



Nutrient Management: Key for Sustainable Crop Production

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In recent years the grain production have stagnated or even declined for most of the cereal crops due to imbalance and inadequate application of fertilizers, changes in biochemical and physical composition of the soil organic matter. On the other hand our population day by day is increasing with faster rates. Therefore, to fulfill the requirement of the present and future generation it is urgent need to manage the nutrients in judicious manner. The nutrient management may help to rejuvenate the soils of their lost nutrients and reverse the process of yield stagnation. Crop plants need balanced nutrition for normal growth and good health. Plants require an adequate and balance supply of all essential nutrients for optimum growth and productivity. Any of the nutrient deficiency acts as a weakest link to inhibit efforts to enhance farm productivity and profitability. Balanced use nutrient element correct nutrient deficiency, improves soil fertility, increases nutrient and water use efficiency, improves crop and environmental quality; and overall enhances crop yields and farmers' profit.

Introduction

Nutrient may be defined as the chemical compound or an element required by an organism. Plant nutrition is one of the important factor which directly affects both crop yield and quality. The availability of required nutrients, together with the degree of interaction between these nutrients and the soil play a vital role in crop development. Seventeen nutrients are recognized as essential for good crop growth.

Carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, along with sulfur, calcium, and magnesium, are called macronutrients because plants require in relatively large amounts. Plants also need micronutrients such as boron, copper, manganese, zinc, iron, chloride, nickel and molybdenum to remain healthy. A deficiency of any one essential nutrient that limits or prevents a metabolic function and plant growth is called essential nutrient. So the nutrient management is an essential part of crop production.

What is nutrient management?

It is a system used by farmers to manage the amount, form, placement, and timing of the application of nutrients (whether as manure, commercial fertilizer, or other form of nutrients) to plants.

Why nutrient management is essential

- To budget, supply, and conserve nutrients for plant production.
- To minimize agricultural nonpoint source pollution of surface and groundwater resources.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To protect air quality by reducing odors, nitrogen emissions (ammonia, oxides of nitrogen), and the formation of atmospheric particulates.
- To maintain the physical, chemical and biological condition of soil or to maintain the soil health.

Advantages of nutrient management

- Nutrient management increases soil fertility.
- It increases production and productivity of crops.
- It enhances nutrient use efficiency.
- Nutrient management can reduce the losses of fertilizers.
- Nutrient management reduces the environmental pollution as well as ground water pollution.

Constraints of nutrient management

- ▶ Lack of knowledge about nutrient management system.
- ▶ Financial inability to acquire fertilizers in time.
- ▶ Unavailability and unstable market price of fertilizers during crop seasons.
- ▶ Lack of knowledge about the beneficial aspect of combined use of organic manures and fertilizers.
- ▶ Lack of technical knowledge in preparing organic manure and its role in maintaining soil fertility and enhancing crop productivity.
- ▶ Absence of training about appropriate techniques of soil fertility and nutrient management for crop production.
- ▶ Lack of knowledge about the beneficial aspects of crop rotational and crop residue management.
- ▶ Scarcity of lands for cultivation of green manure crops.
- ▶ Use of cow dung and crop residues for cooking due to shortage of bio-fuel.

How to build up the nutrient management

1. Soil testing

In agriculture, a soil test is the analysis of a soil sample to determine nutrient and contaminated content, composition and other characteristics such as the acidity or pH level. A soil test can determine fertility, or the expected growth potential of the soil which indicates nutrient

deficiencies, potential toxicities from excessive fertility and inhibitions from the presence of non-essential trace minerals. The test is used to mimic the function of roots to assimilate minerals.

2. Plant tissue testing

The nutrient content of a plant can be assessed by testing a sample of tissue from that plant. These tests are important in agriculture since fertilizer application can be fine-tuned if the plants nutrient status is known. Nitrogen most commonly limits plant growth and is the most managed nutrient.

3. Methods of fertilizer application: the nutrient management could be build-up by the adopting the following fertilizer application methods

- **Broadcasting:** Application of fertilizer uniformly on the soil surface is known as broadcasting of fertilizers. This is done either before sowing of the crop or in the standing crop. Broadcasting is the advantageous with solid and soluble fertilizers. Generally the entire dose of phosphatic and potassium fertilizers are applied by broadcasting before sowing. Because of their low mobility in soil, these fertilizers should be incorporated into the rooting zone.
- **Band Placement:** Application of fertilizers in narrow bands beneath and by the side of the crop rows is known as band placement of fertilizers. Band placement should be done when the soil fertility is low and volatilization losses is high .
- **Point Placement:** Placement of fertilizer near the plant either in a hole or in a depression followed by closing with soil is known as point placement. It should be adopted for top dressing of nitrogenous fertilizers in widely spaced crops.
- **Fertigation:** It is the process of application of fertilizers with irrigation water is known as fertigation. It is good method of fertilizer application. It directly provides the nutrient in soluble form to the plants and hence enhances the nutrient use efficiency.
- **Root Dipping:** The roots of the seedlings are dipped in nutrient solution before transplanting. In soils deficient in phosphorus, roots of rice seedlings are dipped in phosphorus slurry before planting.
- **Foliar Spray:** Application of fertilizers to foliage of the crop as spray solution is known as foliar spray. This method is suitable for application of small quantities of fertilizers especially micronutrients.

4. Time of fertilizer application: The time of fertilizer application is important tool in nutrient management system. Application of fertilizer in proper time providing nutrients in sufficient quantities to meet the crop demand and at the same time avoiding excess availability and leaching losses.

Nanotechnology in soil fertility, fertilizer and plant nutrition: Nanotechnology is defined as understanding and control of matter and dimensions at 1-100 nm. Nano enhanced products like nano-fertilizer, with nano-based smart delivery system are available in advanced countries to provide nutrients at desired site, time and rate to enhance nutrient or fertilizer use efficiency and productivity.

Conclusion

Crop plants need balanced nutrition for normal growth and good health. Plants require an adequate and balance supply of all essential nutrients for optimum growth and productivity. Any of the nutrient deficiency acts as a weakest link to inhibit efforts to enhance farm productivity and profitability. Balanced use of plant nutrient correct nutrient deficiency, improves soil fertility, increases nutrient and water use efficiency, improves crop and environmental quality; and overall enhances crop yields and farmers' profit.

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