

Precision Farming Tools in Agriculture

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SUMMARY

Precision agriculture (PA) (also known as “precision farming,” “site-specific crop management,” “prescription farming,” and “variable rate technology”) has been developing since the 1990s, and refers to agricultural management systems carefully tailoring soil and crop management to fit the different conditions found in each field. Precision farming is an approach where inputs are utilized in precise amounts to get increased average yields, compared to traditional cultivation techniques. In India, one major problem is the small field size. More than 58 per cent of operational holdings in the country have size less than one hectare (ha).

INTRODUCTION

Precision farming distinguishes itself from traditional agriculture by its level of management. Instead of managing whole fields as a single unit, management is customized for small areas within fields. This increased level of management emphasizes the need for sound agronomic practices. Before considering the jump to precision agriculture management, a good farm management system must already be in place. Precision agriculture is a systems approach to farming. To be viable, both economic and environmental benefits must be considered, as well as the practical questions of field-level management and the needed alliances to provide the infrastructure for technologies. Precision farming" refers to the careful tailoring of soil and crop management to different conditions found in each field. Sometimes known as "prescription" or "site specific" farming, precision farming applies a combination of new technologies in order to optimize farm inputs, improve efficiency and reduce environmental pollution. Key technologies involved in precision farming include Global Positioning Systems (GPS), Geographic Information Systems (GIS) and Variable Rate Treatment (VRT). Tools of the precision farming are discussed as below :

- Global Positioning Systems (GPS)
- Geographic Information Systems (GIS)
- Variable Rate Technology (VRT)
- Yield Monitors
- Remote Sensing
- Proximate Sensors
- Computer Hardware & Software
- Irrigation System
- Leaf Color Chart (LCC)
- Soil Plant Analysis Development (SPAD) Meter or Chlorophyll Meter

Global Positioning Systems (GPS)

It is a set of 24 satellites in the Earth orbit. It sends out radio signals that can be processed by a ground receiver to determine the geographic position on earth. It has a 95% probability that the given position on the earth will be within 10-15 meters of the actual position. GPS allows precise mapping of the farms and together with appropriate software informs the farmer about the status of his crop and which part of the farm requires what input such as water or fertilizer and/or pesticides etc.

Geographic Information Systems (GIS)

It is software that imports, exports and processes spatially and temporally geographically distributed data.

Variable Rate Technology (VRT)

The existing field machinery with added Electronic Control Unit (ECU) and onboard GPS can fulfill the variable rate requirement of input. Spray booms, the Spinning disc applicator with ECU and GPS have been used

effectively for patch spraying. During the creation of nutrient requirement map for VRT, profit maximizing fertilizer rate should be considered more rather than yield maximizing fertilizer rate.

Yield Maps

Yield maps are produced by processing data from adapted combine harvester that is equipped with a GPS, i.e. integrated with a yield recording system. Yield mapping involves the recording of the grain flow through the combine harvester, while recording the actual location in the field at the same time.

Remote Sensing

These are generally categories of aerial or satellite sensors. They can indicate variations in the colours of the field that corresponds to changes in soil type, crop development, field boundaries, roads, water, etc. Aerial and satellite imagery can be processed to provide vegetative indices, which reflect the health of the plant.

Proximate Sensors

These sensors can be used to measure soil parameters such as N status and soil pH) and crop properties as the sensor attached tractor passes over the field.

Computer Hardware & Software

In order to analyze the data collected by other Precision Agriculture technology components and to make it available in usable formats such as maps, graphs, charts or reports, computer support is essential along with specific software support.

Irrigation System

Recent developments are being released for commercial use in sprinkler irrigation by controlling the irrigation machines motion with GPS based controllers.

Leaf Color Chart (LCC)

LCC was developed by IRRI (International Rice Research Institute) and also by FRRI (Philippines Rice Research Institute). In India these charts are provided by Nitrogen parameters which provide guidance to the farmers regarding improved Nitrogen (N) management. Nitrogen is applied by the farmers in rice plants at different growth stages, but the amount of N to be applied and the time of applications vary substantially. LCC helps to synchronize N application with the real time and quantity demand of the rice crop. Helps to prevent under or over usage of N in rice plants.

Soil Plant Analysis Development (SPAD) Meter or Chlorophyll Meter

Conventional agricultural practices that rely heavily on blanket fertilizer recommendation, eventually leading to deteriorated partial factor productivity and N use efficiency. We investigated the effect of SPAD-based N-management on productivity and N use efficiency of rice and wheat in eastern India.

CONCLUSION

From the above information we have concluded that there are lot of benefits of Precision farming. Farmers have small lands holdings, variations in cropping system, high cost of production, lack of knowledge regarding crop production, computer analysis and right decision making. These are the some constraints in achieving success in crop production. So all these constraints can be overcome by the use of various precision farming tools. Use of these tools we can easily identify variability in field, requirement of inputs to the crops. It's a just small contribution to carry this information to the next generation which will be useful in agriculture.

REFERENCES

Reddy S. R. - Principles of Agronomy.(6) Ludhiana : Kalyani Publishers ; 2019