Name: _____

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*.

Select an agricultural crop produced in your area. Blueberries

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. Ammonium sulfate is the most often used nitrogen source. Ammonium nitrate and other nitrate containing fertilizers should be avoided because nitrate ions are very damaging to blueberries. blueberries also respond well to fertilizers containing urea, diammonium phosphate and slow release type nitrogen fertilizers. Urea nitrogen and organic forms, such as cottonseed meal, convert to ammonium, making them acceptable nitrogen fertilizer sources

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*.

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?

Producers may be concerned with price increase due to following conservation practices. They may also be uncertain of the productivity that they will get with organic fertilizers.

2. How does implementing nutrient stewardship benefit the environment?

Nutrient stewardship guards against nutrient runoff which can have significant impacts on water systems, including Eutrophication. This will also benefit the environment by encouraging the use of natural byproducts which reduce waste and decrease mining of inorganic compounds.

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

Minimal tillage procedures, water conservation, cover crops, reduction in pesticide use.

Activity 7.1.2 Student Worksheet

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

Crop and Location of fields	Blueberry crops located in Western Washington
Source (Inorganic or organic, N-P-K ratio, other information)	Ammonium sulfate is the most often used nitrogen source. Ammonium nitrate and other nitrate containing fertilizers should be avoided because nitrate ions are very damaging to blueberries. blueberries also respond well to fertilizers containing urea, diammonium phosphate and slow release type nitrogen fertilizers. Urea nitrogen and organic forms, such as cottonseed meal, convert to ammonium, making them acceptable nitrogen fertilizer sources
Application Rate (Pounds/1000 sq ft, pounds/acre, ounces/acre, etc.)	First three years of berry starts, apply fertilizer at 50 - 75% strength.
Time (When and how often?)	Administration during the most active growing phases. Once in the spring, about march, once in 2 months and one more time following harvest. Monitor for deficiency and apply fertilizer that addresses the deficiency as needed.
Place (Ex. Side dressing, top dressing, foliar spray, etc.)	Top dress, one to three feet around the base of the plant.

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

	Benefits	Challenges	Environmental Impact
Source	Fish meal, urea, inorganic sources.	cost, application and shipping charges	possible damage in harvesting the materials used in making the product
Time	1 - 3 times per growing season. Higher rates as plants show symptoms of deficiency	The timing of application can be a challenge to to raining weather and runoff possibilities.	The timing of application can be a challenge to to raining weather and runoff possibilities.
Rate	30 lbs per acre of actual nitrogen in the spring as a complete fertilizer (214 pounds of 14-8-8 per acre or 300 lbs of 10-10-10 per acre) plus 30 lbs of actual nitrogen per acre after harvest as urea (66 pounds per acre) or ammonium sulfate (142 pounds per acre).	Grower must monitor for deficiency symptoms which may be labor intensive.	Adjusting fertilizer rates can reduce the chance of runoff and overfertiling. This is a mechanized process so there will be emissions.

Place	Uniformly sprinkle fertilizer one to three feet around the base.	Must be careful not to fertilize too heavily close to the base or you run the risk of fertilizer burn and reduced growth.	This is a slow release fertilizer so it should pose little runoff concerns. Organic options are available.