

Introduction

Fertilizer plays an important role in crop production. Maximum yield is oftentimes affected by how much and what kind of fertilizer is applied to the rice plant. There are many kinds of fertilizers with one or more elements present for plant growth and development. As much as possible, farmers should select only the fertilizers needed by the plant based on fertilizer recommendation or soil analysis.

It is important that a farmer should discover the most effective and efficient use of fertilizers as well as the right kind and amount of fertilizers to use and the best time to apply them.

The use of organic fertilizers is also necessary to improve the physical and physiological properties of the soil. They supply micronutrients needed by the plant for better, healthier and safer produce.

Kind and Amount of Fertilizers Needed by Plants

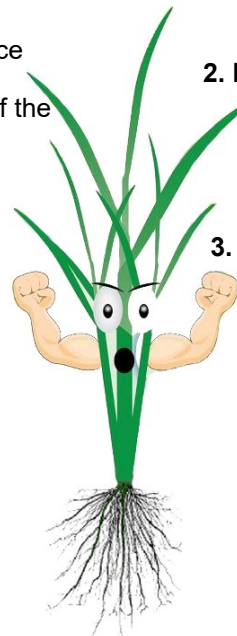
Soil analysis is very important in determining the nutrient content and deficiency of the soil. The result will guide the farmer on the kind, type and amount of fertilizer to apply in his farm. Excessive use of unnecessary fertilizers may result to soil acidity. It will also incur additional costs of unnecessary farm inputs.

Major Nutrient Elements Needed by Plants

A. Nitrogen (N)

1. Functions of Nitrogen in Crop Production

- ☑ Gives dark green color to the plants
- ☑ Promotes rapid growth and development of the rice crop.
- ☑ Builds the physical and physiological properties of the plant.
- ☑ Increases the number of tillers and panicles.
- ☑ Increases number of spikelets per panicle and percentage filled grains.
- ☑ Promotes grain development and grain weight.
- ☑ Increases protein content in grains.
- ☑ Promotes organic N mineralization.



2. Fertilizers with Nitrogen (N) content

- ☑ Urea (46-0-0/45-0-0)
- ☑ Ammonium sulfate (21-0-0)
- ☑ Calcium ammonium nitrate (27-0-0)
- ☑ Ammonium chloride (25-0-0)
- ☑ All combination of Nitrogen and Phosphorous and complete fertilizers that contains nitrogen (e.g. 14-14-14; 16-20-0, etc.)
- ☑ Composted organic materials like manure of animals, weeds/leaves, etc. that contains nitrogen.

3. Symptoms of Nitrogen Deficiency

- ☑ Stunted and poor growth of rice plants with limited tillers.
- ☑ Narrow, erect or upright and short leaves
- ☑ Yellowish green leaves. Yellowing starts at older leaves then turns brownish in color.
- ☑ Deficiency can be further determined through plant analysis, soil analysis, and field response with fertilizer application.

Note: Excessive use of nitrogen fertilizers may result to production of more leaves and tillers that delays panicle development and crop maturity. Also, it may result to susceptibility from pests and diseases.

B. Phosphorus (P)

1. Functions of Phosphorous to Plants

- ☑ Stimulates root development
- ☑ Encourages active tillering.
- ☑ Promotes early heading, flowering, ripening and grain development.
- ☑ Provides resistance to the rice plant against diseases.

2. Fertilizers with Phosphorus

- ☑ Superphosphate (0-18-0, 0-20-0, and 0-45-0)
- ☑ All complete fertilizers (14-14-14, 12-12-12, etc.)
- ☑ Guano or bat manure
- ☑ Rice straw/rice hull, and other composted materials.

3. Symptoms of Phosphorus Deficiency

- ☑ Stunted and poor growth of rice plants with limited number of tillers.
- ☑ Narrow and short leaves that are erect and dirty dark green leaves.
- ☑ Young leaves are healthy while older leaves turn yellow to brown then later exhibits wilting.
- ☑ Reddish or purplish color of leaves.



C. Potassium (K)

1. Functions of Potassium

- ☑ Favors tillering during vegetative stage.
- ☑ Promotes rapid crop growth, flowering and grain development.
- ☑ Helps plant to produce sucrose and agar for the production of bigger and heavier grains.
- ☑ Induces high water-use efficiency through control of stomatal movement
- ☑ Contributes to lodging resistance.
- ☑ Renders resistance against pests and diseases.

