

### Lesson 5: Stand Establishment

Producers are interested in receiving the maximum profit from their crops. In order to receive maximum profits, the producer needs to use methods or techniques that will help in establishing a good stand and enhance the crop's yield potential. Establishing a good stand is vital. In this lesson, the purpose of tillage, tillage methods, environmental effects, seeding methods, seeding depth, nutrients needed for stand establishment, and factors that affect seeding rates will be discussed.

#### Tillage

Tillage (cultivating land) is important in the establishment of a crop stand. Generally, there are three main purposes for tillage: to prepare a suitable seedbed, to eliminate competition from weeds, and to improve the physical condition of the soil. Preparing a suitable seedbed refers to the care taken by the producer to prepare the soil to ensure adequate moisture for germination at the appropriate seeding depth. A suitable seedbed should also maximize the soil contact with the seed for water absorption. Eliminating competition from weeds involves the removal of unwanted plants that would compete for the needed nutrients. The soil's physical condition refers to the soil moisture content, aeration, rate of water infiltration, internal drainage, and water holding capacity. The ideal seedbed would provide the optimum environment so that the seed has the best chance to germinate.

#### Tillage and the Environment

Soil is a precious natural resource. Since there is a limited supply of soil, alternative growing methods are being researched. One method that is used for small-scale production is hydroponics. Hydroponics is growing plants without soil; their essential nutrients are supplied by liquid fertilizers. However, it would be impossible to produce thousands of acres of crops without soil. Therefore, measures must be taken to protect the soil. Soil erosion by wind and water removes an average of 1.6 billion tons of top soil annually from U.S. farm land. This eroded soil runs off into rivers, lakes, and reservoirs where it contaminates these water sources.

There is a growing concern about the effect of certain tillage methods on the environment. Modern technology and equipment enable farmers to use soil-conserving tillage methods. The traditional tillage method that has been used for many years is known as conventional tillage. Conventional tillage involves the use of a moldboard plow, disk, and harrow to prepare the soil. Conventional tillage leaves the soil surface smooth and relatively free of crop residue. It also requires more trips across the field. This method leaves the soil surface exposed and highly vulnerable to water and wind erosion. Farmers are using more soil-conserving methods of tillage rather than the conventional method.

Minimum tillage is considered a type of conservation tillage. Minimum tillage involves the use of a chisel plow, disk, or other implements (equipment). Minimum tillage maintains crop residues and surface roughness, while still providing adequate weed control and seedbed preparation. Minimum tillage increases soil-to-seed contact while decreasing soil erosion.

No-till is another method of conservation tillage. No-till systems leave all crop residue on the soil surface. The no-till methods involve planting seeds directly into the previous crop's residue without exposing the soil. With no-till, good management is important to ensure control of insects and diseases from the previous crop. No-till nearly eliminates soil erosion because all crop residue is left on the soil surface.

#### Seeding

Once the seedbed is prepared, the field is ready for planting. Seeding methods commonly used are row, drill, and broadcast. When using the row method, seeds are evenly spaced in parallel rows. Corn, potatoes, cotton, tobacco, soybeans, and sorghum are crops commonly planted in rows far enough apart to allow periodic cultivation between the rows. Machines used for planting seed are referred to as planters.

Another method of seeding is the drill method. Drills place seeds in narrow rows at high population rates. Crops such as clover, alfalfa, wheat, oats, barley, and rye are usually planted

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by this method. When using the drill method, attachments can be used to place fertilizer at the same time, thus saving time and trips across the field. Planting seed by the drill method reduces the need for mechanical cultivation.

The third method is broadcast planting. Broadcast planters scatter the seed in a random pattern across the top of the soil. Broadcast planting is usually the cheapest method and provides faster coverage for erosion control. Airplanes, tractor-pulled seeders, or hand-held seeders can be used for broadcast seeding. Crops that can be seeded using the broadcast method are grasses, legumes, and small grains. Light tillage is usually required to cover the seeds with a thin layer of soil.

## Seed Depth and Fertilization

Depth of seed placement is critical for germination and emergence. Crop producers are interested in having the planted seed emerge as soon as possible to allow photosynthesis to begin. Seed depth depends on: soil type, seed size, type of emergence, soil moisture, and soil temperature. As a rule, larger seeds (e.g., corn and beans) are planted deeper than smaller seeds (e.g., wheat and clover). Larger seeds have more stored food for seedlings to utilize during germination and emergence. Once the seeds are planted, fertilization of the crop is important.

