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PRECISION FARMING – A NEW TECHNIQUE FOR HORTICULTURAL CROPS

Popular Article

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ABSTRACT

Precision farming involves the application of technologies and principles to manage spatial and temporal variability associated with all the aspects of agricultural production for improving crop performance and environmental qualities. In short it means adding the right amount of treatment at the right time and the right location within a field. Philosophy behind the precision farming is that production inputs (seed, fertilizer, chemicals, etc.) should be applied as needed and where needed for the economic production. About 17 Precision Farming Development Centers (PFDC) have been established in different agro-climatic region. In this article, what is precision farming, development of precision farming, its importance, steps, different tools, application of precision farming, precision plant protection measures, constraints and future thrust are discussed, which can be used in future point of view.

Introduction

Precision farming (PF) is comprehensive information based farm management system to identify, analyze and manage variability within fields for optimum profitability, sustainability and protection of the land resources. It basically means adding the right amount of treatment at the right time and the right location within a field.

Development of precision farming

- The concept of precision farming first originated in the United States of America during 1980s.
- Precision farming is a farming management concept based on modern information technologies such as GPS (Global Positioning System), Remote Sensing Technology and GIS (Geographic Information Systems).
- In Indian context, precision farming may be defined as an accurate application of agricultural inputs for crop growth considering relevant factors such as soil, weather and crop management practices.
- It is actually information and technology based farming system where inputs are managed and distributed on a site-specific basis for long term benefit.

Importance of precision farming

- Improve crop yield.
- Provide information to make better management decisions.
- Virtually no wastage of valuable resources of crop production as each has to be applied specifically as per requirement of production system.
- Reduce chemical and fertilizer costs through more efficient application.
- Ability to achieve optimum produce of uniform and higher quality.
- Provide more accurate farm records.
- Increase profit margin.
- Reduce pollution.

Steps in the precision farming process

1. Assessing variability:

In precision farming, inputs are to be applied in accordance with the existing variability. Therefore, assessing the in-field variability is very crucial and first step of precision farming. Remote Sensing, Global Positioning System, Geographical Information System, Yield Monitoring are the tools for assessment of variability.

2. Managing variability:

After assessing spatial variability, these precision farming practices aims at managing the variability by applying and making farm inputs available only in require quantities at particular time and specific location known as Variable Rate Application.

3. Evaluation of precision farming:

Three important evaluation issues are as follows:

a. The economic viability focuses on market return through sale of the produce.
b. Maintenance of environment focus on precision farming can improve soil, water and crop environment.
c. Finally how far this technology can be transferred to other farmers.

Tools for precision farming

1. Remote sensing

Remote sensing is a tool for collection, processing and analysis of data to exact information from earth surface without coming in to physical contact with it. It holds great promise for precision agriculture because it is potential for monitoring spatial variability over time at high resolution.

2. Geographic Information System (GIS)

It is a computer base management system used for computation, storage, analysis and display of spatial data in the form of a map. The GIS is the key to extracting value from information on variability. It is rightly called as brain of precision farming.

It helps in agriculture in two ways:

One is in linking and integrating GIS data (soil, crop, weather, field history etc.) with simulation models. Another is to support the engineering component for designing implement and GPS guided machines.

3. Global Positioning System (GPS)

GPS are important to find out the exact location in the field to assess the spatial variability and site specific application of inputs.

4. Variable Rate Technology (VRT)

VRT consists of farm field equipment with the ability to precisely control the rate of application of crop inputs that can be varied in their application, commonly include fertilizer, weed control, insect control, plant population and irrigation. In agriculture it is used to optimize the input or maximize the crop yield from a given quantum of unit.

5. Yield monitoring

Yield monitor are crop yield measuring devices installed in harvesting equipment. The yield data from the monitor is recorded and stored at regular interval along with positional data revised from the GIS unit. GIS software takes the yield data and produce yield map**.**

6. Yield mapping

Mapping of yield and correlation of that map with the spatial and temporal variability of different agronomic parameters helps in development of next season crop management strategy.

Application of precision farming

- Water management
- Surface covered cultivation

- Controlled environment structure
- Organic farming
- Precise space utilization
- Micro propagation / tissue culture
- IPM/INM

Precision plant protection measures

Net Houses:

Finer mesh nets with smaller size holes can be used for plant protection against insects. Select net of 32- mesh size (32 holes per inch or hole size 0.8 mm), uniformly weaved, durable quality, nylon netting is mostly preferred to control diamond back moth, striped flea beetle, leaf miners and aphids.

Pest and Disease Monitoring/Detection through Remote Sensing and GIS

- Collection of aerial infrared photographs and satellite images of selected crops during the growing season.
- Correlation of the data from these images to field collected values for crop development, pest and disease assessment, field productivity and spatial variation.
- Examine the feasibility of using land surface temperature obtained by satellites to drive crop and pest development models for use in operational IPM programs.

Herbigation:

It refers to application of herbicides through irrigation water. In places where the rainfall is limited, the application of herbicides through drip irrigation serves to achieve higher efficiency of the applied herbicides. This action eliminates the need for mechanical incorporation and reduces the cost of weeding operation.

Some of the components of precision farming adoptable under Indian condition

- Good quality seed or planting material
- Precise land preparation
- Timely sowing/planting
- Application of organics
- Drip/ sprinkler method of irrigation
- Fertigation of N, K, micronutrient etc.
- Herbigation
- Mulching with plastic or organics
- Plant protection measures

Constraints

- Small farm size
- Lack of success stories
- Lack of local technical expertise
- Heterogeneity of cropping systems and market imperfections
- Land ownership, infrastructure and institutional constraints
- Knowledge and technical gap
- High cost of obtaining site specific data

Future thrust

- Formation of farmers co-operatives since many of the precision agriculture tools are costly (GIS, GPS, RS etc.).
- Creating awareness amongst farmer about consequences of applying imbalanced doses of farm inputs like irrigation, fertilizers, insecticides and pesticides.

Conclusion

In coming years, precision horticulture may help the Indian farmer to harvest the fruits of frontier technology without compromising the quality of land and produce. In the overall perspective, with the introduction and adoption of modern technologies, agriculture sector is expected to achieve a vertical growth.

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