

# Precision Agriculture

**Objective:** Students will be able to write their own definition of precision agriculture and learn about the components.

## **Background:**

How can Precision Agriculture be defined? In the *Handbook of Precision Agriculture*, Srinivasan compiled a few definitions. These include:

- It is a holistic and environmentally friendly strategy in which farmers can vary input use and cultivation methods – including application of seeds, fertilizers, pesticides, and water, variety selection, planting, tillage, harvesting – to match varying soil and crop conditions across a field (Srinivasan, 2006).
- Careful tailoring of soil and crop management to fit the different conditions found in each field (Johannsen, 1996).
- Information gathering, management planning, and field operations that improves the understanding and management of soil and landscape resources so the cropping inputs of management practices are utilized more efficiently than with conventional “one-fits-all” strategies (Kitchen et al., 1996).
- Farmers use GPS technology involving satellites and sensors on the ground and intensive information management tools to understand variations in resource conditions within fields. They use this information to more precisely apply fertilizers and other inputs and to more accurately predict crop yields (The U.S. House Committee on Agriculture, 2000).
- Application of technologies and principles to manage spatial and temporal variability associated with all aspects of agricultural production (Pierce and Nowak, 1999). Basically it is “doing the right thing, at the right time, in the right place, in the right way.” It applies to virtually every aspect of agriculture, from planting to harvest.
- Managing each crop production input – fertilizer, limestone, herbicide, insecticide, seed, etc. – on a site-specific basis to reduce waste, increase profits, and maintain the quality of the environment (John Deere, 1998).
- An approach for subdividing fields into small, relatively homogeneous management zones where fertilizer, herbicide, seed, irrigation, drainage, or tillage are custom-managed according to the unique mean characteristics of the management zone (Mulla, 1993).

The concept of precision farming has been around for a long time. Before the invention of farm implements, each seed was planted by hand and “fertilizer” was applied to each plant individually (i.e. Native Americans placing fish heads at roots of plants). Large fields were at one time divided into many small fields. The mechanization and development of farming implements caused fields to expand in size and the blanket application of fertilizers, chemicals, planting, etc.

The general goals of precision agriculture include reducing costs, optimizing crop yields and quality, better management of resources, protection of the environment, and energy conservation. The need for this technology is due to the increasing world population while the amount of crop ground is decreasing. Economics plays a large role in deciding whether or not to transition to precision farming techniques from traditional methods.

## **For More Information:**

Ess, D. & Morgan, M. (2003). *The Precision Farming Guide for Agriculturists 2<sup>nd</sup> Edition*. John Deere Publishing

Kentucky Extension: [http://www.bae.uky.edu/precag/PrecisionAg/Extension\\_pubs.htm](http://www.bae.uky.edu/precag/PrecisionAg/Extension_pubs.htm)

## ACTIVITY

**A.** What are some elements that all the given definitions have in common? Using the definitions given and their own knowledge, have students develop their own definition of what precision agriculture is. They can also create a list of names that refer to precision agriculture. (Ex. farming by the foot)

**B.** Divide students into small groups. From the given list, have each group select a topic. The group will then discuss and write down what they know about their topic. They will then go and research the topic and write a 1-2 page paper about the topic. This information will then be presented to the class.

- Variable Rate Technology (VRT)
- Remote sensing
- GPS
- GIS
- Yield monitoring/mapping
- Soil test
- Sensors

How does geospatial technology and precision agriculture tie together?

- GPS is used to create field boundaries and make topography maps. The newest and current GPS addition is auto guidance systems. GPS is also used for yield mapping, crop scouting, and variable rate technology.
- GIS displays maps that are made from collected data.
- Variable rate technology (VRT) allows site specific application of fertilizer, chemicals, and planting. By using VRT, environmental impact is reduced due to soil receiving only what it needs, instead of too much or little.
- Yield monitors use GPS to record crop yields at a specific location. These work by measuring the volume, moisture, and weight of a crop as it passes through the combine. The results are then used to create a map, allowing a farmer to know where high and low yielding areas in a field are.
- Sensors and remote sensing are also used. Sensors can be used to determine weed infestation,

**C.** Read the following paragraph to students:

You have decided to try precision agriculture this year with a large 220 acre field. The local farm store is going to apply the chemicals and fertilizer for you has asked for some information regarding the field. They would like to know the location of any low and high spots, drainage ditches, areas that produce a high and low yield, wet spots, and soil type differences.

Draw your field or using a provide outline, mark these different areas in your field. You can use different colors, shapes, or shading to show the areas. Make sure to create a key so the farm store employees know what each thing stands for.

Now looking at what you have drawn on your field, what inferences can be drawn about this field? Could you divide it into smaller fields and reap some benefits?