To ensure proper stand establishment, crop producers must anticipate which elements are needed to produce a quality crop. Fertilization can be done by either using a general application, a starter application, or a side dressing. In stand establishment, starter fertilizers are most commonly used. Starter fertilizers, also known as “pop-up” fertilizers, give the most effective results. Starter fertilizers may contain only nitrogen. However, a complete fertilizer consisting of nitrogen (N), phosphorus (P), and potassium (K) is needed for stand establishment. Following the application of a starter fertilizer, a top dressing of a complete fertilizer may also be used. Because of the expense, soil test results should be used to determine the correct application rates and nutrients required.

## Seeding Rates

There are many factors related to a productive stand. Using good management practices, crop producers can increase their potential yield. Plant populations refers to the number of growing plants in a given area. The density of growing plants directly influences the yield potential. The desired plant population is dependent upon several factors; one of which is the seeding rate.

Seeding rate refers to the amount of seed planted in a given area (per foot, per acre, etc.). Accurate seeding rates are important. Overseeding wastes seed and underseeding reduces yields. By underseeding, the utilization of available light, moisture, and nutrients is inefficient. Overseeding creates excess competition among the plants, thus reducing yield. Optimum seeding rates should be based on the type of crop, use of crop, pure live-seed ratio, seed quality, soil moisture, soil productivity, time of seeding, method of seeding, row width, and expected average rainfall.

The type of crop being planted influences the desired seeding rate. Corn is typically planted at 18,000 to 24,000 seeds per acre, whereas soybeans are typically planted at a 60-pound-per-acre rate. The intended use of the crop is also a factor. Corn for silage is generally planted at a higher plant population than corn to be harvested for grain.

The pure live-seed ratio refers to the ratio of weight of the viable seed of the cultivar (variety within a plant species) being seeded to the total weight of the seed stock, which may include nonviable seeds, weed seeds, and inert matter. If 80 percent of the seed is viable (able to grow) and it is 95 percent pure, the pure live-seed ratio is 76 percent ( $0.80 \times 0.95 = 0.76$ ). If an individual has 100 pounds of seed, there would be 76 pounds of pure live-seed of the desired cultivar to plant. In order to calculate the correct seeding rate from pure live-seed ratios, reference to the cultivar's recommended seeding rate should be made. An example is presented as follows.

A recommended seeding rate based on 100 percent pure live-seed is 6 pounds per acre. This rate is common for small-seeded range grasses. The appropriate seeding rate would be slightly less than 8 pounds per acre based on the following calculations:

$$\frac{\text{rate based on 100\% pure live-seed}}{\text{pure live-seed (ratio)}} = \text{seeding rate}$$
$$= \frac{6}{0.76} = 7.9 \text{ pounds per acre}$$

Seeding rate can also be affected by seed quality. Seed quality is based on germination rate and other factors. If seed quality is low, it is advisable to increase the rate of seeding to ensure a good stand. Seeding time refers to seeding the stand at the appropriate time of the season (i.e., fall or spring). Climatic conditions can reduce stand establishment if planted after the optimum time. Increased seeding rates are suggested when planting before or after optimum planting dates.

Soil productivity and soil moisture also affect the optimum seeding rate. Productive soils may sustain the recommended seeding rates where poor soils may only sustain production at lower seeding rates due to the less fertile soil condition. Excessive soil moisture can retard germination. Most seeds cannot tolerate excessive moisture and may rot. If there is excessive moisture, seeds should be planted at a shallower depth and at a higher seeding rate to promote faster germination and to compensate for loss due to wet conditions.

The method of seeding and row width also affect the seeding rate. Row planting usually involves relatively lower seeding rates than the drill method. Broadcast seeding is used when high seeding rates are desired. As a rule of thumb, as row width narrows, the number of seeds planted can be increased to some degree. Conversely, planting seeds in wide rows should be completed at lower seeding rates.

### Summary

Successful stand establishment requires careful planning and consideration of many factors. By choosing the appropriate method of tillage, the seedbed can be prepared in a soil-conserving manner. Selecting the proper seeding method, planting depth, use of fertilizer, and optimum seeding rate can make the difference between an average stand and a productive stand.

### Credits

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