STEPS IN PRECISION FARMING

Two basic steps in precision agriculture are: (1) Identification and assessment of variability and (2) Management of variability.

1. Identification and Assessment of Variability

Assessing variability:-

- In precision farming, inputs are to be applied precisely in accordance with the existing variability
- Spatial variability of all the determinants of crop yield should be well recognized, adequately quantified andproperly located
- Construction of condition maps on the basis of the variability is a critical component of precision farming
- Condition maps can be generated through (i) Surveys, (ii) Point sampling & interpolation, (iii) Remote sensing (high resolution) and (iv) Modeling

- **Grid soil sampling:** Grid soil sampling uses the same principles of soil sampling but increases the intensity of sampling compared to the traditional sampling. Soil samples collected in a systematic grid also have location information that allows the data to be mapped. The goal of grid soil sampling is to generate a map of nutrient/water requirement, called an application map.
- **Yield map:** Yield mapping is the first step to determine the precise locations of the highest and lowest yield areas of the field and to analyze the factors causing yield variation. One way to determine yields map, is to take samples from the land in a 100 x 100 m grid pattern to test for nutrient levels, acidity and other factors. Results can then be combined with the yield map to see if application levels need to be adjusted for more effective, yet more economical placement that produces higher crop yields.

- **Crop scouting:** In-season observations of crop conditions like weed patches (weed type and intensity); insect or fungal infestation (species and intensity) and crop tissue nutrient status can helpful later when explaining variations in yield maps.
- **Use of precision technologies for assessing variability:** Faster and in real-time assessment of variability is possible only through advanced tools of precision agriculture.

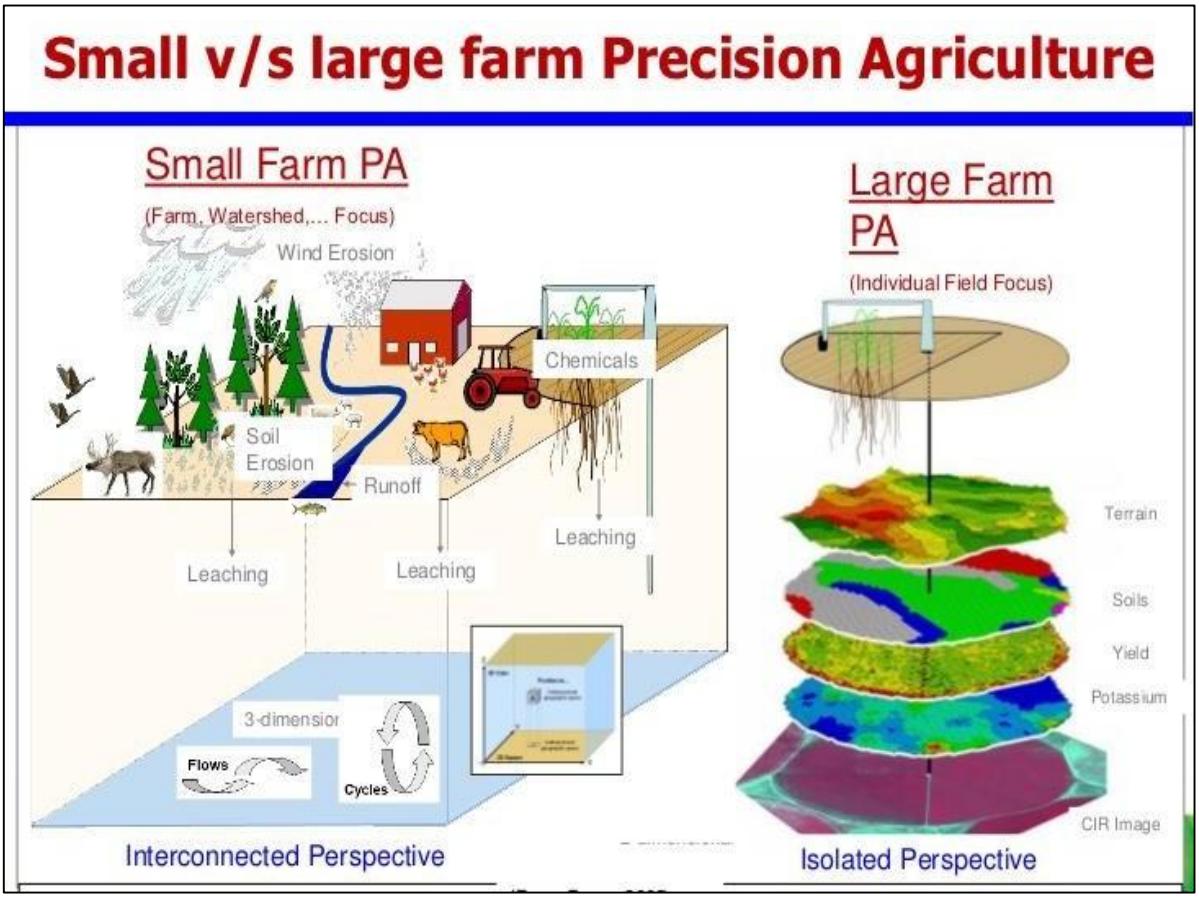
2. Management of Variability

Managing variability:-

Variations occur in crop or soil properties within a field.