2. Fertilizers with K Content

- ☑ Muriate of potash (0-0-60)
- ☑ Sulfate of potash (0-0-52)
- ☑ Ash and composted rice straw.

3. Symptoms of Potassium Deficiency

- ☑ Stunted and poor growth of plants with limited tillers.
- ☑ Narrow, curled and dark green colored leaves.
- ☑ Short and droopy leaves.
- ☑ Purplish-colored leaves.
- ☑ Yellowing at inter-veins, on lower leaves, starting from the tip and eventually drying to a light brown color.
- ☑ Irregular necrotic spots may develop on the panicles.
- ☑ Wilting of plants when K-N ration is low.

D. Calcium (Ca)

1. Functions of Calcium

- ☑ Promotes normal root growth and development.
- ☑ Enzyme activator.
- ☑ Important constituent of the cell wall.

2. Fertilizers with Ca Content

- ☑ Calcium phosphate
- ☑ Calcium carbonate
- ☑ Superphosphate
- ☑ Cyanamide and gypsum

3. Symptoms of Calcium Deficiency

- ☑ Tip of upper growing leaves becomes white, rolled and curled.
- ☑ Plant is stunted or poor growth.
- ☑ Necrotic tissue along margins of leaves which turn brown and die.



E. Sulfur (S)

1. Functions of Sulfur

- ☑ Constituent of amino acid (cystine, cysteine, methionine) and plant hormones.
- ☑ Factor in functioning of many plant enzymes, enzyme activators and oxidation-reduction reactions.

2. Fertilizers with Sulfur Content

- ☑ Ammonium sulfate
- ☑ Single super-phosphate
- ☑ Gypsum

3. Symptoms of Sulfur Deficiency

- ☑ General chlorosis where yellowing starts from upper leaves.
- ☑ Reduced plant height and tiller number.
- ☑ Fewer and shorter panicles and lesser number of spikelets per panicle at maturity.

F. Zinc (Zn)

1. Functions of Zn in Crop Production

- ☑ Present in several dehydrogenase, proteinase, and peptidase enzymes.
- ☑ Promotes growth hormones and starch formation.
- ☑ Promotes seed maturation and production.
- ☑ Constituent of cytochrome essential in respiratory apparatus that yields adenosine triphosphate.

2. Fertilizers with Zn Content

- ☑ Zinc sulfate
- ☑ Zinc chloride
- ☑ Zinc oxide

3. Symptoms of Zinc Deficiency

- ☑ The midrib of the young leaves especially the base become chlorotic.
- ☑ Brown blotching and streaks in the lower leaves appear, followed by stunted growth.
- ☑ Reduced size of leaf blade.
- ☑ Uneven growth and delayed maturity.
- ☑ Stunted growth even when NPK is adequate.
- ☑ In severe cases, transplanted seedlings may die and direct-seeded rice may fail to emerge.
- ☑ Yellowing then whitening of leaves starting from the upper leaves.
- ☑ Deficiency commonly occurs on neutral to alkaline soils, and more frequent on upland submerged soils.
- ☑ Critical level for deficiency is seen in the leaf blade at tillering.

G. Iron (Fe)

1. Functions of Iron

- ☑ Required in protein synthesis.
- ☑ Needed in chlorophyll formation and transport.
- ☑ Activator of several enzymes.

2. Fertilizers with Fe Content

- ☑ Ferrous sulfate
- ☑ Ferrous ammonium sulfate

3. Symptoms of Fe Deficiency

- ☑ Interveneal yellowing of emerging leaves.
- ☑ Whole leaves and plants may become yellow.
- ☑ Reduced yield.

Organic Materials

Organic materials usually are those that undergo decomposition. Generally, organic fertilizers contain micro-elements which are needed by plants. Organic materials are made of farm waste, weeds, grasses, animal manure and other substrates that contain either macro- or micro-nutrients.

Organic fertilizers mainly improves soil condition and fertility. It loosens the soil making it friable and productive. Also, it balances soil temperature, holds moisture and releases nutrients needed by the plants.

References:

- ◇ Modules on Rice Production, ATI-CAR
- ◇ Handout on Nutrient Management, PhilRice, 2006.
- ◇ Photo from bioenergycrops.com and PhilRice



Department of Agriculture
AGRICULTURAL TRAINING INSTITUTE
Cordillera Administrative Region
BSU Compd., La Trinidad, Benguet
Telefax No.: (074) 422-2375
E-mail: ati_car@yahoo.com

MAJOR FERTILIZERS AND THEIR ROLES IN RICE PRODUCTION

