Part 4: Field Applications in Agriculture

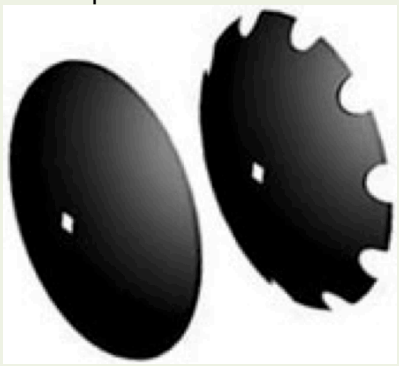
Section A: Applications

Two types of products may be added to a field. They take the form of **crop protection** products and/or **fertilizers**. If a farmer in the state of Ohio has production of 50 or more acres they need to have a license to apply these products. (Training for licenses are conducted by The Ohio State University Extension.) The application of these products can be in a solid form or an aqueous solution.

The form to be applied determines the machinery that is used for the physical application. ***FIELD CULTIVATORS, TANDEM DISCS*** and ***COMBINATION TOOLS*** are used to enhance the uptake of the applications and are used preplanting, preplant incorporated, or preemergence to the crop or weed. Sprayers can be used preplant, preemergence or post emergence. Once the crop or weed has emerged then the farmer traditionally will use a **SPRAYER**.

FIELD CULTIVATORS use various shapes of shanks depending on the soil conditions. They penetrate the ground 3 to 4 inches deep at a speed of 6 mph.

TANDEM DISCS penetrate 3 to 4 inches with an operating speed of 4 to 6 mph.



COMBINATION TOOLS incorporate shanks, disks and leveling devices. A second pass with the combination tool does not result in better soil preparation.

Source 2015 Weed Control Guide for Ohio, Indiana and Illinois. Pub# WS16/ Bulletin 789 / IL15. Ohio State University Extension

Reading Questions

1. What are the two types of products that a farmer will add to a field?

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2. Why would they want to add these products to a field?

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3. What are the four time frames in which a farmer would look at the application of products?

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4. Why would the state want to require people to be licensed to apply these products?

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5. What would be the benefit of a combination tool when trying to apply a product?

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Section B: Nutrient Stewardship

Soil fertility is essential for good crop yield. Addition of nutrients is necessary in many cases. This includes the addition of macro- and micronutrients as we have discussed in other sections. It is important that farmers keep in mind ***the 4Rs of Nutrient Stewardship***, which promote best management practices to achieve cropping system goals while minimizing field nutrient loss and maximizing crop uptake. They promote economically, environmentally and socially sustainable crop nutrition.[1] These principles are the *right source, at the right rate, at the right time, and in the right place.*

