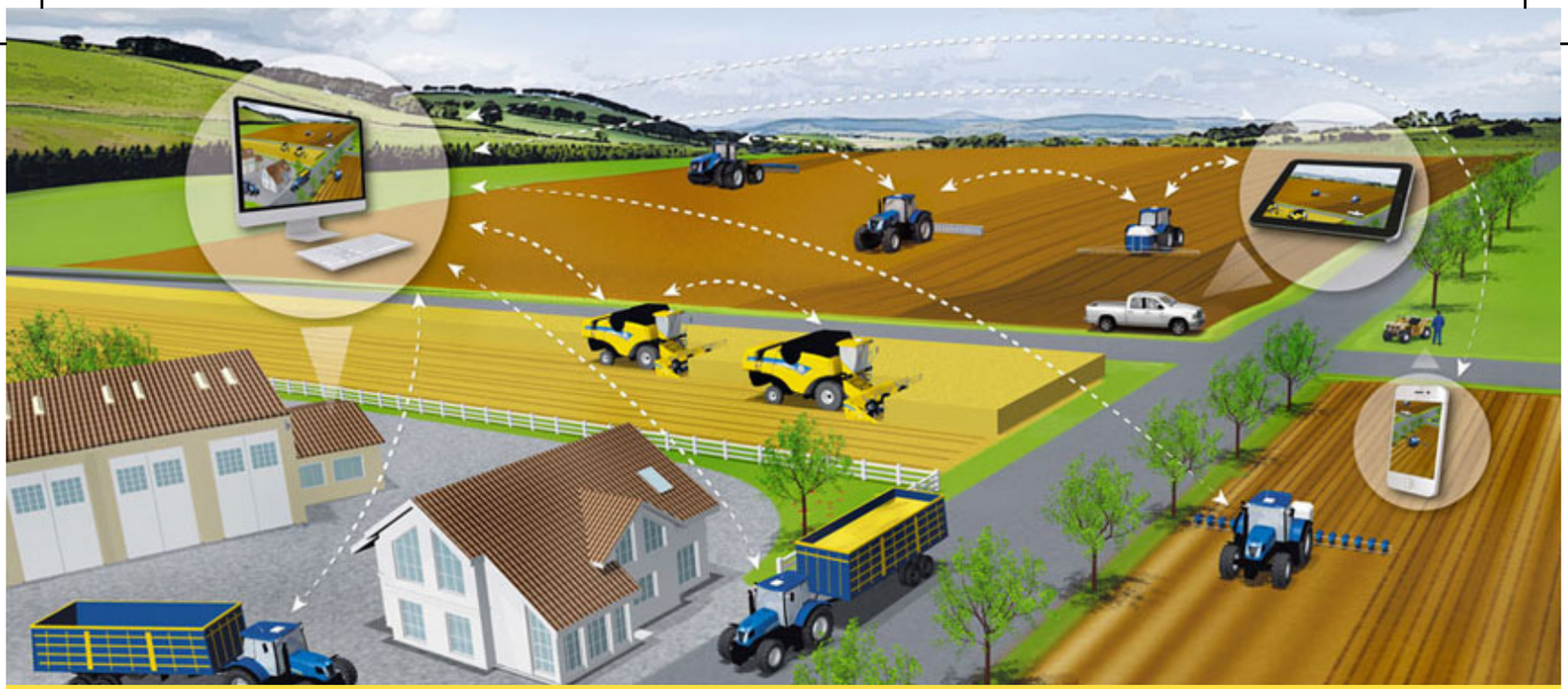

GIS Based Decision Support System for Agriculture in India

Image Courtesy: www.agrimachinerynews.com

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Soul of rapid growth in the Indian economy has witnessed various revolution related with agriculture since primitive era. In India, agriculture is a primary source of economy for the mass population. Agriculture based revolution has resulted in balancing the supply of increasing demand for cereals for the rapidly growing population of India. A study reveals the fact that over 60 % of the rural population in India is dependent on agriculture as the prime source of their livelihood. With advancement in agricultural techniques and selection of crop pattern has increased the yield manifold on the same agricultural area. If agriculture along with allied sector is taken into account such as fisheries, forestry, horticulture etc. it will account for one of the major and single largest contributors of nations GDP. Since Independence, the government has come up with various policies, which supports industrialization or infrastructure development with the help of foreign investment or by promoting the small industry. In spite of the same, agriculture is the only sector in India, which supports a mass population in terms of employment and a major contributor to Indian economy.

In recent past despite the fact that there is an increase in agricultural productivity, the inclination towards the selection of agriculture as a prime source of livelihood has decreased. India has witnessed the maximum population of youth who is contributing towards the building of a nation in a positive direction. Despite this fact, after higher studies the inclination to work in formal agriculture sector or selection of farm cultivation, as a career is merely a thought. It results in old agricultural practice, which is being used by a majority of the farmers which results in comparatively less yield as compared to other countries i.e Canada, China. Currently, the advancement in agricultural technology has its limitations up to the laboratory and research institutes only. It is because due to lack of decision support system farmers are not getting the right advice at right time.

