

Unit F: Soil Fertility and Moisture Management

Lesson 3: Applying Fertilizers to Field Crops

Terms

- Banding
- Broadcasting
- Build up
- Chiseling
- Deep placement



Terms

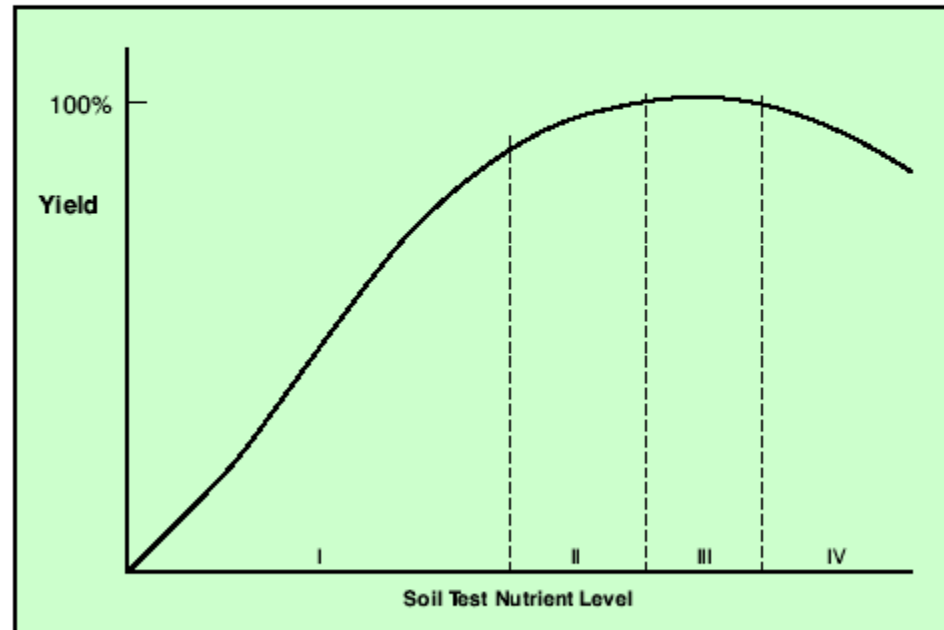
- Fertigation
- Foliar feeding
- Knifing
- Luxury consumption
- Maintenance



Why are fertilizers applied to field crops?

I. Fertilizing can increase yields and increased yields add to a growers income.

SOIL TEST NUTRIENT LEVEL



The yield of a crop is directly related to the nutrient level of the soil.
Fertilization is most profitable for crops in Level I.

Why are fertilizers applied to field crops?

- A. Because fertilizers cost money, a grower must add the amount that is most profitable.
 - The yield of a crop is directly related to the nutrient level of the soil. The nutrient level of a plant can be divided into four levels.

Why are fertilizers applied to field crops?

Level I: Deficient—The nutrient is clearly deficient; growth and productivity are affected.

- After the missing mineral is applied, growth response is strong and profitable.

Level II: Sufficient—A critical level is reached which satisfies plant needs.

- More fertilizer may increase yields slightly, but not enough to pay for fertilizer.

Why are fertilizers applied to field crops?

Level III: High—Nutrient levels are high, yields are maximum.

- Additional nutrients would be stored in the plant which is referred to as *luxury consumption*.
- Fertilization could shift the plant to Level IV or contribute to water pollution.

Level IV: Toxic—Nutrient levels in plant tissue are so high as to be toxic. Yields decline.

Why are fertilizers applied to field crops?

B. Three methods can be used to find nutrient shortages in plants.

- Visual inspection of crops for deficiency signs may uncover clear shortages.
- This method often notes only critical shortages after yield damage has already occurred.

Why are fertilizers applied to field crops?

- Visual symptoms may be unreliable.
- Other problems not related to soil nutrient levels may be present that are affecting plant growth.

Why are fertilizers applied to field crops?

