences and the location plays a role on their development as well. But through the exchange of knowledge from different agriculturally-involved individuals from all over the world, improvement of techniques can be experienced as well. It has made an impact on how information is shared, and being able to use this information for the advancement of the agricultural sector gives a great positive impact that is beneficial for everyone.

## 3. IT AND AGRICULTURE

Upon first glance, it may be challenging to see how such different sectors may work together. Agriculture has been around since men first learned to tend to his own crops and not depend on what just grows where he goes. IT, on the other hand, is a much younger advancement that man has developed. Hand in hand, IT and agriculture can make progress more visible, sharable, and measurable which are highly beneficial for all who are engaged in it. Traditional agriculture still makes its presence felt in today's production of goods since the foundations of agriculture is a pillar which cannot be removed from all processes required to grow crops. However, with continued research and the collaboration of great agricultural minds from all over the world, improving crops and eventually the yields from "the usual" strategy is definitely a positive result that all producers would like. Since IT encompasses a lot of disciplines, it can also be successfully

integrated to many different sectors to help them become more efficient and productive. It may take some getting used to, but when IT is successfully integrated to agriculture, it helps a great deal and can definitely contribute to positive changes that farmers can prove with the growth of their output (Dugad & Sudhakar, 2006).

#### 4. THE EFFECTS OF IT ON AGRICULTURE

IT has made its way into the agricultural sector, and with positive results. To name a few, here are some of its effects:

- **Improved decision making** – By having the necessary information, farmers—big and small can make better and more informed decision concerning their agricultural activities. May it be about who to get their grains from or perhaps who to sell it to, the communication channels that information technology brings makes production up to distribution easier for the farmers. The exchange of knowledge from various countries and organization also helps farmers be more aware of factors to consider before making their decisions.
- **Better planning** – IT has paved the way to come up with farming software which can keep better track of crops, predict yields, when to best plant and what to plant, to intercrop or focus on just one product, or determine the current need of the crops—just about everything needed to improve production and income. By adjusting to the modern farming methodologies, farmers can have better control of their crops. Gaining information from their farm is essential in sustaining its success and fueling further growth.
- **Community involvement** – There are several programs which are made possible by IT applications, and community involvement in agriculture can be increased as well. When a community adopts modern methods for agriculture, the production of local goods can be increased. There are some places where people greatly benefit from the land and their resources for agriculture, and with IT, there can be improved union in local farmers which can lead to their community's overall improved production that may lead to better income for everyone involved.
- **Agricultural breakthroughs** – IT makes the spread of information concerning the latest agricultural breakthroughs more possible. When scientists develop new and improved grains or find techniques to help winter crops become stronger against the cold, farmers from all over the world may benefit from the same breakthroughs simply by being connected to the rest of the agricultural world. Sharing information to help everyone progress is made much easier through resources made available and accessible by IT.

- **Agriculture for everyone** – Farmers have in-depth knowledge when it comes to their trade. However, interested individuals who may be called backyard farmers may also benefit from how modern technology has changed how agriculture is seen. Growing your own sustainable garden of herbs, fruit trees, and other agricultural produce can be possible in a smaller scale. Planting is beneficial in more ways than one, and having your own produce even helps assure the freshness and quality of the food your family eats.

People only have to open their minds to the endless possibilities that technological advancement can bring to agriculture. Instead of being locked away with the traditional strategies for planting, why not get involved in new and improved methods of farming? Today's society can benefit from agricultural advancements and live sustainable lives by improving the production, harvest methods, and distribution of agricultural goods. All of these effects and more are possible through the successful merge of IT and agriculture which is why farmers are getting more and more encouraged to take part in this positive change.

All stakeholders of agriculture industry need information and knowledge about these phases to manage them efficiently. Any system applied for getting information and knowledge for making decisions in any industry should deliver accurate, complete, concise information in time or on time. The information provided by the system must be in user-friendly form, easy to access, cost-effective and well protected from unauthorized accesses.

- 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

**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 remain 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.

## 5. RESEARCHABLE AREAS OF IT:

The initiation of GPS into farm operations is less than a decade old. Its use is fast spreading to all aspects of farm operations and beyond. Some of the areas in agriculture where precision farming is taking hold with implications for the economics of farming are listed below. Since the subject is vast and fast growing, it is difficult to compile a complete list of applications in this limited presentation.

### 1. Soil Fertility Management

a) This involves dividing a field into several small and equal divisions using the sub-inch accuracy of GPS. To do this, the tractor is fitted with a dish antenna to receive signals from satellites, which are recorded on a tractor-mounted computer. Soil samples are mechanically taken from each subdivision and this process is technically known as “Grid Sampling.”

b) Samples are tested in a modern soil testing laboratory for about 17 parameters including physical and chemical characteristics of the soil and recorded.

c) Using the test results of this grid samples, composite colour-grams are created through computer simulation on each of the 17 parameters for the entire field).

d) The colour-grams are stored as stencils in the computer for various functions. One of the chief among the functions is balancing soil fertility of the field with respect to all major, secondary, and micro- nutrients. This is achieved through tractor-mounted computer guided spreader equipment capable of reading the variability of fertility from colour-grams. Fertilizers are then automatically applied at variable rates only to where they are needed as indicated by the colour-grams (Singh *et al.*, 2009).

In practical experience, the savings in fertilizer cost from this variable rate application alone will more than offset the cost involved in the programme. Besides, use of this method brings about greater uniformity of soil fertility in the field, leading to maximum economic yields of crops, which could not be achieved through other methods.

### 2. Other applications of the GPS-generated grid method

The grid generated by GPS is stored in the computer and used for site-specific evaluation and monitoring of numerous functions involved in crop production to achieve peak efficiency in farm management. Some of these areas are listed below:

a) Planting variable rates of seed to maximise crop yields from the specific fertility of each grid section.

b) The GPS-guided grid system helps to apply variable rates of herbicides and pesticides to achieve maximum control of weeds and pests. This not only reduces the cost of chemicals used, but also improves efficiency of pest control and protects environment.

c) This enables the farmer to side dress application of fertilizers at variable rates to meet the specific requirement of each grid section, thus improving fertilizer use efficiency.

d) Irrigation rates are tailored to the requirement of each grid area improving water use efficiency.

f) Scouting for pest information and pest control are achieved on a site-specific basis.

g) At harvest, crop yield information is recorded on a grid section basis. Solutions for differences of yield between grid sections are sought through computer analysis of all variables controlling yield of crops that are stored in the computer. Based on this, the farmer fine-tunes his or her variable rates of application of fertilizers and other impacting parameters for use in future cropping programmes (Hanumanthappa *et al.*, 2017).

h) One other great advantage of the GPS system of farming involves the ability of the farmer to achieve greater efficiency in time control of his farm operations. This is because the GPS system enables him to operate his equipment round the clock irrespective of factors restricting visibility such as fog, darkness, or even showers. The sub-inch accuracy of GPS-based operations provides the farmer maximum efficiency with equipment operations.

### Problems in adoption of IT in Indian Agriculture:

India is an agricultural country, yet the agricultural sector is not able to produce the potential level of production from the existing resources. This is attributed to the lack of utilization of modern technologies in agriculture, small landholding and high input costs. Lack of awareness is the first and foremost reason for this late start of precision agriculture in India. The farmers who have knowledge about these technologies, the exact reasons for their reluctance in implementation of precision agriculture in India include smaller farm size (< 1 ha), land tenure system, high-cost technology, unavailability of technology locally, heterogeneity of cropping systems or crop diversity and lack of technical expertise and knowledge.

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