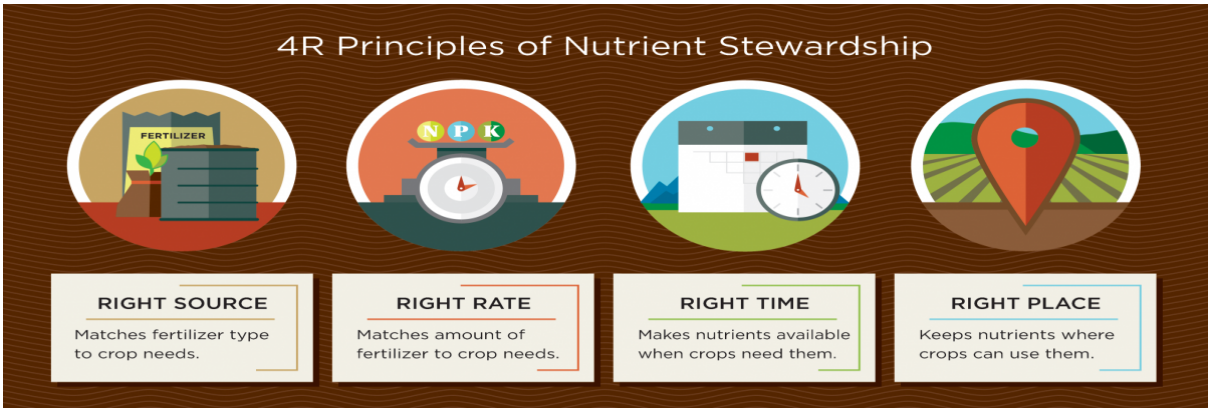

Image Source: http://www.nutrientstewardship.com/

Reading Questions

1. What is meant by the *idea of best management practices*?

2. What are the 4Rs of Nutrient management.

3. Why would it be important environmentally to follow the 4Rs?

4. Why would it be important economically to follow the 4Rs?

[1] Nutrient Stewardship | The Right Time for Nutrient Stewardship is Right Now. The Fertilizer Institute. Retrieved 10 April 2015, from http://www.nutrientstewardship.com/

Section C: Parameters Used in Liquid Spraying

Understanding the needs of the field is critical when selecting the appropriate application technique. Sprayers have the capability to distribute a product over a field efficiently. In order to do so, the product is placed in a *tank* in liquid form where it is pressurized. The tank is connected to the *nozzle body* through *hoses* across the *boom*. (The **boom** is where the nozzle bodies are attached and can stretch up to 120 feet across.) Each of the nozzle bodies have a build up of pressure that is measured in pounds per square inch (**psi**). These nozzle bodies can have one to five *nozzles* on each, depending on the desire of the farmer.

PRODUCTS BEING APPLIED:

LIQUID FERTILIZERS

Liquid Fertilizers are used to introduce nutrients to the soil and plant. They can be applied in one of two ways, broadcasted or directed.

Broadcasted is a type of application that distributes the product over a large area. This is done when the product is being distributed across the whole field, enabling the nutrients to be spread across the soil.

When there is a need to apply the product directly to an area it is called **directed** application.

CROP PROTECTION

Crop Protection is a type of application that provides a chemical treatment that is used to directly reduce the undesirable vegetation, fungus, or insects that are in the field. These products fall into two categories, systemic or contact, which is directly related to the way in which the plant needs to receive the product.

Systemic means that the root system provides the mechanism in which the product is distributed through the plant.

When a product must come into **contact** with the vegetation that is being applied, the liquid is distributed directly on the plant.

These products are put on using one of the following types of spray patterns: **broadcast**, **banding**, **directed**, and **mechanical air assisted.**

Section D: Understanding the Application

In order to make an application of product to a field it is important for the applicator to know the product that is being used, how it will benefit the production environment, and the impact that it will have on the environment.

Calibration

Spray nozzles are calibrated using water that weighs 8.34 pounds per U.S. gallon (1 kg/L). This calibration makes sure that droplet size and volume of the nozzle creates the desired coverage. When applying liquid pesticides the applicator needs to be aware of the weight of the product and use a conversion factor to ensure proper application to the field. Under application reduces the efficacy of the product. Over application can cause environmental concerns. It is important that the applicator follows all recommendations that are listed on the pesticide product label, which includes the dilution/concentration of the pesticide. These levels are based on studies conducted to determine the lethal dose.

The Product

Pesticides and liquid fertilizers are used to manage a variety of concerns within the production environment. The best option for farm operators is an Integrated Pest Management Plan (IPM) that looks at the whole production cycle. This includes crop rotation, hybrid selection, tilling practices and pesticide applications. It is important to know the site of action and the resistance of the pest that is involved. For example, herbicide usage has caused weed resistance and not all weeds can be controlled by the same herbicide.

The Surrounding Environment

The term **persistence** is used to indicate how long the pesticide will survive in the environment. This is directly influenced by the physical and chemical properties of the pesticide and how they react to the biotic and abiotic conditions within the field. This includes the weather and the physical and chemical composition of the soil. Awareness of the movement and reactivity of the pesticide will reduce the amount of runoff from the fields.

Reading Questions

1. Create a diagram that represents the flow of the product in a sprayer.

2. What considerations would farmers think about as they make a choice between broadcasted or directed application of fertilizers?

3. What is the difference between systemic applications and contact applications?

4. How would you define the term *production environment*?

5. Why should farmers be concerned with the calibration of their sprayer?

6. What are the concerns that farmers may have when selecting a product?

7. Persistence of a product is of great importance to farmers. Why is this so?

8. Why would farmers want to control the amount of overspray?