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PRECISION FARMING TO MAKE AGRICULTURE AN ULTRA-TECH ACTIVITY

Drishty Katiyar[1], Narendra Kumar Bhinda[2] and Abhishek Kumar[1]

1 Department of Soil Science and Agricultural Chemistry & Department of Agronomy, Chandra Shekhar Azad University of Agriculture & Technology, Agricultural College Lane, Nawabganj, Kanpur, Uttar Pradesh-208002, India.

2 Maharana Pratap University of Agriculture and Technology, University Rd, Pahada, Udaipur, Rajasthan-313001, India.

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Corresponding author:
Bhinda, N. K.
narendrabhinda@gmail.com

ABSTRACT

Agriculture is the primary source of income for a significant population worldwide. The latest technologies are built to solve the most pressing problems globally, one of them being feeding the world population. Precision farming is a management strategy that gathers, processes, and analyses temporal, spatial, and individual data. Precision farming, combined with other information, can support management decisions according to estimated variability for improved resource use efficiency, productivity, quality, profitability, and sustainability production. Farmers optimize inputs like water, fertilizers, and pesticides to enhance productivity, quality, and yield. It relies on new technologies such as Global Positioning System (GPS), Global navigation satellite system (GNSS), Geospatial Tools as ArcGIS, and Artificial Intelligence. Using satellites and drones in precision agriculture plays an essential role in identifying the precise location of problems. The future of agriculture moves more toward machine learning every year. These technologies in precision agriculture can give an idea about specific solutions to problems, for example, if you need to apply a particular mineral or fertilizers in one area of your land, rather than using it on the entire farm, thus saving money, resources, and time. There are many factors in precision farming that need to be taken into account to maximize crop production. Being more precise on planting, harvesting, and fertilizing, will get you more out of your field.

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INTRODUCTION

Precision farming is a farming system where inputs such as seeds, tillage, fertilizers, pesticides, and operations are modified according to the field's yield potential to enable maximum profit. It facilitates the optimal use of inputs, resulting in increased gross margins with reduced impact on the environment. It is sometimes known as variable rate technology (VRT) and site-specific agriculture, as it is the management of inputs to small plots as a function of the diversity of the physical medium and the environment. The term precision agriculture appears to have been used first in 1990 as the workshop's title held in Great Falls, Montana, sponsored by Montana State University. Before this, in the '80s, the term 'site-specific crop management' or 'site-specific agriculture' was used. The concept of precision agriculture is not a new thing, but the terminology is of recent origin. The present status of precision agriculture is similar to the no-tillage concept of 1960. In this farming, the farm field is broken into 'management zones', and management decisions are based on the requirements of each zone. Precision farming tools such as GPS and Geographical Information System are used to control the zones. Precision farming models ensure the empowerment of farmers and aim to replace big machinery, high energy consumption, over-application of chemicals with intelligent machinery and intelligent processes. It is a cyclic system of farming. Modern precision farming has a relatively short history, and its application started over the last twenty-five years when GPS and yield monitors were made available in the agricultural field. Harvesting was mechanized, and sensors were placed on harvesting machines to measure the spatial distribution of yield continuously. When the first yield monitors were developed and yield maps were created, it was shown that the yield and soil properties varied highly within the field. This fact has been marked in the development of modern precision agriculture (Hedley, 2015). Many technology firms and startups have begun to explore this business opportunity as the next huge area of growth. There is an extensive opportunity to apply artificial intelligence (AI), machine learning (ML), drone technology, internet of things (IoT), smartphones, and robotics to precision agriculture. In the 18th century, a scientist argued that as population growth is exponential while food growth is linear, there will be inevitable food shortage at the moment in time (Malthus, 1798). Malthus's theory creates some trepidation in the global community. Humanity and finance incentives by the next generation have always falsified Malthus with new ways to generate more food supply.

WHY PRECISION AGRICULTURE?

Precision agriculture is applying principles and technologies to manage spatial and temporal variability associated with all aspects of agricultural production to improve crop performance and environmental quality. Excessive use of fertilizers and chemicals is increasing environmental pollution, land degradation and depleting water resources. In India, about 144 million ha of land are affected by water or wind erosion alone.

PRECISION AGRICULTURE TO ADDRESS POVERTY ALLEVIATION, ENHANCE THE QUALITY OF LIFE, AND FOOD SECURITY

Precision farming models certify first-grade commercial production. Ultra-technology -

activity in the point of view, technical perspectives are required for better time management at the farm level such as GPS, VRT, SSM service, financing, etc. The total farming land is broken into "management zones" (by square foot 1/10-1/100 acre). All management decisions are based on the specific requirements of each zone.

COMPONENTS OF PRECISION AGRICULTURE

The components of precision agriculture are GPS, yield monitoring, GIS, remote sensing, VRT and smartphones required for right input, at the right time, in the right amount, at right place and in the right manner. GIS works as the brain of the precision farming system, the key is to extract value from information on variability. GPS helps identify any location of the field to assess the spatial variability and site application of inputs. The specific application of remote sensing techniques is used to detect, identify, measure, and monitor agriculture phenomena. Yield monitors store the information generated in the computer. According to the farmer's needs, many smartphone applications have been developed, such as agriculture calculators, agriculture news, agriculture information resources, weather, and m-government. Each component has its specific importance while farming. The sensor's values are fed to a cloud-hosted IoT platform with predefined decision rules and models-also called business logic that ascertain the condition of the examined object and identify any deficiencies or needs.

PRESENT SCENARIO OF PRECISION AGRICULTURE

Though precision farming is gaining popularity in developed countries, it is still at a nascent-stage in developing countries, including India. Space application centre, ISRO, in collaboration with CPRI, Shimla has initiated a study on exploring the role of sensing for precision farming. The global food system faces formidable challenges today that is to increase markedly over the next forty years. Researchers at Kyoto University developed a two-row rice harvester for determining yields on a micro plot basis (Lida *et al*.,1998). The formulation of policies that reflect the real scarcity, value and penalize pollution, and green payments policies for the farmers adopting techniques that would lower environmental costs, can promote the adoption of precision farming technologies (Braden *et al*.,1994). Currently, growers have adopted labor-assist platforms to reduce the reliance on ladders and increase efficiencies.

CONCLUSION

Precision Agriculture is still only in the early stages of implementation in most of the developing countries. Coordination between farmers, the government and the multinational corporations, is gaining momentum. Precision farming addresses both economic and environmental problems by the help of the latest technologies that facilitate agricultural production. It can be concluded that precision farming could immensely help reduce the cost of production and increase profit and marginal return. It enables optimal use of input through site application and precise application in agriculture. The latest precision farming tools help graph performance in relation to productivity linked soil parameters and weather forecasting, especially in monsoons. Thus, this type of farming with innovative modern equipment may help farmers harvest through frontier technologies without compromising land and produce quality. Precision farming can trigger a techno-green revolution in India, which is the need of the hour.

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