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Precision Farming: Modern Agriculture Revolution

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INTRODUCTION

Precision farming is an information and technology-based farm management method that aids in the identification, analysis, and management of variation within fields or farms in order to maximize the long-term viability and profitability of land resources. To put it another way, precision farming is all about doing the right thing at the right time, in the right place. Advanced information technology should be employed for agricultural production in precision farming to make better decisions. Precision farming combines cutting-edge technology with conventional agricultural practises. It's an integrated crop management method that tries to match input types and amounts to crop demands for small areas within a farm field.

Because of its unique attribute of precision in space and time, precision farming is based on the Global Positioning System (GPS). GPS was created by United States of America defence experts for the sole purpose of serving the US Defence Department. Precision agriculture (PA) involves the application of precise and correct amounts of inputs such as water, fertilisers, insecticides, and other chemicals to crops at the right moment in order to increase productivity and maximise harvests. The application of inputs (such as chemical fertilisers and pesticides) should be in the correct quantity, at the correct time, and at the correct location. "Site-Specific Management" is a term used to describe this sort of management.

Need of precision farming

- It aids in increasing agricultural productivity and profitability, as well as reducing soil degradation on cultivable land.
- It contributes to the reduction of chemical use in agricultural production.
- It aids in the efficient use of water resources.

It aids in the dissemination of contemporary farming techniques that can enhance the quality and quantity of agricultural products.

Components of Precision Farming

- Crop Characteristics: This contains the crop's stage, health, and fertiliser requirements, among other things.
- Soil layer: A detailed soil layer including physical and chemical parameters, texture, depth, salinity, toxicity, soil temperature, texture, productivity potential, and other information is required.
- Microclimate data: daily and seasonal information on crop canopy, wind direction, temperature, humidity, and so on.
- Drainage: There must be enough surface and subsurface drainage.
- Irrigation facilities: Ensuring adequate water availability as well as other input plans.
- Farm machinery and equipment: Sensors should be installed.

Benefits of Precision Farming

- Crop yields are increased by 40% to 60%.
- It provides a 30% premium pricing in the market.
- It produces marketable produce in excess of 90% first grade.
- Precision farming requires less labour.
- It saves 30 to 40% of the water that would otherwise be wasted.
- It also gives farmers more control over their crops.

Basic steps in Precision Farming

Precision farming consists primarily of three basic steps. It involves

1. Assessing variability
2. Managing variability
3. Evaluation

1. **Assessing variability:** In precision farming, it is one of the most vital and crucial steps. Some factors influence crop yield, and the processes vary in space and time. Precision farming faces a big problem in quantifying the variability of these components and processes. A fundamental difficulty in precision farming is determining when and where various combinations of these elements and processes are responsible for spatial variability in crop performance in terms of yield. Some strategies for measuring variability are available and have been extensively employed in precision farming. The following are some of the techniques:
   - Survey method
   - Interpolation technique
   - High-Resolution Sensing
   - Modelling
2. **Managing variability:** Farmers should match agronomic inputs after assessing variation in order to implement suitable management recommendations. These agronomic inputs should be site-specific, and precise application control devices should be used. Farmers can utilise GPS instruments to manage site-specific variability. It is necessary to record the sample location coordinates when gathering soil or plant samples so that they can be used for management. The following are some of the management practises required for precision faming:
   - Crop management
   - Soil management
   - Water management
   - Precision soil fertility management
   - Precision pest management
3. **Evaluation:** This is the final phase in the precision farming process. The three most significant aspects of precision agricultural evaluation are economics, the environment, and technology transfer.

Tools and techniques for precision farming

1. Global positioning System
2. Geographical information System
3. Grid sampling
4. Variable rate technology
5. Yield monitors

6. Yield maps
7. Remote sensors
8. Auto- guidance systems
9. Proximate sensors
10. Computer hardware and software

Challenges of precision farming in India

Precision farming is widely employed in wealthy countries, although it is still in its infancy in developing nations such as India. The following are the issues that India faces in precision farming:

- Indian farmers' and landowners' culture and attitudes.
- The farmers' farms are small.
- There aren't enough success tales to go around.
- Market imperfections and cropping system heterogeneity.
- Land ownership, infrastructure, and institutional constraints.
- A lack of knowledge about local procedures.
- Technical limitations and a lack of knowledge.
- Data, quality, and cost inaccessibility.

CONCLUSION

Precision agriculture, in conclusion, enables farmers to use crop inputs such as fertilisers, herbicides, and irrigation water more effectively and efficiently. It will aid in the more efficient use of inputs while preserving the environment. Governments in developing countries, such as India, should adopt remedial measures to promote precision farming in order to ensure that resources are preserved for future use.Because precision farming can address both the environmental and economic challenges that plague agriculture today. The concept of doing the right thing at the right time in the right place can be a game changer in terms of increasing India's GDP. However, in order for precision farming to succeed, new technology information should be disseminated at a faster rate so that this type of farming may be adopted in rural regions as well.