The risk of Crop failure due to changing environmental condition across the globe is also a challenge. Unavailability of real time database of demand and supply is also one among the major factors, which is directly affecting the profitability of the farmers in a negative way despite high crop yield.

OUTLOOK

The Geographical Information System (GIS) can be considered as the boon for agriculture industry if its use can be practiced in a way that is more effective. In Next Section this article will cover the details that will reveal the fact that despite high agricultural productivity why profitability is less. What is the major pain area for agricultural practice? How can GIS as a technology be effectively used by formal sectors to help farmers in decision support system for selection of crop until obtaining maximum profits in terms of the selling price?

Introduction

India is prone to all aspects of the natural disaster. Amongst that flood and drought, are the major contributor that directly affect the agro based industries. In the promising era of information technology where India has witnessed in laying down the successful milestones in space technology, there is no active decision support system, which can help and support the farmers in their routine life for cultivation activities. Until now, the selection of crops is being done by old farm practice or by getting influence from productivity/income of other farmers.

Selection of crop or what is to be produced as horticultural practices, which can be more profitable, requires some advance practices, which will be based on decision support system, analyzing the current market requirement. The lack of decision support system can be understood by various examples where farmers have cultivated Onion by breaking all record of past productivity without understanding the fact that what will be the market requirement when yield will be ready for sale. This is the common trend where productivity of certain yields get maximized result in reduced market value due to less demand and high supply.

Understanding the agriculture based market dynamics; selection of yields, risks, real time market database can be taken on priority for a better decision support system. Here Geographical Information system can play a major and vital role, which will reduce the risk of agricultural failure for farmers at great extent.

GIS is explained in an easy way is a system, which can provide the information of a target area or geography considered for the study. In agriculture practices, geography plays a vital role in day-to-day cultivation related activity. Selection of crop, choosing the area, targeting the market segment, understanding risks associated with that, planning of distribution network all these requires the help of GIS.

GIS Based Decision Support System

The government has planned for various means of support systems for farmers however if all their individual effort or effort being done in segments come up on a common platform then an effective decision support system can be made. GIS based this system will help all farmers in taking the day to day decisions where the agriculture expert suggests the selection of crop based on geography by understanding all risks. Other stakeholder plans the distribution of network of the yields based on analyzing the market demand. Currently, in spite of high yields, farmers are not happy due to lack of decision support system by government.

Here GIS will help in analyzing the past record or database with reference to the geographical maps which can be used in producing various models for agricultural practices.

How This System Can Work?

a) Selection of site and crop:

GIS as a tool can help the decision makers in identifying the sites, which is being used for cultivation, and analyzing the details of potential sites that can be used for various means of agriculture such as floriculture etc. This can be correlated with an example where in the state of Bihar in Indo-Gangetic flood plain cultivation of banana is the only option as most of the time these areas are submerged in water. Irrespective of market requirement, farmers have no option other than to cultivate banana. By understanding, the situation one of the farmers is now trying to cultivate Orange instead of Banana. Here it is to be noted that supply of orange in the major part of north India is being done by Maharashtra including Bihar. Hence In a different environmental condition by identifying the market, demand and taking the risk the orange farming introduced has succeeded to a great extent.

This is one of the examples where government stakeholders can use the GIS based decision support system by creating awareness among the farmers