2. **Tissue testing:** measures nutrient levels in plant tissue.

- This type of testing may uncover problems that soil testing misses.

Why are fertilizers applied to field crops?

3. **Soil testing:** measures nutrient levels in soil as well as other soil features.
- Testing laboratories operate on one of two concepts of fertility levels.
 - Fertilize the soil to bring it to an optimum level, then adding yearly maintenance amounts to replace those lost by crop harvest.

Why are fertilizers applied to field crops?

- Frequent soil tests followed by fertilization of the plant to supply needs.
- Growers depend on these tests to determine the lime and fertilizer needs for crops.
- Soil tests have limits.
- Conditions that affect nutrient uptake, such as wet soils, cannot be detected in the laboratory.

What are the methods of fertilizer application?

II. Producers have a number of options for placement of fertilizer.

AN AIR APPLICATOR IS USED TO APPLY FERTILIZER



(Courtesy, Case Corporation)

What are the methods of fertilizer application?

- A. Selecting the proper application technique for a particular field depends at least in part upon the inherent fertility level, the crop to be grown, the land tenure, and the tillage system.

What are the methods of fertilizer application?

1. On fields where the fertility level is at or above the desired goal, there is little research evidence to show any significant difference in yield that is associated with the method of application.

PATRIOT™ SPRAYER APPLIES FERTILIZER TO FIELD



(Courtesy, Case Corporation)

What are the methods of fertilizer application?

2. On low-testing soils placement of the fertilizer within a concentrated band has been shown to result in higher yields.

What are the methods of fertilizer application?

- B. Fertilizers can be applied before a crop is planted, while it is being planted, after it is growing, or in some combination of the three.
 - The time of application has different effects on the crop.

What are the methods of fertilizer application?

1. Fertilizer applied before a crop is planted is called preplant.
2. The simplest way to fertilize before planting is broadcasting.
 - Broadcasting: spreading fertilizer evenly on the soil surface.
3. Soil injection, also known as root zone banding, deep placement, knifing or chiseling, is a process where the fertilizer is placed below the surface in the root zone.

What are the methods of fertilizer application?

4. Fertilizer applied while planting is called *starter fertilizer*.

- The most common method of applying starter is called *banding*, where the planter places a band of fertilizer below and to the side of the seeds.

What are the methods of fertilizer application?

5. *Pop-up fertilizers*: are placed in the row with the seeds.
 - Only small amounts are applied to prevent seedling damage.

What are the methods of fertilizer application?

C. There are several ways to fertilize after planting.

1. **Pre-emergence:** is fertilizing after the planting but before the crop emerges from the ground.
2. **Post-emergence:** is fertilizing after the crop has emerged from the ground.

What are the methods of fertilizer application?

3. **Top dressing:** is the same as broadcasting, except that the fertilizer is spread over a growing crop and is not mixed into the soil.
4. **Sidedressing:** is a way of making a second application of fertilizer part way through the growing season by fertilizing along the crop row.
5. **Fertigation:** is a method of injecting fertilizer into irrigation water.

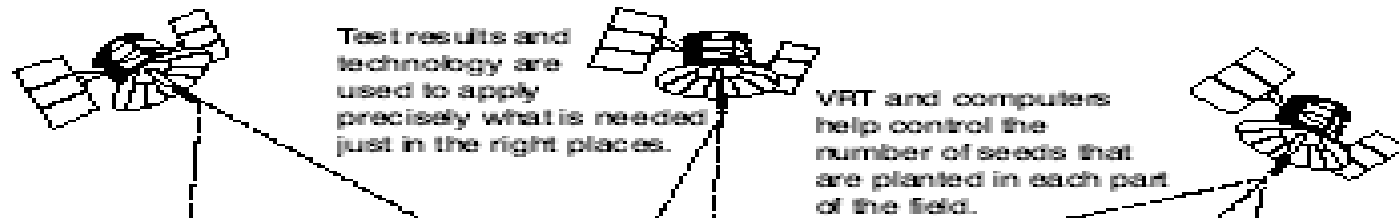
What are the methods of fertilizer application?