- These variations are noted, and often mapped.
- Management actions are taken as a consequence of the spatial variability within the field.
- Land leveling
- VRT
- Site specific planting
- Site Specific Nutrient Management
- Precision water management

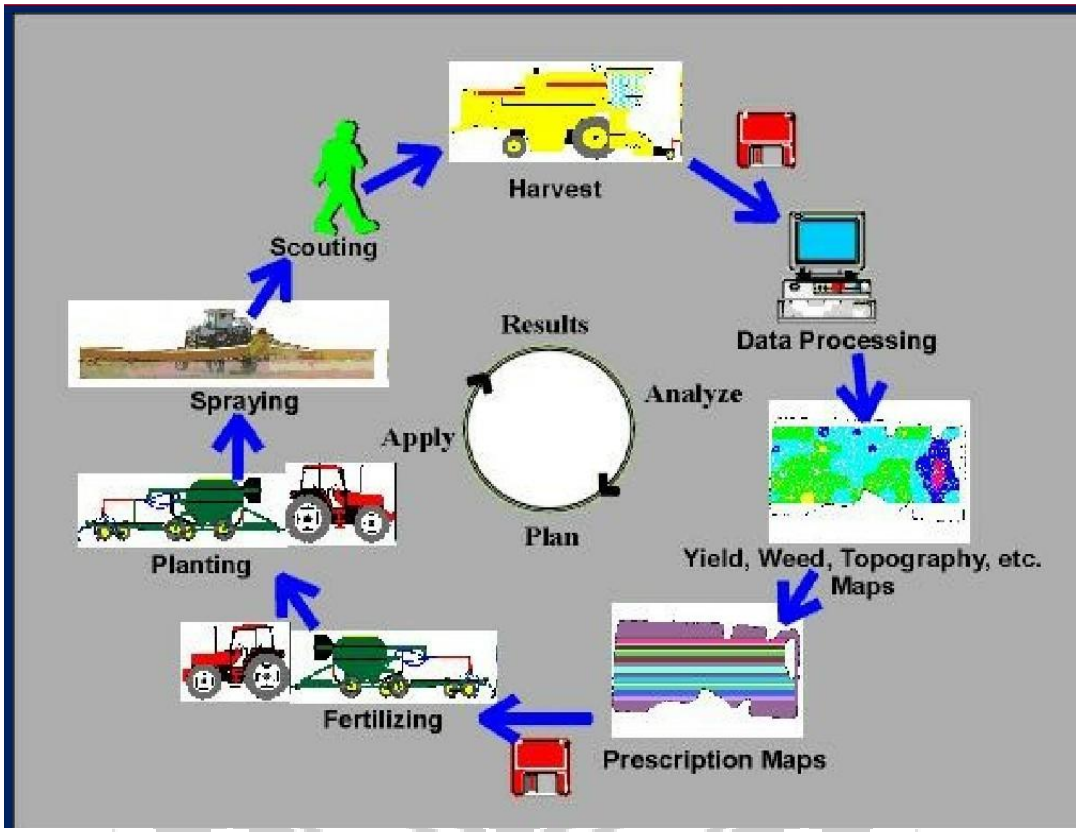
- **Variable rate application:** Grid soil samples are analyzed in the laboratory and an interpretation of crop input (nutrient/water) needs is made for each soil sample. Then the input application map is plotted using the entire set of soil samples. The input application map is loaded into a computer mounted on a variable-rate input applicator. The computer uses the input application map and a GPS receiver to direct a product-delivery controller that changes the amount and/or kind of input (fertilizer/water), according to the application map.
- **Yield monitoring and mapping:** Yield measurements are essential for making sound management decisions. However, soil, landscape and other environmental factors should also be weighed when interpreting a yield map. Used properly, yield information provides important feedback in determining the effects of managed inputs such as fertilizer amendments, seed, pesticides and cultural practices including tillage and irrigation. Since yield measurements from a single year may be heavily influenced by weather, it is always advisable to examine yield data of several years including data from extreme weather years that helps in pinpointing whether observed yields due to management or climate induced.
- **Quantifying on farm variability:** Every farm presents a unique management puzzle. Not all the tools described above will help determine the causes of variability in a field and it would be cost-prohibitive to implement all of them immediately. An incremental approach is a wiser strategy, using one or two of the tools at a time and carefully evaluating the results and then proceeding further.
- **Flexibility:** All farms can be managed precisely. Small-scale farmers often have highly detailed knowledge of their landa based on personal observations and could already be modifying their management accordingly. Appropriate technologies. Here might make this task easier or more efficient. Larger farmers may find the more advanced technologies necessary to collect and properly analyze data for better management decisions.



Advantages of PFS to farmers

1. **Overall yield increase:** Precise selection of crop varieties, application of exact types and doses of fertilizers, pesticides and herbicides and appropriate irrigation meet the demands of crops for optimum growth and development. This leads to yield increase, especially in areas or fields where uniform crop management practices were traditionally practised.
2. **Efficiency improvement:** Advanced technologies, including machinery, tools and information, help farmers to increase the efficiency of labour, land and time in farming. In developed countries like United States, a mere 2 hours are sufficient to grow 1 ha of wheat or maize.
3. **Reduced production costs:** Application of exact quantities at the appropriate time reduces the cost of agrochemical inputs in crop production. In addition, the overall high yield reduces the cost per unit of output.
4. **Better decision-making in agricultural management:** Agricultural machinery, equipment and tools help farmers acquire accurate information, which is processed and analysed for appropriate decision making - in land preparation, seeding, fertilizer, pesticide and herbicide application, irrigation and drainage and post production activities.
5. **Reduced environmental impact:** Timely application of agrochemicals at an accurate rate avoids excessive residue in soils and water and thus reduces environmental pollution.

6. **Accumulation of farmers' knowledge for better management with time:** All PFS Field activities produce valuable field and management information and the data are stored in tools and computers. Farmers can thus accumulate knowledge about their farms and production systems to achieve better management.



Precision Farming Cycle