REMOTE SENSING, GIS AND E-COMMERCE: TECHNOLOGICAL TOOLS TO SUSTAIN AGRICULTURAL DEVELOPMENT OF RURAL INDIA

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Abstract: Agriculture is the backbone of the Indian economy. Although the overall involvement of agriculture to gross domestic product (GDP) is approximately one sixth and also it employs 58% of our National human resources. The computer is an electronic device which is capable of keeping records such as budget information, farm equipment inventories and animal health forms. Like many small business owners, farmers also use basic computer programs. Internet, remote sensing and geographic information system used by farmers for increasing knowledge and monitoring soil and field crops.
Keywords: Image Sensing, Agricultural Development, Information System, Indian Farmers.

1. Introduction

Agriculture contributes around 26 percent to the total GDP. GVA (Gross Value Added) for the year 2016-17 growth rates of Agriculture & allied, Industry, and Services sector are 9.64%, 8.32%, and 11.87%, respectively [1]. Agriculture plays a significant role in economic and social development in most developing countries. Information of adequate quality is a necessary condition for improvement of all areas of agriculture. With the rapid development of the computer, preprocessing of data and its related information can be effectively generated, stored, analyzed, disseminated and used to support farmers and farming communities to improve agricultural productivity and sustainability. The application of the computer in agriculture originally exploited for the conversion of statistical formula or complex model in the digital farm for easy and accurate calculation which are found relatively tedious in the manual calculation [2]. In the next generation, the same computers have been used to mechanization, automation and to develop decision support system for taking a strategic decision on the agricultural production and protection research. Remote sensing contributes in the prediction of yield, crop wise soil suitability, allocation of resources for various agricultural inputs, and many more [4]. This paper aims to review and identify a role of the computer in the agricultural development of rural India, and most

importantly, to share use of the computer in the dissemination of agriculture information to farmers and farming communities [3]. GIS is an semi-automated computer hardware cum software infrastructure capable of capturing, storing, processing, analyzing, segregating, and displaying the identified geospatial and geographical location specific information.

2. Reviews

Strongly increasing trends in the use of computers and the Internet by agricultural producers suggest that many farmers perceive positive and rising competitive benefits from this technology. A 1997 U.S. Department of Agriculture/National Agricultural Statistics Service (USDMNASS) survey found that 31% of U.S. farmers owned or leased a computer, although only 13% had access to the Internet; by 2001, these numbers had increased to 50% and 43% (USDMNASS, 2003). Farmers' adoption and use of computers and the Internet depends on their anticipated impacts on farm performance and competitiveness. Such impacts could stem from various internal factors associated with computer use, such as better record-keeping, decision-making, and production processes [4].

2.1 Technologies for Agriculture Development

Geographical Information System (GIS) is a technology that provides the means to collect and use geographic data to assist in the development of Agriculture. A digital map is generally of much greater value than the same map printed on a paper as the digital version can be combined with other sources of data for analyzing information with a graphical presentation. The majority of the operational GIS is used for thematic mapping, handling spatial queries, and decision-making support [5]. Remote sensing techniques are widely used in agriculture and agronomy. The use of remote sensing is essential to monitor different agricultural activities. Information and Remote sensing centre is playing a major role by providing overall view of agricultural science, as it is very suitable for gathering information over large areas with high revisit frequency [6]. GIS has a wide scope in agriculture research as well in practical field implementation, there are many uses and tactical benefits in near possible future of agricultural industry. It promises to help in identification and avoidance of feminine, determination of floods situations caused by incessant rain and pre-interpretation of insect infestation. This collection of statistics allows farmers to take impactful decisions before sowing to improve yield as well as the quality of a crop [7]. It can also help in change, rotation, and type of crops as the change in soil are noticed, this will maintain the quality of outcome keeping it to the maximum growth.

2.2 Value Addition and Conveniences of Remote Sensing and GIS

Agricultural planning has always been a working structure based on conjectures. This is highly dependent on a set of recorded facts and datasets acquired for a large piece of land examined over a couple of years or so. Still there exists some natural factors that may influence for which a satisfactory record cannot be discovered. We have figured out various factors that effects the growth of crop and the relevant quality points to help farmers using GIS which are as under:

1.   Remote Sensing can help in precision farming by admitting yards to yield the quality product at their fullest. It can move out the obsolete data collected merely based on previous facts and help in taking more rational conclusions on qualitative farming tactics [5]. It is capable of providing crop statistics for decision making and planning incorporating other features like monitoring of crop growth and the soil status, also generation of regular crystal reports related to an overall area that comes under healthy cultivation of crops.

2.   It also supports in effective acquisition of soil data and impact of weather conditions based on real time data collection. Quality of the soil within a one field is not sundry. Also the amount of sunlight, shade and rain remains changing for different areas affecting the overall quality of a crop.

3.   Remote Sensing is essential in compliance mapping of food sources that are vulnerable to natural disasters [6]. The World Food Program is one of the biggest users of GIS data for taking required actions based on the data obtained for drought and flood conditions. This organization is also playing a major role in protecting food supplies by constructing projects like damns, and irrigation and many more.

4.   GIS can help in recognition of impervious ground over an affected area. Monitoring of land is carried out to look for archaeological features of land. It has been proved to be a necessary tool for agricultural science for quality based information acquisition and fast decision making.

5.   GIS also play a vital role in identification of new land areas for planting of suitable crops. It also includes features to make existing productions efficient or persistently keep on providing the yields to satisfy the growing population needs.

6.   The earth surface is a confined reservoir with an immense amount of spatial data that requires exhaustive manipulation, deep analysis and structural modeling. This can be practically and productively accomplished with use of GIS [6]. Remote Sensing can also upgrade it by providing the yield estimate based on inputs of features such as climate and

habitat analysis, mineral province changes, soil alteration, availability of water, type of land, favorable weather conditions, environmental assessment and many more.

2.3 Role of E-commerce in Agriculture Sector

Use of Internet has given the globe a shrinking effect. During recent years, e-commerce has found its way to agriculture. As the Internet continues to become more popular among people who deal with agricultural businesses of any type, e-commerce finds further applications in agriculture. Active involvement in e-commerce demands that both buyers and sellers can access the Internet [7]. Not only this but also that they are friendly with the basic use of hardware and software at least. In small scale agriculture businesses most of the common transactions like buying, manufacturing, selling, packaging and delivering of products are dependent on the e-commerce of today's world [8]. Through internet forums, social networking sites and online knowledge bases farmers get a lot of information. With these, they contact with other farmers and experts and exchange know-how. There are many online databases, articles, newspapers in which there is a lot of information available for farmers which help them in increasing productivity.

Conclusion

Farmers can also increase and update their knowledge using the computer but a number of factors that influencing computer users include complexity of farm, the degree of external support, age, time, network, personality and approach to learning. For resolving these problems formal classes could be organized and availability of authenticated literature should be increased. This also helps in future planning to manage crop-oriented land for evolution and expansion of socio-economic activities. The modern progress and enhancement in the field of Remote Sensing and GIS promise to integrate all available information from the management perspective. GIS not only makes the extraction, transformation, and loading of desired information easier but also promotes important tools for decision making in problem-solving to sustainable agricultural development. Remotely sensed data, mostly in form of large images, can be used for identification of nutrition and mineral deficiencies, wide spread of crop diseases, scarcity or superfluity of water, weed infestations, pests and insect damage, and many more. Remote Sensing and GIS is an effective and an efficient technological system to propose potentially mature action plans based on the management policies for the pursuit of agricultural and environmental sustainability of any region.

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