Lesson 6: Managing the Crop

Quality crops are the result of good management. Good crop management decisions involve fertilizer use and application, pest control measures, soil pH and adjustments, tillage, treatment of crop residues, and the proper use of irrigation. Producing quality crops at a profit requires planning and the use of sound management practices.

Elements Needed for Plant Growth

There are 16 nutrient elements that are required for plant growth. Each of the elements performs specific tasks. Carbon, hydrogen, and oxygen are essential in the process of photosynthesis and respiration. They are not generally applied as fertilizer. The other 13 elements are important for many plant functions.

The 13 nutrient elements can be categorized according to the amounts needed by plants. The major elements, commonly called macronutrients, are nitrogen (N), phosphorus (P), and potassium (K). These three nutrients are most commonly applied to crops. Calcium (Ca), magnesium (Mg), and sulfur (S) are considered secondary macronutrients. The other seven mineral elements, known as micronutrients, are boron (B), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), zinc (Zn), and chlorine (Cl).

Application

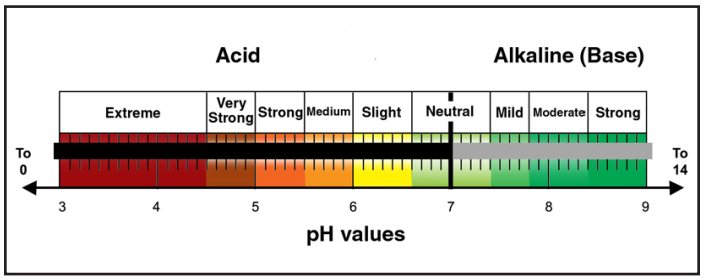
The amount of fertilizer applied should be based on the soil test results. Fertilizers are expensive. Some fertilizers are petroleum-based, and applying them incorrectly can be very costly. After considering the results of a soil test, more effective management decisions can be made regarding soil nutrient needs and applications.

Fertilizer may be applied at the time of planting with a starter fertilizer. Starter fertilizer may consist of nitrogen only or a complete fertilizer containing N, P, and K. Side-dressed fertilizers may be applied after the plant seedlings have emerged and vegetative growth has begun. Top-dressed fertilizers are applied after plants have become established. The amount and application method vary because of cultural practices, soil type, type of crop, and personal preference. Information relating to production of specific crops can be obtained from seed companies. However, soil tests are vital for good management decisions and should be completed well before planting.

Soil pH

Soil pH refers to the degree of acidity or alkalinity of a soil. The pH scale ranges from 0 (maximum acidity) to 14 (maximum alkalinity). At the midpoint of the scale (7), the pH is considered neutral, meaning neither acidic nor alkaline. See Figure 6.1.

Figure 6.1 – pH Scale



Profitable crop production is dependent on soil pH. Most crops grow and produce the best in soils with a pH range of 5.0 to 7.5. Soils with a pH outside the 5.0 to 7.5 range inhibit the absorption of nutrients by growing plants. When planning for crop production, the soil's pH should be tested at least every 3 years. Once the pH is determined, measures can be taken to adjust it to a desirable level.

Altering the pH can be accomplished by applying lime or sulfur depending on the needed change. If the soil is too acidic, application of agricultural lime will raise the pH. The amount of agricultural lime needed varies depending upon the amount of organic matter, soil texture, and current pH level of the soil. The greater the organic matter and clay, the more lime required. More acidic soils also require greater amounts of lime to raise the pH to an acceptable level.

If the soil is excessively alkaline, application of sulfur or aluminum sulfate will lower the pH. In land where production has occurred before, excessive soil alkalinity may be caused by heavy applications of lime or by applying lime to soils with a high pH. Applications of sulfur will lower alkalinity of soils in an average of 3 to 6 months. Applications of aluminum sulfate will change soil alkalinity within 10 to

14 days. When using agricultural lime, sulfur, or aluminum sulfate, care should be taken not to use more than what is needed. The crops to be produced, fertilizers used, and cultivation practices after harvest are factors to consider when attempting to alter a soil's pH.

Crop Residues

After harvesting crops, farmers are faced with the decision of how the plant residues should be handled. Plant residues are the unused parts of the crop that are not harvested (e.g., straw, corn stalks, and soybean hulls). A major component of soil is organic matter. Organic matter is important because it is the basis of soil productivity. Crop residues are often tilled into the soil to increase soil organic matter, which raises the nutrient-holding capacity, water-holding capacity, and physical condition of the soil. Most Missouri soils contain less than 3 percent organic matter, whereas other states like Illinois have 5 percent or more of organic matter. Crop residues can also be left on the surface, which will greatly reduce the amount of soil erosion due to wind and water. Crop residues left on the soil surface reduce the force of the rain and slow the travel of water across the surface. Crop residues help hold the soil particles together, which also reduces erosion by wind.

Pest Control

Farmers lose billions of dollars annually because of crop pests. Crop pests include diseases, weeds, insects, and animals. Crop pests may damage crops by destroying the seed, attacking the live plant, or contaminating the harvested crops. Crop pests may reduce yields, reduce quality, and damage crops in storage. Methods of controlling plant pests involve mechanical, cultural, biological, genetic, and chemical means.

Mechanical control refers to practices that disrupt the pest's environment or the pest itself. Cultivation exposes soil-borne pests to the air and sunlight and controls weed. Mowing, electricity, and traps are also considered mechanical control methods.

Cultural control refers to adapting agricultural production practices to control pests. Pests can be controlled by planting resistant crop varieties, rotating crops, and timing certain operations to break the reproductive cycle of specific pests.

Biological control involves the use of predators or diseases that affect only the pests. Genetic control is done through the development of crop varieties that are resistant to pests.

Chemical control of pests is accomplished through the use of pesticides and other chemicals. Care must be taken not to use excessive dosages because of the increased chance of soil and water pollution due to runoff. Pesticide application should be performed by experienced persons and according to recommended rates.

Irrigation

In many states, the average annual rainfall is not adequate to sustain intensive crop production. There are also years where rainfall in some areas is not sufficient due to drought conditions. When these situations arise, steps may be taken to supply adequate water to the crops.

Irrigation is a technique of supplying water to plants, which has been used for thousands of years in many parts of the world. Although irrigation is not a new technique, some of the methods have greatly improved. Irrigation provides water for crop production through aerial, surface, and subsurface methods.

Aerial irrigation generally refers to the use of sprinkler systems. Aerial irrigation involves the use of permanent or portable pipes. High volume equipment such as center pivot systems are used in the western parts of the U.S., where rainfall is limited.

Surface irrigation moves water directly from the source to an area where the crops are. The surface methods include flood, drip, furrow, and corrugation irrigation. Surface irrigation uses various methods to move the water across the soil surface to the crops.

Summary

Managing a crop involves making decisions related to assessing nutrient needs of crops, fertilizer application,

pest control, soil pH, handling crop residues, and irrigation. Each factor can enhance or restrict the crop's potential for high yields. Good crop management considers each of the factors that affect crop growth.

Credits

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Delorit, R.J.; L.J. Greub; H.L. Ahlgren. *Crop Production.* 5th ed. Englewood Cliffs, NJ: Prentice-Hall, 1984.

Fridline, C.R. *Field Crop Nutrition*. The Ohio State University: Ohio Agricultural Education Curriculum Materials Service, 1978.