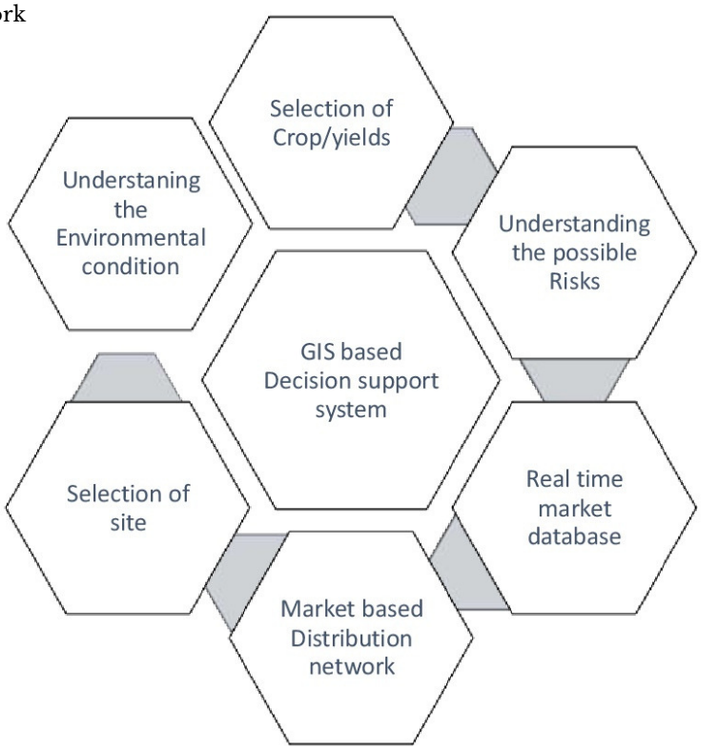

Figure 1. A typical GIS based Agri decision support system

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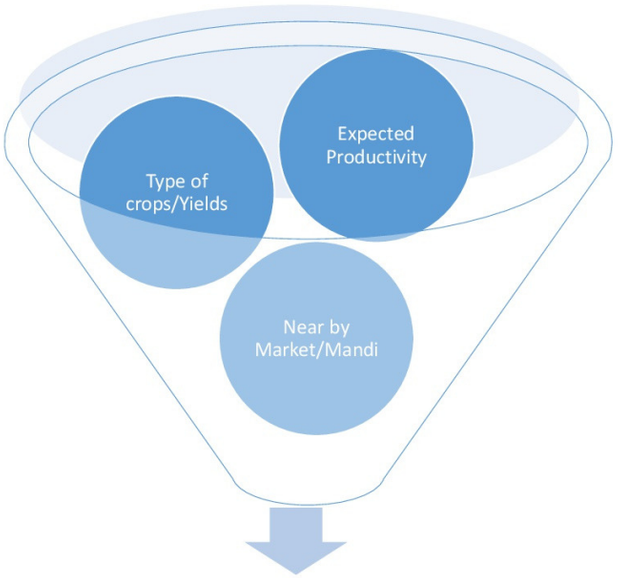
for selection of site, which is not exploited for cultivation due to various environmental, based disaster. The selection of site will largely depend upon the various physical, physiological, hydrological, hydrogeological, the morphology of the area.

b) Understanding the Environmental Condition:
Recent past has witnessed various environmental disaster which has concluded in a huge loss for the agriculture industry.

Hence, by understanding the varying environmental conditions, an alert mechanism can be planned for farmers. Flood and drought are most common amongst them. Here GIS can play an important role in identifying the potential site that may have maximum impact. It will help in reducing the feasible adverse impact on farming activity.

c) Understanding the Risks:
In a current practice, the traditional pattern of cultivation with seasonal crops is being done across India. In no, any condition farmer is taking risk of cultivation of other agricultural yields. Here GIS based decision support system can be used for evaluating the other geographical area of similar environmental condition with their productivity and market output. Based on the same the local farmers can be motivated for the production of the same.

d) Real-time Market Database:
One of the major disadvantages of Indian farm industry is lack of real time database. This results in the gap while considering the demand and supply of agricultural output. This can be better understood by an example where farmers burn their yields in the farm, on the other hand, the same product is being in highest demand in another part of a country. Every crop agricultural yields have its own cycle, some have a short span and some take few month to get ready. Database of yields that has a life cycle of one month to the maximum can be linked to the geographical map. Here it will help the agricultural market or government storage agencies or distributor to understand from where the yields can be obtained to fill the gap in demand and supply. This can be done at panchayat level across the country, where the type of yield with its probable output can be linked to the central database. There are various government schemes at panchayat level, which is in practice. Even government has more focus on providing positive strength to the panchayat.



Updation of the above information by every panchayat on central server of Agriculture based decision support system

For a better GIS based Decision support system the Information from the Panchayat can be utilized in different ways;

- Analysis of the type of crop, Agriculture products
- Analysis of location of agriculture products across the country
- Analysis of probable quantity of products
- Analysis of estimated quantity vs produced quantity
- Analysis of route cause analysis for low productivity
- Analysis of high productivity and preparation of case study for awareness amongst other farmers at different location
- Analyzing the demand and supply curves (Based on temporal study)
- Analyzing the quantity that can be exported by maintaining demand and supply in country
- Analyzing the selection of crop in next season

e) Market Based Distribution Network:
Based on input data from every Panchayat analysis of storage and distribution can be further planned. This will also help in estimating the quantity of agricultural products with reference to its coordinates/locations across the country. Which can be further utilized for export across the neighboring countries if required. Route planning for transportation of agricultural products across the mandis (whole sale markets) of different state can be done so that cost of productivity for farmers can be optimized.

Conclusion

The major reason behind the failure of the participation of private players for crop insurance in India, is lack of the GIS based decision support system. Currently, the demand and supply curve is being maintained by using Political decisions. How much should be the support price for the agricultural product is dependent upon the willingness of the government to pay the money. By GIS based decision support system the participation of Private players may get increased in crop insurance and agricultural loan. GIS based decision support system can be required across the country where each panchayat will participate by providing the information of expected agricultural productivity. The input of this information can be then used by government stakeholders for the planning of storage, distribution, and analyzing the demand and supply.

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