6. **Foliar feeding:** is fertilizing by spraying solutions directly on the leaves of the crop.
 - This method offers the quickest response of any fertilizing method.

What are the methods of fertilizer application?

7. Site-specific application also known as variable rate technology (VRT) uses computer technology to alter the rate of fertilizer application as the fertilizer applicator passes across the field.
 - This approach offers the potential to improve yield while minimizing the possibility of over fertilization, which results in improved profit.
8. Global positioning systems (GPS) are used in precision farming to locate exact points in the field.
 - Twenty-four Navstar satellites orbiting the earth send radio signals.
 - Exact points are located by determining the distance from three or more points. This is known as trilateration or triangulation.

GPS System



Soil samples are taken using satellites to help locate the exact position.

Test results and technology are used to apply precisely what is needed just in the right places.

VRT and computers help control the number of seeds that are planted in each part of the field.

Crop specialists use high-tech tools to find pests.

Monitors measure how much crop is harvested at precise sites in the field.

Computers record the test results in layered maps.

What is rate of fertilizer application?

III. Rate of fertilizer application depends upon the soil test level

A. Soil fertility problems are largely associated with acidity, phosphorus, potassium and nitrogen.

- Recommended soil tests for making decisions about lime and fertilizer:

What is rate of fertilizer application?

1. Water pH test, which shows soil reaction as pH units.
2. Bray P1 test for plant available soil phosphorus which is commonly reported as parts per million (ppm)
3. Potassium test, which is commonly reported as ppm, as well.

What is rate of fertilizer application?

4. Testing to determine nitrogen fertilizer needs for field crops is not recommended in the same sense as testing for the need for lime, phosphorus, or potassium since nitrogen can change forms or be lost from the soil.



What is rate of fertilizer application?

5. Testing soil to predict the need for nitrogen fertilizer is complicated by the fact that nitrogen availability, both the release from soil organic matter and the loss by leaching and denitrification is regulated by unpredictable climatic conditions.

What is rate of fertilizer application?

B. The amount of fertilizer recommended may be build up plus maintenance, maintenance or no fertilizer.

What is rate of fertilizer application?

1. **Build up**: is the amount of material required to increase the soil test to the desired level.
2. **Maintenance**: is the amount required to replace the amount that will be removed by the crop to be grown.

What is rate of fertilizer application?

3. Build up plus maintenance: when soil test levels are below the desired values, it is suggested that enough fertilizer be added to build the test to the desired goal and to replace what the crop will remove.
4. At or below the desired values, the yield of the crop will be affected by the amount of fertilizer applied that year.

What is rate of fertilizer application?

C. Maintenance: when the soil test levels are between the minimum and 9 kilograms above the minimum for phosphorus or between the minimum and 45 kilograms above the minimum for potassium, apply enough to replace what the crop to be grown is expected to remove.

What is rate of fertilizer application?

1. The yield of the current crop may not be affected by the fertilizer addition, but the yield of subsequent crops will be adversely affected if the materials are not applied to maintain soil-test levels.

What is rate of fertilizer application?

2. No fertilizer—it is recommended that soil test levels be maintained slightly above the level at which optimum yield would be expected.
 - It would not be economical to attempt to maintain excessively high values.

Review / Summary

- Fertilizing can increase yields and increased yields add to a grower's income.
- Because fertilizers cost money, a grower must add the amount that is most profitable.
- Producers have a number of options for placement of fertilizer.

Review / Summary

- Selecting the proper application technique for a particular field depends at least in part upon the inherent fertility level, the crop to be grown, the land tenure, and the tillage system.
- Soil fertility problems are largely associated with acidity, phosphorus, potassium and nitrogen.