AGRI MAGAZINE
(International E-Magazine for Agricultural Articles)
Volume: 02, Issue: 07 (July, 2025)
Available online at http://www.agrimagazine.in
©Agri Magazine, ISSN: 3048-8656

The Concept of Precision Farming

*Virupakshi Aski[1], Harsha, C.[1], Varsha, S.C.[2] and Praneet, B.K.[1]
[1]Department of Agricultural Extension, KSNUAHS, Shivamogga, India
[2]Department of Agricultural Extension, UAS, Bangalore, India
*Corresponding Author's email: vsaski2018@gmail.com

The concept of Precision farming originated in United States of America in 1980's. Professor Pierre C. Robert who is considered as the father of precision farming defined precision farming as precision agriculture is not just the injection of new technologies but it is rather an information revolution made possible by new technologies that result in a higher level, a more precise farm management system. Precision Farming is defined as information and technology based farm management system to identify, analyse and manage spatial and temporal variability within fields for optimum productivity and profitability, sustainability and protection of the land resources by minimizing the production costs. In our Indian terms we can define precision farming as ―precise utilization of inputs with respect to the crop, soil, and weather conditions to achieve effective and optimum utilization of resources without wastage‖.

Comparison between Precision farming and Traditional farming

Precision farming technologies may be relatively new concept in India but precision management is not. Indian farmers have long known that soil conditions, fertility, moisture etc. vary widely across a single field and that various parts within fields responded differently to different types of inputs and cultural practices. The small size of their farms often permitted effective monitoring of spatial and temporal yield variation and variable application of inputs by simple observation and manual means. The advent of green revolution in the country pushed up production levels by leveraging the advantages of high yielding varieties, fertilizer application and liberal use of pesticides. The trend has continued and generalized regional recommendations based on crops grown are followed. For example, pesticide application rate is on a per hectare basis irrespective of what percentage of crop is really affected. Providing subsidies has encouraged fertilizer use. Fertilizers application rate have been developed on a regional scale by agricultural experiment stations irrespective of whether the variety planted can make full use of it or not. Withdrawal of subsidies contemplated by government would lead to decline in fertilizer consumption. Judicious use of fertilizer at precise point of need can facilitate higher yields and also reduce the degradation of soil and pollution of ground water (Khosla et al., 2001). The right time for implementing precision farming has arrived. Many precision farming technologies are multifunctional and their adoption should result in favorable changes in various aspects of farming. Indian farms have traditionally worked by many generations of farmers, who have accumulated substantial location specific knowledge and skills. Precision farming technologies allow integration of local and traditional knowledge into farm resource management to create a historical spatial database, which would be useful for posterity. Further, the collection and analysis of geo-referenced data from all fields in a village provides a unique opportunity to gain new insights into the functioning of Indian agricultural systems. The data will have added value, especially when integrated into regional databases. It is therefore abundantly clear that precision farming technologies are and will be increasingly relevant to the development of sustainable and profitable cropping systems in India.

Benefits/Advantages of Precision farming

- Compile and analyse data in real time
- Reduce water waste and improve crop management
- Get optimum results from labour & resources
- Produce food to feed the entire world
- Monitor soil & plant parameters
- Help automate field management
- Provides better information for making management decision
- Reduce pollution
- Improve crop yield
- Reduce chemical and fertilizer costs through more efficient application
- Ability to achieve optimum produce of uniform and higher quality
- Provide more accurate farm records
- Reduced runoff, erosion and sedimentation of water bodies and reduction in environment pollution
- Reduction in application of irrigation water, thus reduce the leaching of nutrients along with deep percolation

Key Aspects of Precision farming

The precision farming mainly depends on three key aspects. They are:

1. Information: is one of the important key aspects in precision farming as it mainly deals with the various aspects of spatial and temporal variability data on which the management decisions depend.
2. Technology: it comprises the use of technologies like GPS, GIS, remote sensing etc., to acquire knowledge on various aspects of crop and land parameters.
3. Management: it comprises the management decisions to manage the variability.

Steps in the precision farming process

The precision farming process consists of 3 steps. They are:

1. **Assessing variability**: The assessment of variability is the first and most important phase in any precision farming system. Factors and the processes that regulate or control the overall crop performance in terms of yield and productivity vary in both space and time. For efficient and effective management of available production inputs we need enough knowledge about both the spatial and temporal variability statistics of the farm. In precision farming, methods for assessing spatial variability are readily available and widely employed. There are several approaches for estimating temporal variability, but they rarely give both spatial and temporal variability at the same time. Remote sensing, global positioning system, geographic information system, yield monitoring are the tools used for assessment of variability.
2. **Managing variability**: Management of field variability through site specific allocation of available crop production inputs is second step in precision farming. Once variation correctively and adequately assessed, farmers must match all the agronomic inputs to known conditions employing management recommendations. These are allocated by employing site specific management strategy using accurate control precision equipment. This can be achieved by Variable rate application.
3. **Evaluation of precision farming**: Evaluation in terms of economics, environment, and technology transfer are all significant factors in determining the effectiveness of any precise technology. The most critical fact regarding the analysis of profitability of precision farming is that the value comes from the application of the data of performance of the given system which are collected from the field and not from the use of the technology. Precision farming systems have been investigated for potential gains in environmental quality by lowering agriculture input and reducing greenhouse gas emissions, which is frequently touted as a motivation for employing precision farming. Precision farming can be made practicable by enabling technologies, applied by

agronomic principles and decision rules, and lucrative through increased production efficiency or other types of value Enabling technologies can make precision farming feasible, agronomic principles and decision rules can make it applicable and enhanced production efficiency or other forms of value can make it profitable.

Constraints in adoption of Precision farming

The constraints in adoption of precision farming technologies in India are:

- Small size of land holding
- High cost of investment
- Highly skilled labour requirement
- Lack of training programs
- Complexity of tools and techniques requiring new skills
- Lack of local technical expertise
- Heterogeneity of cropping systems and market imperfections
- Inadequate knowledge about PF among the farmers
- Un assured availability of quality seed or planting material of desired crop and variety

Conclusion

Currently, potential benefits of precision farming are utilized only to a small extent mostly limiting to large farmers with limited adoption of only few components of precision farming. This paves a numerous opportunity for farmers to identify specific crops and to enhance the production and productivity by exploring the various components of precision farming. It has high potential to increase farmer‘s income, increase extrinsic and intrinsic quality of agricultural production, and decrease negative environmental effects of agricultural production and all other issues at the same time. This has to be effectively utilized by the farmers to achieve higher returns and maintain sustainability in the production.

References

1. Anonymous, 2021, Agricultural statitistics at a glance 2021, Govt. of India, Ministry of Agri. & Farmers Welfare, Department of Agri. & Farmers Welfare, Directorate of Eco. & Statistics, pp:11-12.
2. Greena, A. V., Kalaivani, S. and Palaniswamy, S., 2015, Knowledge of precision farming beneficiaries. *J. of Ext. Edu*., 27 (3):5506-5510.
3. Rajesh, C. M., 2020, Performance of horticulture crop growers under protected cultivation in Chikkaballapur district. M.Sc. Thesis (Unpub.), Univ. Agric. Sci., Bangalore.
4. Robert, P. C., Rust, R. H. and Larson, W. E., 1995, In proceedings of site specific management for agriculture system, 27-30 March 1994, Minneaports, MN, ASA CSSASSA, Madison. pp:13-14.