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CASE

Activity 7.1.2 Fertilizing Right

Purpose

Agriculturalists use many sustainable practices to conserve the environment. One area of focus is nutrient management. Fertilization is an important component of raising crops and producing food efficiently. Proper fertilization practices can improve agricultural production while minimizing the impact to the environment.

The primary nutrients needed by plants are nitrogen (N), phosphorus (P) and potassium (K). Different plants need different amounts of the primary nutrients. The N-P-K ratio for a product describes the percentage of each primary nutrient found in the fertilizer. A typical N-P-K ratio for a lawn could be 11-3-3. This means the fertilizer is 11% nitrogen, 3% phosphorus, and 3% potassium by weight.

Producers are encouraged to utilize best management practices that optimize the efficiency of fertilizer use. The “4R” nutrient stewardship approach encourages the use of the **right fertilizer source** at the **right rate** at the **right time** in the **right place**. The right source of fertilizer is one that is easily used by the target crop or one that is easily converted to compounds easily used. Since the most appropriate fertilizer depends on application method, management goals and costs, there may be several possible sources. Rate of application should be selected so that the nutrient supply is appropriate for the crop requirements. Fertilizer applications should be timed so the nutrients are available when crop demand is high. The right place to apply fertilizer is where the crop can access the nutrients effectively.

How does practicing nutrient stewardship benefit agricultural producers? What challenges do implementing these practices pose?

Materials

Per student:

- Computer with Internet access
- Pencil
- *NRE Notebook*

Procedure

For this activity you will determine proper fertilizer use for your area and how practicing nutrient stewardship can improve agriculture while preserving the environment. Record your findings in on *Activity 7.1.2 Student Worksheet*.

1. Select an agricultural crop produced in your area.
2. Research what types of fertilizers are used on the crop you have selected. Select one that contains the right source for your crop to research in greater detail.
3. Determine how each of the 4R’s can be applied to this crop and record your findings in Table 1 of *Activity 7.1.2 Student Worksheet*.
4. Discuss the benefits, challenges and environmental impacts of fertilizer use on the crop and local environment in Table 2 of *Activity 7.1.2 Student Worksheet*. For example, if you are using a foliar or leaf application, what are the benefits, challenges, and possible environmental effects of that practice?

Conclusion

1. What might keep producers from using nutrient stewardship practices with their crops?

   Lack of education

   Culture - in our region, we have a strong presence of Amish and Old Order Mennonite

   Avoid nutrient management plan – too intrusive

2. How does implementing nutrient stewardship benefit the environment?

   Sustainable agriculture

   Preservation of key resources – water, soil

   Preventing leaching of fertilizers into the Chesapeake Bay system

5. What additional stewardship practices may also benefit the environment when used in conjunction with the 4R's of nutrient stewardship?

   Drip Irrigation – conservation of water

   No Till practices – conservation of soil

   Crop Rotation – less pesticide/herbicide needed

6.

Name: _____

Activity 7.1.2 Student Worksheet

Table 1. ***4R's of fertilizing***

Crop and Location of fields	Sweet Corn Lancaster County, PA
Source (Inorganic or organic, N-P-K ratio, other information)	Inorganic, N-P-K Starter Fertilizer is typically just N & P, so we would do the following at planting: Monoammonium phosphate (MAP; 11-52-0) and ammonium polyphosphate (10-34-0) based fertilizers make excellent starter fertilizer materials At 2 feet high, additional N is added: (46-0-0)
Application Rate (Pounds/1000 sq ft, pounds/acre, ounces/acre, etc.)	Starter: 100 lbs per acre depending upon soil test, but this rate is typical 2 feet high: 220 lbs per acre of the N fertilizer is added
Time (When and how often?)	Starter: at planting When 2 feet high – apply N
Place (Ex. Side dressing, top dressing, foliar spray, etc.)	Starter – at least 2 inches away from seed Corn at 2 feet high N application - sidedressed

Table 2. ***Benefits, Challenges, and Environmental Impacts of 4R's***

	Benefits	**Challenges**	**Environmental Impact**
Source	N and P are necessary nutrients for corn growth	Fully utilize the nutrients – optimimize all factors to ensure full impact Cost	Eutrophication Excess N leaching into soil
Time	Applied at the time when the plants need it	If the weather impacts fertilization which could negatively impact the plant or the environment	Eutrophication Excess N leaching into soil
Rate	If applied at the appropriate rate, then the corn will maximize yield, and it will save the farmer money if it is applied at the correct rate	It could decrease yield and cost the farmer money in wasted fertilizer.	If excess, then… Eutrophication Excess N leaching into soil
Place	It will provide necessary nutrients to optimize corn production.	If planted farther away from seed/plant, then fertilizer may not be fully utilized or it may damage the plant.	If it is not at the correct place, then the plants will not utilize it and it will leach into the soil and result in the same negative effects as above.